FOREIGN TRADE UNIVERSITY

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REPORT

FACTORS AFFECTING E-PAYMENT ADOPTION IN HANOI: A CONSUMER PERSPECTIVE

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CONTENTS

LIST OF ABBREVIATIONS

AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
SPSS	Statistical Package for Social Science
SRMR	Standard Root Mean Square Residual
Df	Degree of freedom
UTAUT	Unified Theory of Acceptance and Use of Technology
TPB	Theory of Planned Behavior
TAM	Technology Acceptance Model
TLI	TLI
VIF	Variance Inflation Factor
TRA	Theory of Reasoned Action
R-squared	Coefficient of Determination
SEM	Structure Equation Modeling
RMSEA	Root Mean Square Error of Approximation
PU	Perceived usefulness
PEOU	Perceived ease of use
PBC	Perceived Behaviour Control
KMO	Kaiser-Mayer-Olkin
PIIT	Personal Innovativeness in Information Technology
IS	Information Systems
DOI	Diffusion of Innovation
GFI	Goodness-of-Fit Index
EFA	Exploratory Factor Analysis
CR	Composite reliability

CFI	Comparative Fit Index
CFA	Confirmatory Factor Analysis
BI	Behavioural intention
INTENT	Behavioural intention

LIST OF FIGURES AND TABLES

CHAPTER 1: INTRODUCTION

1.1. The rationale of the research

In the recent years, e-payment has been an increasingly hot issue. As the e-commerce landscape is evolving at a rapid rate, e-payment methods also grow in terms of varieties. Özkan, Bindusara, and Hackney (2010) state that due to the limitation of traditional payment methods, novel methods of conducting business and transactions online have been introduced, better befitting newer environments. The success that e-payment experienced is in part thanks to the exponential growth of information technology (Tee and Ong, 2016). The help of information technology also helps demonstrate the potential of different economies transforming from cash–based to cashless ones. However, that vision would be the result of various complex processes, hence current trading activities are still mostly based in cash (Yaokumah, Kumah and Okai, 2017). Likewise, Lai (2017) argues that there exists a natural limit to the rate of consumer adoption concerning technological products and services acceptance. The problem is how to lessen this barrier and improve e-payment adoption.

According to Vietnam E-commerce White Paper, in the year 2018, 39.9 million people in Vietnam participated in online shopping (iDEA, 2019). With a population of more than 95.54 million people at the time (World Bank, 2018), that is more than 40% of the total population. The average expenditure for the year of each online buyer was estimated to be 202 USD, accumulating 8.06 billion USD in business-to-consumer (B2C) e-commerce sales, an increase of 30% over the previous year, accounting for about 4.2% of the total retail sales of consumer goods and services nationwide (iDEA, 2019). Nonetheless, the majority of online shoppers still opted for cash-on-delivery payment method with 88% of the respondents, followed by card payment. This is not a favorable prospect for e-payment as the year before (2017) witnessed 82% of the respondents prefer cash payment to other alternative e-payment methods. It can be inferred that e-payment still poses a stigma to shoppers online and that is why even in an online environment, banknotes are still highly valued.

That is not to say Vietnam has not achieved highs in its transitioning to more of a cashless economy. According to the State Bank of Vietnam (2020), the total number of bank cards in circulation is more than 103 millions, which is higher than the population. This number includes 87.78 million domestic bank cards and 15.35 international ones. In addition, the percentages of consumers paying by different electronic methods also increased from 2017 to 2018 (iDEA, 2019). For example, in 2017, only 19% of the people surveyed would like to use credit and debit cards for online transactions. One year later, the number increased to 34%. Another case in point is the increased use of e-wallet from 7% to 17% of the people over the same period.

To further improve the rate of electronic payment adoption by consumers, several theoretical frameworks and research models have been developed, attempting to explain the factors affecting consumers' decision to accept and use. However, domestically, Vietnam has specific economic, cultural and social norms that international models may not explain the situation fully. Moreover, few Vietnamese researchers focus on what are the main factors affecting consumers' decision to use electronic payment. Therefore, there is a need for a research model suitable to the conditions of Vietnam based on domestic and international studies in recent years and offering solutions to attract consumers into incorporate electronic payment methods in their daily life.

1.2. Research objective and hypotheses

The main objective of the study is to evaluate the significance of different factors on the adoption of e-payment methods in the context of Hanoi, Vietnam. In particular, the factors are focused mainly on consumers’ perception of e-payment that are adapted from the framework of Lin and Nguyen (2011) with three modifications. It can be said that the proposed factors and the proposed framework are derived from the technology acceptance model (TAM). In other words, the framework in the study is a modified TAM. This would be a contribution to the developing science of Vietnamese consumer technology adoption within the setting of rising popularity of different e-payment methods.

In the framework, the theoretical factors are divided into three categories: motivation, uncertainty, and character. Motivation includes perceived ease of use and perceived usefulness; whereas uncertainty is composed of perceived risk, information on e-payment, and perceived trust. Character, the third category, comprises personal innovativeness in information technology and perceived behavioral control.

After finding out which factors are to be tested, the construct for each factor is developed, adapted from previous prominent researches in the field, containing reflective questions on different aspects of consumers' psychology. At the same, these hypotheses were formulated:

H1a: Perceived ease of use has a positive effect on behavioral intention

H1b: Perceived usefulness has a positive effect on behavioral intention

H2a: Perceived risk has a positive effect on behavioral intention

H2b: Information on E-payment has a positive effect on behavioral intention

H2c: Perceived trust has a positive effect on behavioral intention

H3a: Personal Innovativeness in Technology has a positive effect on behavioral intention

H3b: Perceived Behavioral Control has a positive effect on behavioral intention

H4a: Behavioral Intention mediates the positive relationship between motivation (perceived ease of use and perceived usefulness) and e-payment use

H4b: Uncertainty (perceived risk, information on e-payment, and perceived trust) affects e-payment use indirectly through behavioral intention

H4c: Behavioral Intention mediates the positive relationship between characters (personal innovativeness in technology and perceived behavioral control) and e-payment use.

1.3. Research Subject, Object, and Scope

The subjects of the research are factors that affect the rate of e-payment adoption, whereas the objects are people who may or may not use e-payment methods to buy consumer goods and services. Regarding the research scope, the study was

conducted in the vicinity of Hanoi, in the time span of one month from the 1st of April to the 10th of June, 2020. The first month was used to review the literatures, drafting research outline and theoretical constructs. From May 1st to May 20th, the data was collected and the remaining time was spent on data analysis and conclusions formation.

Data was collected through non-random convenience sampling method. There are 256 observations from the respondents, which were then analyzed to figure out the correlation between each of the seven independent variables and the dependent variable. The independent variables are: perceived ease of use (PEOU), perceived usefulness (PU), perceived risk (PR), information on e-payment (IE), perceived trust (PT), personal innovativeness in information technology (PIIT), and perceived behavioral control (PBC). The dependent variable in this study is e-payment use, which is mediated by behavioral intention (BI).

1.4. Research methodology

The research is quantitative oriented with three main approaches: exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and structural equation modelling (SEM). EFA and CFA are mostly concerned with the measurement model, which means that assessing if the questions and constructs that have been developed are valid and reliable, while structural equation modelling is concerned with confirming the causal relationship between different factors and e-payment use.

Regarding data collection, primary data were collected directly from questionnaire given to 256 consumers who may or may not have experiences with e-payment. The questionnaire was developed using Likert seven-point scale, which includes mostly reflective questions about consumers' perception of e-payment.

As for data sampling, due to the geographic and time limitations of the researcher, the study was carried out using non-random convenience sampling. This means taking samples based on the convenience and accessibility of the subject, where the researcher is able to contact the subject. Specifically, questionnaire was distributed using the Internet and words-of-mouth, with specific measures as not to contaminate the sample population, such as including questions that filter people

who lives in other cities or provinces and only promoting the questionnaire where there are mostly peole who lives in Hanoi.

Concerning data analysis, quantitative methods were utilized in model development process, whereby IBM SPSS and IBM AMOS are used to analyze the resulting surveys and apply structural equation modelling.

1.5. Structure of the research.

The report is divided into five chapters, each each with a specific talking points as followed:

Chapter 1 - Introduction: This chapter aims to discuss the rationale of the research, what the report aims to accomplish, its respective scope and methodology, and relevant information on what factors affect consumers' perception of e-payment.

Chapter 2 – Literature Review: This chapter aims to give an overview of the literature on relevant conceptual frameworks and theoretical knowledge of how new technology is accepted and how e-payment as a subject of study revolved around technology acceptance. The literature will then come together to build a a feasible theory model.

Chapter 3 - Research Methodology: This chapter aims to give a clear research methodology and the process for data analysis. It will discuss the data collecting procedures, questionnaires, and how data are analyzed to come up with a conclusive model to test different hypotheses.

Chapter 4 - Results: This chapter aims to illustrate research findings from the data accumulated from respondents using the formulated questionnaires and further analyze both individual factors, model exploration and validation, using exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and structural equation modeling (SEM). These results are then compared to a set of indices for model fit and used to evaluate the hypotheses.

Chapter 5 - Conclusion and Recommendation: This final chapter summarizes all previous findings and give recommendations for future further research, strategies for the government and merchants who are interested in the benefits of e-payment.

CHAPTER 2: LITERATURE REVIEW

2.1. E-payment

There are a few definitions of e-payment. According to Tella (2012, p. 17), e-payment is “an online billing solution offering subscribed merchants’ customers the facility of extending their payment options to online payment.” Meanwhile, Nguyen and Huynh (2018, p. 926) define it as “the payment process made without the paper instrument usage”. Tan (2004) also agrees with Nguyen and Huynh, saying that any payment not influenced by paper-based instruments should be considered an e-payment transaction. Indeed, these authors imply paper-based instruments here are fiduciary money (bank notes and coins), cheques, and the like. O'mahony, Peirce, and Tewari (1997) have more sophisticated definition: “payments made via the automated clearing house, commercial card systems (purchasing card, travel & entertainment cards and fleet cards) are wire transfers as electronic”.

It can be said that e-payment is a subset of an e-commerce transaction for buying and selling goods or services through wire transfers. In other words, it comprises of a variety of systems (e-payment system – EPS) in which monetary value is transferred electronically or digitally between two entities as compensation or consideration for the receipt of goods or services. The identity of the entity in this regard could be a bank, business, government or even an individual customer (Tan, 2004). The entity sends out payment orders through electronic terminals by themselves or by authorizing other people, to realize money payment and capital transition. Different e-payment systems (EPS) channel online payment, mobile payment, telephone payment, and selfservice terminal payment. Those who use e-payment system to complete payment behaviour are called users.

Like with the definition, there are a few ways to categorize digital payment. For Anderson (1998), electronic payment systems can generally be classified into four: Online Electronic Cash System, Electronic Cheque System, Online Credit Card Payment System, and Smart Cards based Electronic Payment System. Each

payment system has its advantages and disadvantages for the customers and merchants. These payment systems have numbers of requirements: e.g., security, acceptability, convenience, cost, anonymity, control, and traceability (Tella, 2012). Tan (2004), on the other hand, looks at the systems at another viewpoint and categorized e-payment transactions into three segments: retail e-payment, corporate e-payment and wholesale e-payment. He clarifies that the retail e-payment segment is composed of three types of transactions: business-to-consumer (B2C), consumer-to-business (C2B), and consumer-to-consumer (C2C), which is also known as peer-to-peer (P2P). Another way to classify are the three types: direct online credit/debit payments, mediated credit/debit payments, stored-value money and electronic bill payments (Fazlollahi, 2002: Bitpipe, 2006). This report is focused mostly on retail e-payment, whereby looking at consumers' perception of e-payment in general, which comprises both e-commerce and point of sale (POS) transactions, as categorized by Worldpay (2020).

Next, let's move on to consider what methods constitute e-payment. In the world, according to Ross (2017), paying by credit and debit cards are the two most favored e-payment methods at 64% combined, followed by payment providers such as PayPal and WorldPay. The second favorite way for customers to purchase goods and services online is paying by digital wallets/ mobile payment services such as Google and Apple Pay (Emmanuel, 2020). In recent years, the popularity of other alternative payment methods such as cryptocurrency and prepaid cash or card has also risen (Worldpay, 2015, 2020). However, the same sources stated that these forms of payment would remain constant and may not gain more market shares. The current and forecasted market shares of different electronic payment methods can be seen in table 2.1 and table 2.2. Except for cash on delivery (table 2.1) and cash (table 2.2), all other methods are electronically facilitated.

Table 2.1: Global E-commerce Payment Methods.

Global E-commerce Payment Methods	2019	2023*
Digital/Mobile Wallet	41.8%	52.2%
Credit Card	24.2%	18.8%
Debit Card	10.6%	8.8%
Bank Transfer	9.0%	9.3%
Charge & Deferred Debit Card	5.0%	3.0%
Cash on Delivery	4.5%	2.7%
Buy Now Pay Later	1.6%	2.8%
PostPay	1.3%	0.9%
Pre-Paid Card	1.0%	0.5%
PrePay	0.6%	0.3%
Other	0.6%	0.3%
* Forecasted		

(Source: Worldpay, 2020)

Table 2.2: Global Point of Sale (POS) Payment Methods.

Global POS Payment Methods	2019	2023*
Cash	30.2%	18.7%
Debit Card	24.3%	26.3%
Digital/Mobile Wallet	21.5%	29.6%
Credit Card	20.9%	22.3%
Charge Card	2.1%	2.1%
Pre-Paid Card	1.0%	1.2%
* Forecasted		

(Source: Worldpay, 2020)

This report specifically stated seven types of e-payment methods, even though it does not include all aforementioned methods. It is due to the others being not popular enough in the country, such as Buy Now Pay Later or Post Pay. The first type is payment through bank card, this could be either credit card and debit card, such as VISA, Mastercard, ATM bank card. The second one is transaction

via electronic wallet, for instance, Momo, ZaloPay, Timo, Paypal, Moca, and Vi Viet. The third method is using smartphone like Apple Pay, Google Pay, Samsung Pay and Mobile Banking. The next one is online payment gateway : Ngan Luong, VTC Pay, Payoo, Baokim, 123Pay, Smartlink, OnePay, SenPay, VNPay, et cetera. Paying by phone and game gift cards is the fifth kind, which is followed by the use of Internet Banking and Bank Transfer. The last type, even though faced with restrictions from the state and not particularly popular (SBV, 2017), is still included so as to let respondents view the whole scope of electronic payment; that is payment using cryptocurrency (e.g. Bitcoin, Ethereum, Litecoin).

The situation regarding e-payment in Vietnam is somewhat unique. Even though in recent years, digital payment is expanding at rapid rate, cash is still considered the epitome of payment instrument in the economy (Bloomberg, 2019). Realistically, one could even buy a house with pure cash or gold alone (Boudreau and Nguyen, 2019). According to iDEA (2019), cash-on-delivery method for e-commerce is prevalent with 88% of the shares. Different electronic methods are less used, with automated teller machine (ATM) bank card at 42%, credit and debit card at 31%, and digital wallet at 17%. Mobile phone and game gift card lags behind at 6%.

Due to the pervaisiveness of e-commerce, Vietnamese people have also had the chance to experience the advantages of buying through e-commerce without the need of physical paper instruments. From 2015 to 2018, the number of consumers of purchasing for goods and services online have increased more than 9 millions (iDEA, 2019). The estimated annual value of a purchaser has also increased from 160 USD to 202 USD. Nonetheless, as stated above, due to unique local circumstances, Vietnamese people seem like they are still refusing new alternative methods of paying for products. In 2015, 91% of online shoppers prefer cash as their default method (VECITA, 2015). Over the span of four year, in 2019, the figure for this was still very high, at 88% (iDEA, 2019). In the future, hopefully with the encouraging policies from the government as well as good practices from businesses, this number can be lowered to a position that better reflects Vietnamese digital economy.

E-payment seems unfamiliar, artificial and inauthentic in comparison to traditional service processing methods, and customers believe that new payment processing methods expose them to new potential risks (IFCC, 2001). In Vietnam, most transactions are dominated by cash, since the bulk of personal consumption are done through the medium of cash. According to the State Bank of Vietnam, in 2018, cash remains the main method of payment, especially among individuals which comprises more than 90 percent of retail payments (SBV, 2018). Among the total population of 84 million, it is estimated that less than 15 percent have used bank services regularly and less than 30 percent have savings in banks, and most account users are high-income earners living in urban areas or working in large companies. However, the liberalization, globalization and Vietnam's integration into WTO are opening many opportunities and threats for general Vietnam economy and the banking industry. To participate in the global economy, Vietnamese have to change their payment transaction habits to adapt to the general trend of the world. In recent years, new models of business have been appeared such as e-commerce, e-business; thus, IT has to be equipped in banking systems to enhance their quality of service. Many kinds of modern banking applications are now employed in Vietnam including online transaction, ATM and POS, payment cards, and internet banking. Moreover, the State Bank of Vietnam has made efforts to reduce the volume of cash payment transactions by planning a 2006-2009 project to increase the issuance of non-cash-transactions. Despite the preference of cash over e-payment, the attitude of the public towards e-payment has been encouraged over the past few years with the increase of bank card users and the expansion of ATM and POS network, especially in some big cities such as Hanoi or Ho Chi Minh. As e-payment makes progress, the importance of cash has been on the decline over the past three years. But the public is still concerned about the security, lack of information on e-payment forms, and thus, is hesitant to change from traditional and simple method to automatic and electronic ones (Le, 2008), which matters with the purpose of this research.

2.1.1. Advantages

For the consumers:

- Digital and mobile wallets are proving to be convenient and safe for consumers and businesses internationally (Worldpay, 2020).
- E–payment systems enable consumers to transact at anywhere and time that they would like (Yaokumah et al., 2017). It is a great convenience; in fact, it is considered by Swick (2010) to be an indispensable convenience of shopping online, ot the greatest advantage. For example, instead of having to pull the wallet out and calculate the money, users can just complete a transaction with a swipe or a few simple maneuvers on the computer. That is both promptness and compactness. Cash and cheques, the epitome of traditional payment methods could not be used at any time of the day, and they could be bulky when being brought out and about. However, a card (debit/credit), or something that is already present on the internet (payment providers) or the phone (digital wallets), is much more compact and easier to use for customers.
- Using the systems, consumers are allowed to have more variety in goods and services selection. It should be noted that electronic payment is usually connected to e-commerce. That means the benefit of being to choose thousands of goods and services at a finger tip by e-commerce is evidently related to e-payment.
- Customers can deal directly with the manufacturer, bypassing the intermediary stage, so they can buy products at a cheaper and faster price, achieving higher efficiency.
- The prospect of losing money as a risk is reduced: credit cards, digital wallets, and other digital payment method can be blocked if stolen. However, if one lose cash, it is almost not possible to get it back.

For organizations:

- The e–payment cost: For most businesses, merchants and vendors, they do not have to pay fee to implement the system initially (Yaokumah et al., 2017).

- E–payment system providers may run maintenance, also known as e–commerce quality services to help businesses, merchants and vendors better serve the customer's needs (Nguyen and Huynh, 2018).
- Every transaction is encrypted, making monitoring more convenient and effective (Nguyen and Huynh, 2018). When customers raise queries regarding specific payments, it is straightforward for the company to track and resolve issues.
- E-payment is secure. With the use of encryption, firewalls, proxy servers, and the like, the chances of a data breach or hacking the e-business greatly reduce (Laudon & Traver, 2016). This is due to credit institutions providing e–payment services investing enormous amounts of money for IT infrastructures and security.
- More sales. Due to the transacting convenience of the customers, they may be prompted to buy more, leading to increased revenue and profit.
- Reducing administration costs: online transactions shorten operational time, standardize procedures, processes, and improve the efficiency of searching for and processing documents.

For the economy:

- It is committed to price and quality guarantee (Gefen, Karahanna and Straub, 2003), which means that the transparency of the market is capitalized. Price and quality of goods and services are for everyone to see. There is no unfair competition.
- E–payment eliminates gradually the need of using paper-based instruments, barring illegal activities such as tax evasion, the use of counterfeit cash, and corruption, which means increasing transparency and increasing the law enforcement capacity (Gefen, Karahanna and Straub, 2003).
- E–payment reduces cash in monetary circulation and driving economic benefits (Gefen, Karahanna and Straub, 2003), such as the increase in supply of (digital) money based on money multiplier formula and the reduction physical cost of storing cash.

- The improved transaction speed and efficiency help the economy in the way it saves cost and manpower.
- Digital payment can foster better financial inclusion for the general populance by increasing access to a wide range of financial services.
- E-payment have a key role in the success of overall e-commerce expansion (Khosrow, 2008). The vast expansion of e-commerce, in large due to the Internet has called for novel payment methods which are more suitable for the web rather than paper-based payment instruments (Panurach, 1996).

2.1.2. Disadvantages

Traditional e-payment systems are noted to have many limitations which inhibit consumers from adopting them. Previous research suggests that some of these factors are the lack of trust, perceived security issues, usability problems, high transaction costs, lack of perceived advantage and unnecessary risks. These factors are deemed to be important to provide customers with the confidence to switch to an online payment system. Moreover, customers will stop engaging in online activities if these prerequisites are not facilitated in the payment systems, thus causing merchants to lose on potential online sales (Abrazhevich, 2004). Let's look at some more disadvantages in details below.

- Security: The e–payment systems, with the lack of authentication, is the top concern (Swick, 2010). Meanwhile, there are no solutions to verify or authenticate who enter the information e–payment systems that may not be criminals (Rahman, 2014). Thus, it is vital to dispute the fraudulent cases of using bank accounts or debit/credit cards.

- Probable Processing Errors: The mistaken merchandise which is ordered and paid in an e–commerce environment may arrive, such as wrong size for clothing item or faulty description misunderstanding. The product may not be used, while customers have been charged. Hence, it could take a longer time to return and replace the goods (Rahman, 2014).
- Fees: Some vendors of e–payment systems require the customers or merchants pay a service fee (Rahman, 2014; Credit Card Processing, 2019).

Furthermore, one of e–payments downside is repudiation of charges, because no transaction information of the e–payments, customers may have an exceedingly hard time to raise a claim to the wrongly charged cost. Thus, it is in customers' discretion to know how to protect themselves in cases where fees are applied incorrectly in the processing of e–payment systems.

- Complexity: Hassler (2010) states that there are several sets of security requirements, services, and mechanisms for e-payment systems to fulfill.

2.2. Research models

In just a few decades, the widespread of the Internet has been seen due to the educational and business sectors have invested heavily in information systems (Salloum et al., 2018). E-payment system as one of such systems has become a new research trend. The adoption and usage of e-payment systems is a critical issue that still needs further examination. Numerous research studies were carried out to examine the factors that affect the adoption of e-payment systems through the usage of different theories/models such as technology acceptance model (TAM), unified theory of acceptance and use of technology (UTAUT), theory of planned behavior (TPB), theory of reasoned action (TRA), diffusion of innovation (DOI) theory, as well as many others.

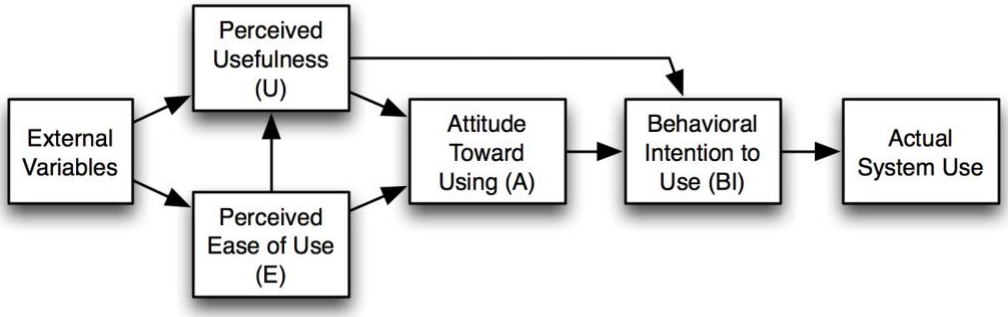
2.2.1. Technology acceptance model

The Technology Acceptance Model (TAM) was developed and originally proposed by Fred Davis, Richard Bagozzi, and Paul Warshaw (1989). It has become a widely studied model of information system (IS) usage and IS acceptance behavior. TAM has been widely adopted in a variety of settings and across a broad range of IS applications: e-mail (Venkatesh and Davis, 1996), spreadsheets (Adams, Nelson and Todd, 1992), microcomputer usage (Igbaria, Parasuraman and Baroudi, 1996), group support systems (Chin and Gopal, 19995), and expert systems (Keil, Beranek and Konsynski, 1995). These applications are mainly focused on the influence of perceived usefulness, attitude toward use, behavior intention, and actual usage behavior.

A key aim of TAM is to provide a basis for seeking the different influences of external factors on internal beliefs, attitudes, and intentions (Davis, Bagozzi and Warshaw 1989). To accomplish the objective, the researchers determined a number of critical variables suggested by literature regarding cognitive and affective determinants of computer acceptance. TAM was modelled using the theory of reasoned action (TRA) as a theoretical background, using theoretical relationships that were already established among these variables. Based on the goal for TAM, many adapted versions to the TRA were made and supported by evidence and theory.

Recently, more and more studies have expressed their concerns about the appropriateness and comprehensiveness of TAM (Krogh, Ichijo and Nonaka, 2000; Malhotra and Galletta, 1999; Mohamed, 2010; Soliman and Spooner, 2000), which are TAM's shortcomings in accounting for human factors, emotional factors and social influence factors. To address these problems, the extended conceptual framework even includes perceived risk and trust as determinants to the decision to adopt a particular technology. Figure 2.1 depicts the outline of the TAM with its main constructs.

Figure 2.1: Technology Acceptance Model.



(Source: Davis, Bagozzi and Warshaw 1989)

As stated above, TAM was derived from the theory of reasoned action (Fishbein and Ajzen, 1975). It can be said that TRA illustrates behavioural theories while TAM is more focused on "information systems" acceptance. TAM identifies and predicts user acceptance attributes before they actually experience it. Davis

(1989) assumed that user acceptance of technology depends on perceived usefulness (PU) and perceived ease of use (PEOU). PU is thus defined as "user's opinion that after using a system it will increase a user's job performance within an organisation", and PEOU is defined as "the expectation that the software is free of effort" (Davis, 1989). TAM is said to be a good predictor of the intention to use a software package; however, it is not enough to predict user attitudes towards e-payment (Munoz-Leiva, Climent-Climent and Liébana-Cabanillas, 2017). One of the main reasons for this is that e-payment systems deal with money exchange and not productivity as illustrated in TAM. However the key factors of this model – PU and PEOU – were considered to be influential in the capacity of providing perceived advantage to the user's to influence them to switch to online payments.

Similar to TRA, TAM claims that computer usage is determined by behavior intention (BI), but differs in that BI is viewed as being determined by the person's attitude toward using the system (A) and perceived usefulness (PU), with the following equation illustrates the estimated relative regression weights of each factor:

$$BI = A + PU \quad (1)$$

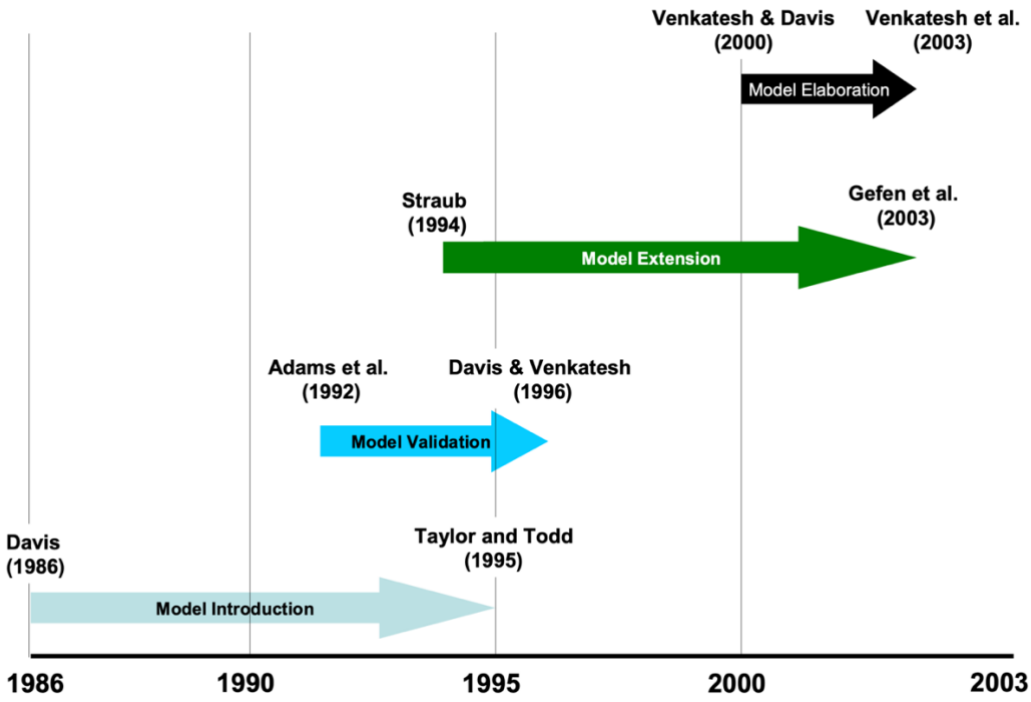
Within the model, A is determined by U and EOU, with the following equation illustrates the estimated relative regression weights of each factor:

$$A = PU + PEOU \quad (2)$$

This equation is inspired by TRA's view that attitudes toward a behavior are determined by relevant beliefs. As equation (1) clearly shows, TAM states that PU has a direct effect on BI over and above A. Equation (2) indicates that PU influences A as well. It is hypothesized that these two variables are positively correlated, as shown in the equation. Previous IS research contains empirical evidence consistent with a PU and A link (Davis et al., 1989).

From its inception, TAM has come a long way in academia. Lee, Kozar, and Larsen (2003), in their article, have outlined four periods in TAM research progress. These are: Model Introduction, Model Validation, Model Extension, and Model Elaboration. Figure 2.2 shows these in chronological order:

Figure 2.2: The Progress of TAM.

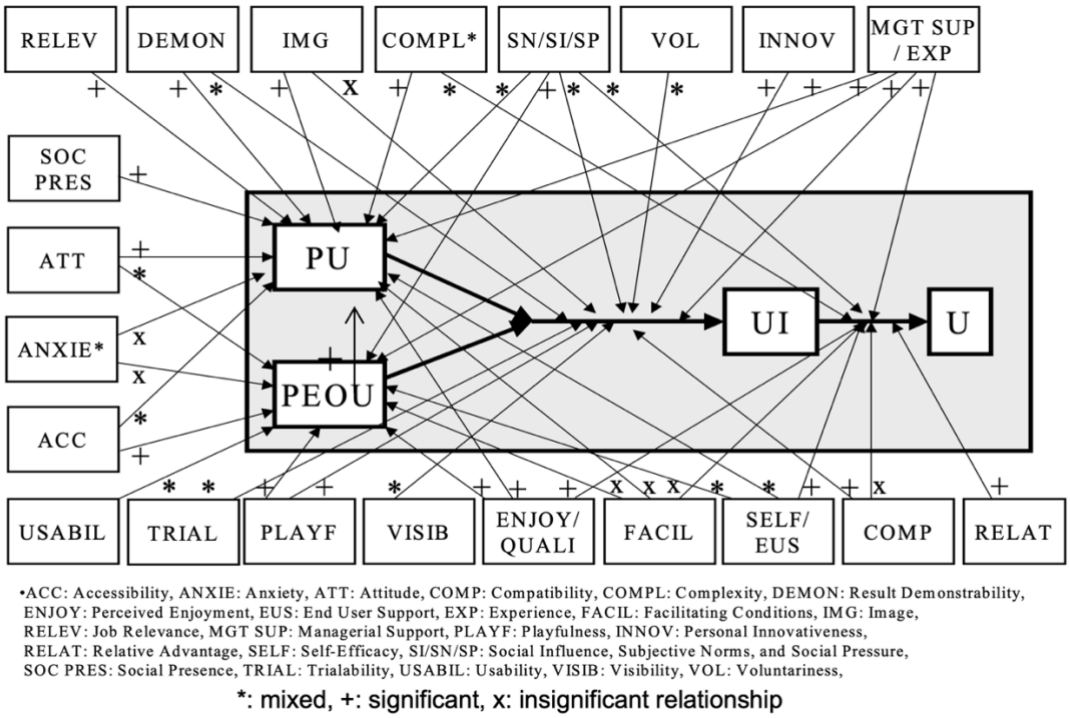


(Source: Lee, Kozar and Larsen, 2003)

Through the researches done in the first period, TAM was found to be able to successfully predict IS acceptance behavior in different contexts and with different technologies. In addition, it was indicated that TAM was much more straightforward, easier to use, and generally a more powerful framework for finding the determinants of user acceptance of computer technology than TRA (Igbaria et al., 1997). In the second stage, the studies extensively investigated if TAM instruments were powerful, consistent, reliable, and valid and they found these properties to hold. Researchers checked for validation of the instruments in different contexts and different time, stating that "no absolute measures for those constructs exist across varying technological and organizational context…. Measurement models must be rigorously assessed and, if necessary, respecified" (Segars and Grover, 1993, p.525). Studies in third phase made tremendous headways in trying to achieve a "greater understanding regarding the causal relationships among beliefs, system usage and their antecedent factors (Chin and Gopal 1995, p. 46). The fourth period helped to precisely describe the two determinants of PEOU and PU (of which details are shown in figure 2.3), and thus

advanced TAM as a salient theory, laying the foundation for further research. In summary, with the inspection of the development of TAM studies across four periods, we find that TAM has evolved continually. It underwent a normal evolution through those years of efforts, culminating in the introduction of TAM 2, TAM 3 and other modified versions.

Figure 2.3: The Extended TAM.

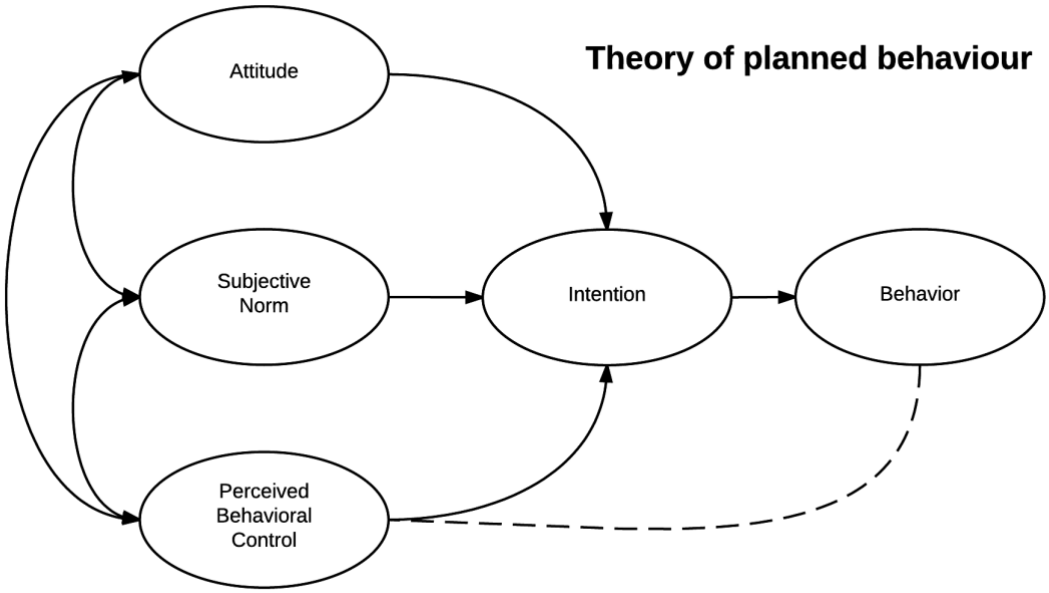


(Source: Lee, Kozar and Larsen, 2003)

2.2.2. Theory of Planned Behavior.

The theory of planned behavior (TPB) could be considered an extension of the TRA (Fishbein & Ajzen, 1975). TPB's inception was attributed to a the original model (TRA) limitations in considering that actions that stem from people's incomplete willful control (Ajzen & Fishbein, 1980). The concept was proposed by Icek Ajzen to increase the power of prediction for the theory of reasoned action by including perceived behavioral control (Ajzen, 1991). Figure 2.4 depicts the theory in the form of a diagram. The theory states that attitude, subject norms, and perceived behavioural control, together shape an individual's behavioural intentions and behaviours (Ajzen, 1991).

Figure 2.4: Theory of Planned Behavior.



(Source: Ajzen, 1991)

It is vital to understand what each variable mean in this conceptual framework. First, attitude points to the way people perceive a specific action (Albarracin and Ajzen, 2007). Second, subjective norm is the extent to which an individual's viewpoint of the particular behaviour is affected by the opinion of their closed ones (e.g., parents, spouse, friends, teachers) and society at large. It is called by Ajzen as the "perceived social pressure to perform or not perform the behavior" (Albarracín and Ajzen, 2007). Third, perceived behavioural control, refers to the degree to which a person believes that they are in control of their action and the situation. The theory of planned behaviour suggests that people are much more likely to intend to enact certain behaviours when they feel that they can enact them successfully.

Similar to TRA, a central theme in the theory of planned behavior is the individual's willfulness (intention) to perform a task. The researchers assume intention to capture the motivational forces that lead to a behavior; it is the indication of how strong people are willing to do and of how much effort they are

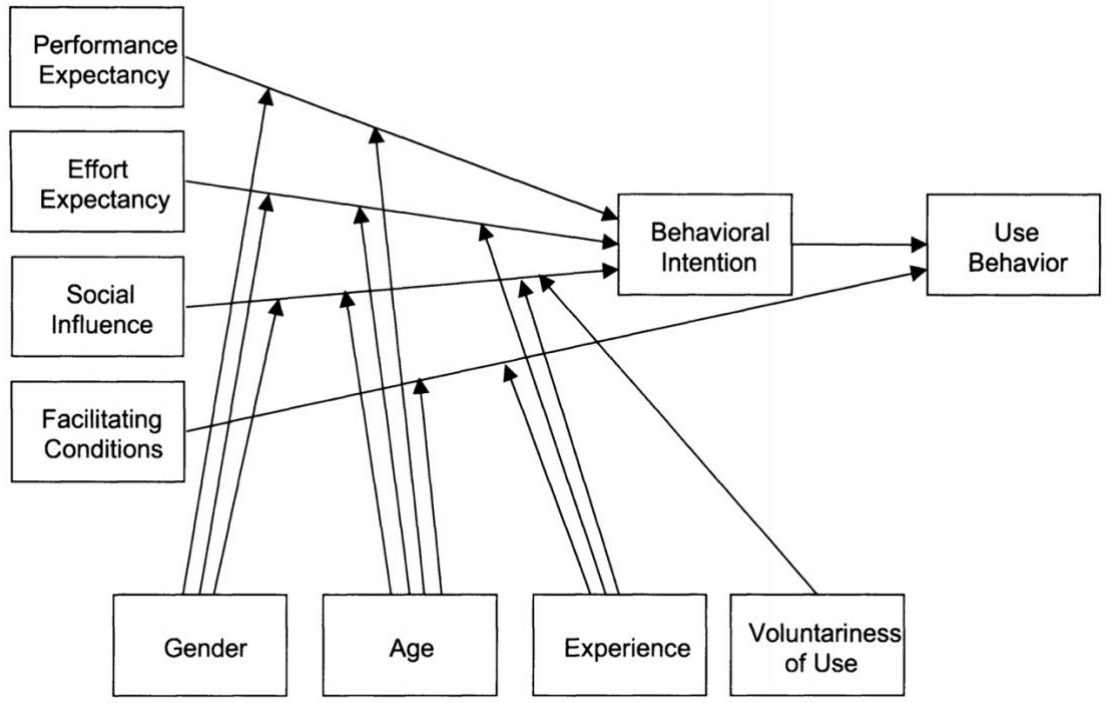
planning to take, in order to do the action. The general rule is the stronger the intention to engage in a behavior, the better the chance that behavior is performed. It should be clear, however, that a behavioral intention can cause expression in behavior only if the behavior in question is under control, i.e., if the person can decide at will to perform or not perform the behavior. Although some behaviors may in fact meet this requirement quite well, the performance of most depends at least to some degree on factors that are not stem from motivation, such as opportunities and resources (e.g., time, money, skills, cooperation of others) (Ajzen, 1985). Collectively, these factors represent people's actual control over the behavior. To the extent that a person has the required opportunities and resources, and intends to perform the behavior, he or she should succeed in doing so.

The concept of perceived behavioral control is TPB's novelty compared to TRA. It is derived from self-efficacy theory (SET), which was proposed by Bandura (1977). Self-efficacy theory states that what behavioral reaction and to what level that reaction reach is determined by expectations from motivation, performance, and feelings of frustration associated with repeated failures. Because some studies' findings show due to circumstantial limitations, behavioural intention does not always lead to actual behaviour (Norberg, Horne and Horne, 2007). In other words, behavioural intention cannot be the only behavior determinant where an individual's control over the behaviour is incomplete. By introducing the new variable, perceived behavioral control, a model can better predict behaviours, especially when they are non-volitional.

2.2.3. Unified Theory of Acceptance and Use of Technology

The unified theory of acceptance and use of technology (UTAUT) is a technology acceptance model which attempts to explain user intentions to use an IS and the following adoption of technology. The theory states that there are four main factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. Figure 2.5 depicts the model in a diagram form.

Figure 2.5: Unified Theory of Acceptance and Use of Technology.



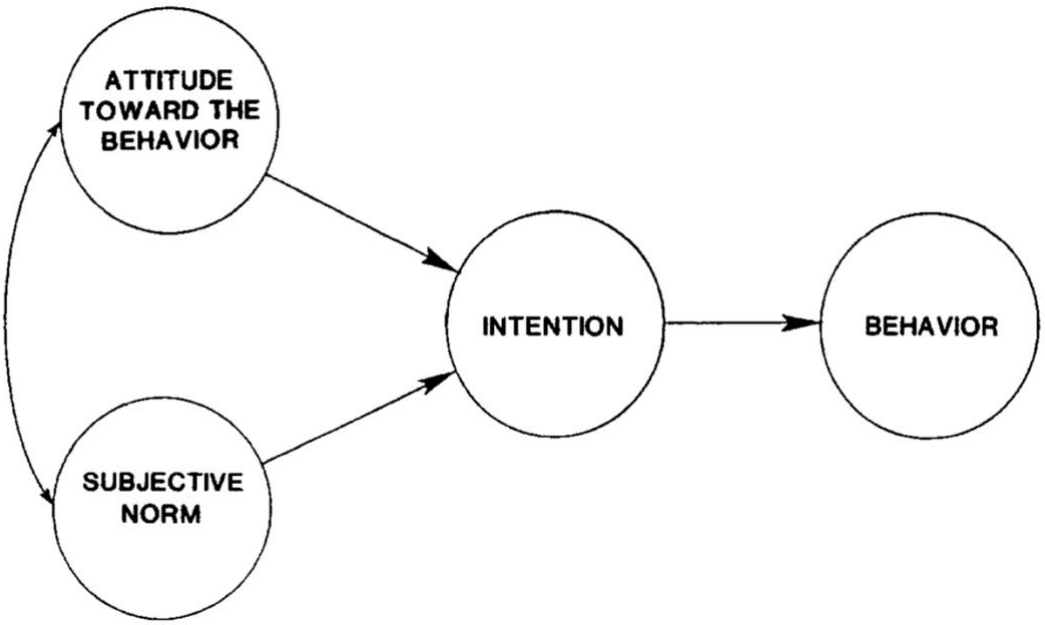
(Source: Venkatesh et al., 2003)

Regarding the causal relationship, performance expectancy, effort expectancy, and social influence is theorized to directly determine behavioral intention and in turn that intention cause the actual behavior. Meanwhile, facilitating conditions are a direct indicator of user behavior. In this model, there exist four moderators: gender, age, experience, and voluntariness of use that interact with the effect of the four constructs on behavior intention and use behavior. The theory was developed through a review and consolidation of the constructs of eight models that earlier research had employed to explain information systems usage behaviour, including theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, a combined theory of planned behavior/technology acceptance model, model of personal computer use, diffusion of innovations theory, and social cognitive theory. Venkatesh et al. (2003), in a longitudinal study found it to account for 70% of the variance in Behavioural Intention to Use (BI) and about 50% in actual use.

UTAUT has come under a lot of criticism. Indeed, the biggest one of them all is it being too complex. Bagozzi (2007) critiqued the model as it is "reaching a stage of chaos" of technology adoption studies due to it and and the subsequent extensions comprising 41 independent variables for predicting intentions and more than 8 independent variables for predicting behavior**.** Van Raaij and Schepers (2008) called the grouping and labeling of items and constructs problematic because a variety of unrelated items were combined to reflect a single psychometric construct, where as Li (2020) establishes that good predictive power can be achieved even with simple models when proper initial screening procedures are applied.

2.2.4. Theory of Reasoned Action

Figure 2.6: Theory of Reasoned Action



(Source: Fishbein and Ajzen, 1980)

The theory of reasoned action (TRA) was proposed by Martin Fishbein and Icek Ajzen (1980). TRA is based on a variety of theories regarding attitude. Some of them are expectancy-value theories, learning theories, attribution theory, and dissonance theory (Montano and Kasprzyk, 2015). The TRA's conception is that, if individuals assess the recommended action as positive, and in the case that they think their closed ones would like them to carry out the action (subjective norm),

this leads to a greater intention and lead them to do it. Many studies in the field have confirmed the link between attitudes, subjective norms, and intention, which then leads to behaviour (Sheppard, Hartwick and Warshaw, 1988). After its inception, TRA was later improved and renamed the reasoned action approach.

2.2.5. Diffusion of Innovation Theory

Diffusion of Innovation (DOI) Theory is one of the most widely known frameworks in IS. It has been widely used to find out factors that influence an individual's decision to adopt an innovation or a new technology. Proposed by Rogers (1962), there are five main factors that constitute DOI. The first one is relative advantage, which is the degree to which an innovation is seen as better than the idea, program, or product it replaces. The second factor is compatibility, or how consistent the innovation is with the values, experiences, and needs of the technology adopters. The third element is complexity, or simply how difficult the innovation is to understand and/or use. The next one is triability, or the extent to which the innovation can be tested or experimented with before the decision to use the technology is made. The last factor is observability, also known as the extent to which the innovation provides tangible results. However, this report is focused on the demand side – the consumers. Therefore it is not appropriate to go into details regarding this theory.

2.3. Previous studies of e-payment adoption

From its inception, there have been several researchers trying to use different model and theories to study e-payment adoption, especially when the global trend is pushing for cashless societies. Some recent studies carried out in Vietnam and different countries are described in details in table 2.3.

Table 2.3: Summary of e-payment adoption studies (Salloum and Al-Emran, 2018; in addition to author compilation)

Study	Country	IS application	Model/ Theory	Findings
Safeena et al. (2014)	India	Internet banking	TAM, IDT, TRA, and TPB	The results pointed out that 'perceived benefit' and 'social influence' have a positive effect towards the use of internet banking, whereas 'perceived impediment' indicated a negative effect.
Sinha and Mukherjee (2016)		E-banking	TAM, IDT, and trust model	The results indicated that 'trust on technology', 'trust on the bank', 'perceived ease of use', 'perceived usefulness', and 'complexity' have a significant effect on the customers' intention to use off branch e-banking.
Upadhyay and Jahanyan (2016)		M-payment system	TAM, IDT, and UTAUT	The results pointed out that 'perceived usefulness', 'perceived ease of use', 'system quality', 'connectivity', 'discomfort', 'task-technology fit', and 'structural assurance' have a significant impact on the usage intention of M-payment system, whereas factors like 'perceived monetary value', 'absorptive capacity', and 'personal innovativeness' were found to be insignificant.
Ting et al. (2016)	Malaysia		TPB	The results revealed that 'attitude', 'subjective norm' and 'perceived behavioural control' have a

Study	Country	IS application	Model/ Theory	Findings
				positive effect on the intention to use the M-payment system. However, 'subjective norm' and 'perceived safety' were found to have a significant difference between the Malays and Chinese users.
Özkan et al. (2010)		E-payment system	TAM	The empirical results suggested that 'convenience', 'design', 'perceived risk', 'perceived usefulness' and 'perceived ease of use' have a significant influence on the consumers' intention to use the E-payment system.
Chin and Ahmad (2015)			Proposed model	The results showed that 'perceived ease of use' can be used as a mediator of 'perceived enjoyment'. Besides, 'perceived ease of use' was found to be a significant factor in determining the 'perceived usefulness' and consumers' intention to use the system.
Teoh et al. (2013)			TAM	The results revealed that 'benefits', 'self-efficacy', and 'ease of use' exert a significant influence on the consumers' perceptions towards the use of e-payment. However,

Study	Country	IS application	Model/ Theory	Findings
				the insignificant results obtained for 'trust' and 'security' warrant further investigation.
Ayo et al. (2010)	Nigeria	E-banking system		The results showed that 'perceived ease of use' and 'perceived usefulness' are not the only antecedents that affect the e-banking acceptance. There were other factors that may also affect the customers to use the e-banking systems such as 'organisational reputation', 'perceived risk', and 'trust'.
Aderonke (2010)				The results revealed that 'network security' and 'security of the system' are the primary concerns of the users and constitute a hindrance for intending users.
Meharia (2012)	USA	M-payment system		The results suggested that mobile assurance using any of the trust services correctly predict the intention to use the M-payment systems.
Ramos-de-Luna et al. (2016)	Germany	Near-field communication (NFC) based M-	TAM	The results showed that 'attitude', 'subjective norms' and 'innovation' are the determinants of the future intention to use NFC-based M-payment system.

Study	Country	IS application	Model/ Theory	Findings
		payment system		
Nasir et al. (2015)	UK	Internet banking		It is found that 'perceived usefulness' and 'perceived ease of use' consistently have a significant positive impact on adopting the internet banking. Besides, the users were specifically concerned about the 'security risk', 'privacy risk' and 'financial risk' related to using the internet banking services. However, 'social risk' has no significant impact on adopting these systems.
Al-Dala'in et al. (2009)	Australia	E-payment system	TAM	The results indicated that the 'adoption of mobile devices' has a significant direct effect on increasing the online shoppers' trust in using the E-payment systems.
Santouridis and Kyritsi (2014)	Greece	Internet banking		The results showed that 'perceived usefulness' and 'perceived ease of use' are considered the most significant determinants of the behavioural intention to adopt the internet banking.
Lee (2009)	Taiwan	Online banking	TAM and TPB	The results revealed that the intention to use online banking is adversely affected by the

Study	Country	IS application	Model/ Theory	Findings
				'security/privacy risk' and 'financial risk', whereas factors like 'perceived benefit', 'attitude', and 'perceived usefulness' indicated a positive effect.
Salloum and Al-Emran, 2018	UAE	E-payment	Modified TAM	The results showed that trust does affect perceived usefulness, ease of use and e-payment adoption. However, perceived usefulness does not lead to e-payment adoption.
Pham and Ho (2015)	Vietnam	NFC based M-payment system	TRA, TAM, TPB, IDT, and UTAUT	The results revealed that the intention to adopt the NFC based M-payment system is affected by most of the 'product-related factors', 'personal-related factors', and 'attractiveness of alternatives'.
Lin and Nguyen (2011)	Vietnam, Taiwan	E-payment	Modified TAM	The results showed that perceived ease of use and usefulness tend to significantly impact their use intention. In addition, risk and lack of information correlate negatively with intention. PIIT partially moderates the effect of independent variables.
Nguyen and Huynh (2017)	Ho Chi Minh City, Vietnam	E-payment	Modified TAM	The results showed a structural relationship among the dimensions, including perceived

Study	Country	IS application	Model/ Theory	Findings
				risk, trust, perceived usefulness, ease of use and e–payment adoption.
Pham, Cao, Nguyen and Tran, (2013)	Vietnam	E-banking	TAM, TPB, TRA, DTPB	These authors proposed a model to apply to e-banking adoption studies, with these variables: bank image, perceived risk, perceived ease of use, perceived benefit, trust, and subjective norm and intention to use.
Vu (2017)	Vietnam	E-payment	TAM, TPB	The author proposed model to apply to e-payment adoption studies, with these variables: perceived usefulness, perceived ease of use, attitude, subjective norms, perceived behavioral control, and beahavioral intention

2.4. The proposed model

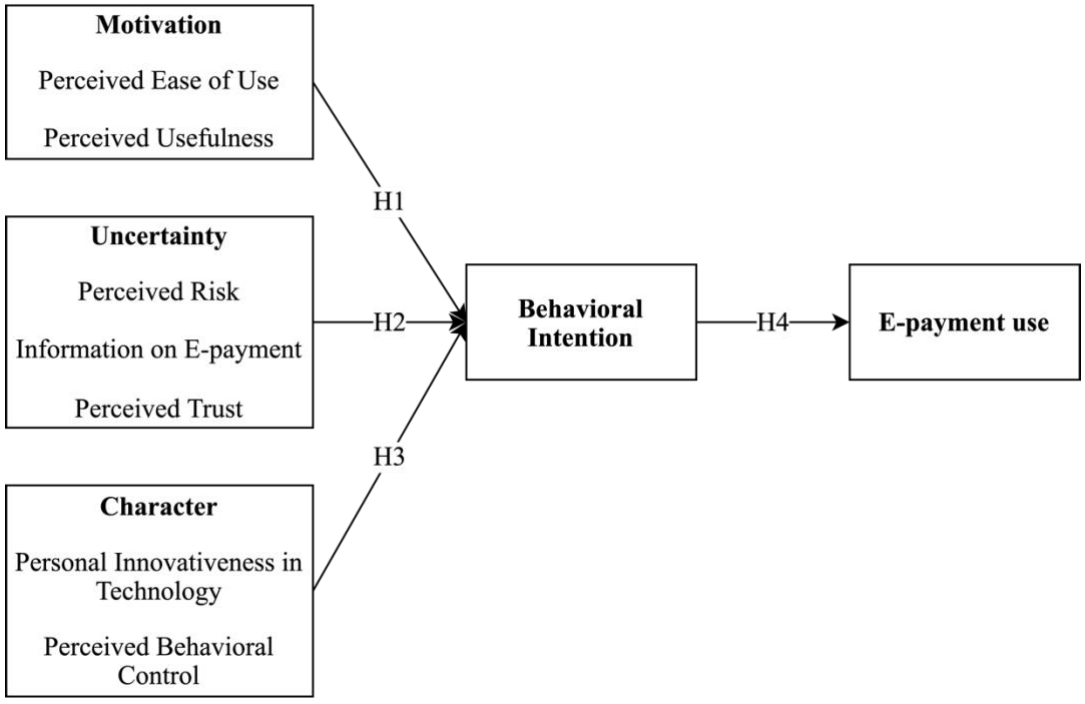
Figure 2.7 shows the project's conceptual framework. It includes seven factors which is hypothesized to have influence on the intention of e-payment adoption (BI). BI is the mediator variable of the model: on the one hand, it is the predictor of actual e-payment use (adoption); on the other hand, it is influenced by seven other independent variables: perceived ease of use (PEOU), perceived usefulness (PU), perceived risk (PR), information on e-payment (IE), perceived trust (PT), personal innovativeness in technology (PITT), and perceived behavioral control (PBC).

This framework is adapted from Lin and Nguyen (2011), with the addition of two more variables (PT and PBC) and the change in path of another variable (PIIT). Perceived trust and perceived behavioral control were added due to a body of research using these two factors with regard to electronic payment adoption (Salloum and Al-Emran, 2018). Concerning the change in path of PIIT, it is because in Lin and Nguyen's study, PIIT was hypothesized to be a mediator variable. However, the conclusion only partly supports this hypothesis, yet the direct effect of PIIT to actual usage was significant. PIIT and PBC were also added to a group named "Character" to counter balance with the other two groups that are named by Lin and Nguyen.

In a sense, it is a modified approach of TAM and PBC. According to Vu (2017), a mixed conceptual framework of TAM and PBC would be of beneficial in the context of Vietnam. However, not every single independent variable that she proposed is on this conceptual framework. The omitted ones are: attitude and subjective norms. Attitude is omitted due to the fact that in TAM framework, it is influenced by PEOU and PU, in addition to the fact that these are independent variable in its own right. Regarding subjective norms, it is argued that subjective norms will not bring any valuable insights into the market situation because Vietnam is still heavily reliant on cash for e-commerce payment.

One more change of this project from Lin and Nguyen's study was that perceived trust and perceived risk are two different variables. In their study, they imply that risk and trust are "two sides of the same coin" and they just use one construct to measure risk and trust. However, authors like Nguyen and Huynh (2017) argue that they are different construct and should be as such. This study concurs with Nguyen and Huynh.

Figure 2.7: The project's conceptual framework (Author compilation)



2.4.1. Perceived Ease of Use (PEOU)

Innovative technology systems that are perceived to be easier to use and less complex will have a higher likelihood of being accepted and used by potential users. Perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort" (Davis et al., 1989). An ease-of-use system should have friendly interfaces such as clear and visible steps, suitable content and graphical layouts, helpful functions, clear commands, and easy understand error messages. Awareness about the ease or difficulty of use of a new system sometimes is based on the knowledge and age of user (Thatcher and Perrewe, 2002). Highly educated and younger users are not hesitant to try a new IT system. On the other hand, lower educated or older users think that high tech systems are very complicated.

More and more studies have proven the direct effect of PEOU on new system use (Lin and Nguyen, 2017). The lower the perceived complexity of using a service provided by internet banking, the more positive will the attitude of the consumer toward using the internet banking service. Based on the extant literature, PEOU has a positive relationship with the intention to adopt the e-payment system

(Al-Fahim et al., 2015; Ayo et al., 2010; Chin and Ahmad, 2015; Dutot, 2015; Meharia, 2012; Nasir et al., 2015; Santouridis and Kyritsi, 2014; Sinha and Mukherjee, 2016; Upadhyay and Jahanyan, 2016). In this study, it is argued that the higher the easiness of the e-payment system, the higher the students' intention to use will be. Thus, the following hypothesis is formulated:

H1a: Perceived ease of use has a positive effect on behavioral intention

2.4.2. Perceived Usefulness (PU)

A new product or service that does not help people more easily perform their jobs and life, or is too abstract to be useful, will be easily eliminated. Many aspects can evaluate the usefulness of a system which is the degree to which a person believes that using a particular system would be free of effort." (Davis, 1989, p. 320). Perceived usefulness has a strong determinant of usage intentions (Venkatesh et al., 2003). In the context of e-payment, perceived usefulness means that the system can be available and helpful for customers at any time and any place, and therefore, can be considered as the comprehensive ability of customers in integrating e-payment into their daily activities (Koivumaki, Ristola and Kesti, 2004). Under different light, an innovative system is believed to be of high usefulness when it adapts to the needs of people and connects closely to the use, productivity, performance, effectiveness and satisfaction (Lu, Yu, Liu and Yao et al., 2003). Perceived usefulness is an important indicator for technology acceptance (Davis et al., 1989) and sometimes has a strong impact on IT/IS use (Rao and Troshani, 2007). Several recent studies also show positive correlation of PU with BI (Al-Fahim et al., 2015; Ayo et al., 2010; Chin and Ahmad, 2015; Dutot, 2015; Meharia, 2012; Nasir et al., 2015; Santouridis and Kyritsi, 2014; Sinha and Mukherjee, 2016; Upadhyay and Jahanyan, 2016).

H1b: Perceived usefulness has a positive effect on behavioral intention

2.4.3. Perceived Risk (PR)

Perceived risk is defined as "a combination of uncertainty plus seriousness of outcome involved" according to Bauer (1960, p. 13). The researcher reported that perceived risk relates to uncertainty and consequences associated with a

consumer's action. The level of risk is said to diminish when individuals trust others who are involved in the transactions (Featherman and Pavlov, 2003). Further research conducted on the impact of perceived risk on consumer decision-making in using online transaction activities revealed that customers are less motivated to adopt new payment methods when they perceive that the risk of adopting them is greater than old ways of payment (Jarvenpaa, Tractinsky and Vitale, 2000). As a result of disclosing personal information customers could face an economic risk and a privacy risk. If a customer chooses to pay online he will face the risk of fraud/theft, hacking, password stealing. Hence the decision whether to pay online/not is influences by perceived risk.

Furthermore, the intangible nature of electronic transactions tends to heighten the consumer's perception of risk (Lin and Nguyen, 2015). One of the major concerns with regard to e-payments is noted to be the risk of security. This is because money and information are exchanged online without any direct engagement with the recipients. The main concern in this aspect is credit card fraud (Leong et al., 2003). The risk of losing personal information and credit card details going to the hands of hackers are still a major anxiety for users (Özkan, Bindusara and Hackney, 2010).

Perceived risk is thought to be a predictor and barrier to e-payment use (Lin and Nguyen, 2015), playing a negative role in individuals' decision to adopt e-payment. It significantly influences consumers' purchasing decisions, in which it involved the probability of unpredictable, unpleasant and costly consequences connected with those decisions (Celik, 2008). Whether such risks actually exist or not, consumers tend to persist about those if they hold the perception or believe they are at risk. Therefore, the hypothesis is:

H2a: Perceived risk has a negative effect on behavioral intention

2.4.4. Information on e-payment (IE)

According to Pikkarainen, Pikkarainen, Karjaluoto, and Pahnila (2004), the information which customers have about the products has been improved and such information is one of the major factors directly affecting new product adoption, especially information on a new applied technology systems. Before purchasing

or using it a product or service, consumers often gather information about it. When applying a new system, customers may be at an early stage in learning and processing; therefore, customers often look for related e-payment information relating to the bank supplying e-payment forms, (dis)advantages of e-payment, the features, benefits or operation of the systems, and even amount of customers trust in using this system and security protections. In a larger realm, companies were more likely to share and collect information to reduce information asymmetry if more partners and peer companies had adopted e- business or new information technology (Michael, 2010). Therefore, the following hypothesis is formulated:

H2b: Information on E-payment has a positive effect on behavioral intention

2.4.5. Perceived Trust (PT)

Trust has long been considered as a catalyst in consumer e-marketer relationships since it can facilitate successful transactions (Schurr and Ozanne, 1985). Consumers' perceived trust in e-payment systems refers to consumers' belief that e- payment transactions will be processed in accordance with their expectations (Mallat, 2007; Kim et al., 2010). Kim et al. (2008) showed that increases in trust will directly and positively affect purchase intentions. According to the same source and Lee (2005), trust is especially important element influencing consumer behavior in uncertain environments such as electronic commerce. Unless service providers make customer trust, it is exceedingly difficult to attain widespread acceptance of a new technology or service. In wake of that, it is expected that trust is also likely to be a critical factor affecting e-payment adoption. Based on the arguments above, we propose the following hypothesis:

H2c: Perceived trust has a positive effect on behavioral intention

2.4.6. Personal Innovativeness in Technology (PIIT)

Personal innovativeness refers to individuals’ willingness to change and accept risky venture (Lin and Nguyen, 2011). If individuals are more willing to take risks, they are more likely to engage in innovative behavior. Thus, in IT

context, personal innovativeness in technology (PIIT) is the willingness of an individual to try out any new information technology, which segments potential adopter into what characterizes as innovators, early adopters, early and late majority adopters and laggards (Rogers, 1962) and explains how an individual belonging to each adopter category reacts differently to the introduction of an innovation. Individuals with higher PIIT like to experiment with IT innovations; also, they are usually the first in their group or society to feel more comfortable and confident when using a new system. Thus, consumers with higher PIIT levels may prefer using e-payment services. The proposed hypothesis is:

H3a: Personal Innovativeness in Information Technology has a positive effect on behavioral intention

2.4.7. Perceived Behavioral Control (PBC)

Perceived behavioral control is defined as an individual's perception of how easy or difficult it is to perform a behavior (Ajzen, 1991, p.188). It indicates a degree of control over behavior performance rather than as a result of behavior (Ajzen, 2002). In the context of electronic payments, PBC describes consumers' perceptions of the availability of the necessary resources, knowledge, and opportunities to make payments.

Previous studies have shown that behavioral control awareness has a direct impact on use decisions. A case in point is the study by Herrero Crespo and Del Bosque (2010) of factors that influences consumers' decisions to use online services. Under the TPB, PBC, could be used to predict the behaviors. Therefore, the proposed research hypothesis is:

H3b: Perceived Behavioral Control has a positive effect on behavioral intention

2.4.8. Behavioral Intention

Behavioural intention is defined as an indication of an individual's readiness to perform a given behavior (Davis et al., 1989). It is assumed to be an immediate antecedent of behavior (Ajzen, 2002). Depending on the theory and conceptual

framework, it is influenced by different factors. For TAM, those are attitude, PEOU, and PU. As for TPB, those are subjective norms, attitude, and perceived behavioral control. From the literature, the author hypothesizes:

H4a: Behavioral Intention mediates the positive relationship between motivation (perceived ease of use and perceived usefulness) and e-payment use.

H4b: Uncertainty (perceived risk, information on e-payment, and perceived trust) affects e-payment use indirectly through behavioral intention.

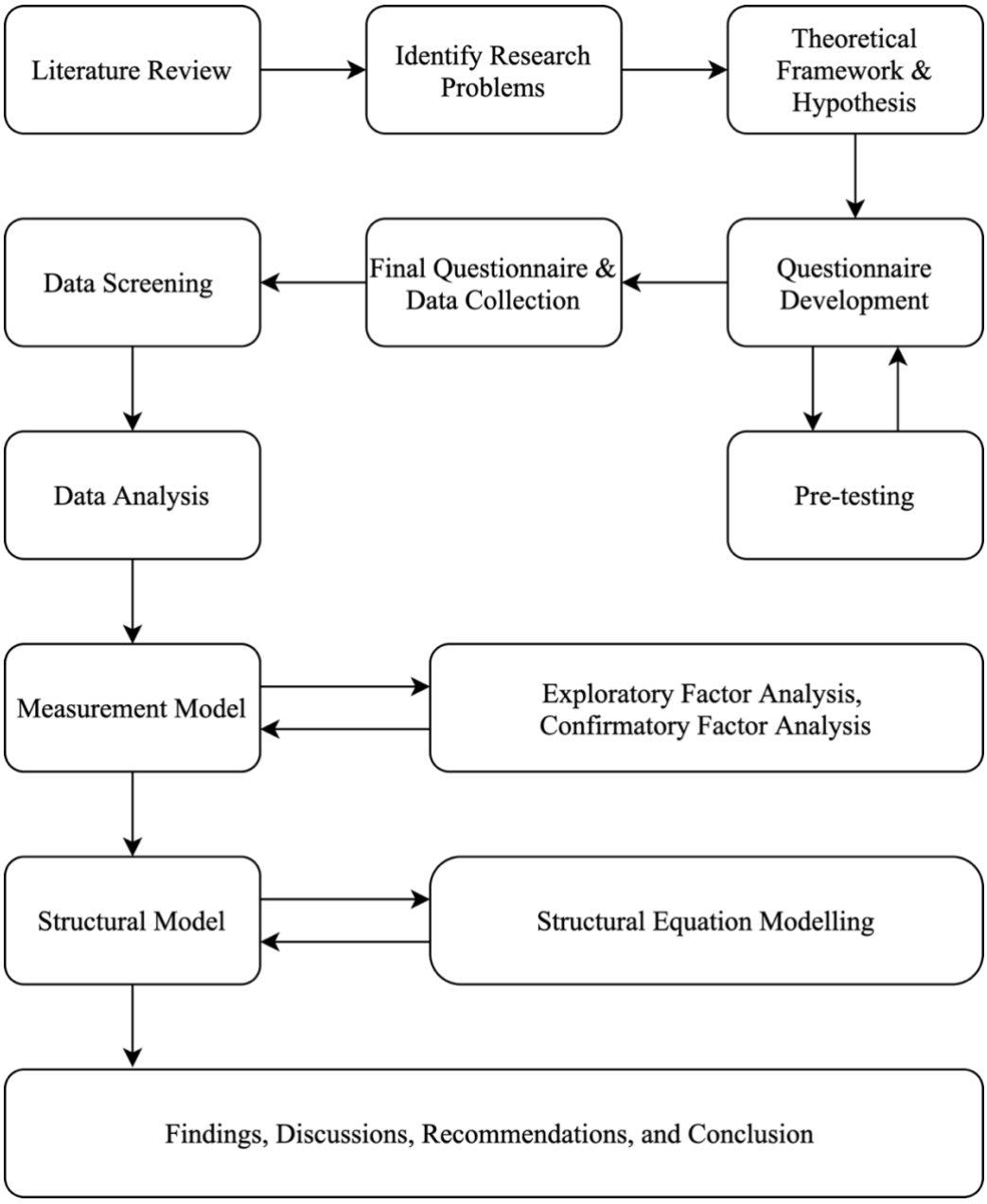
H4c: Behavioral Intention mediates the positive relationship between characters (personal innovativeness in technology and perceived behavioral control) and e-payment use.

CHAPTER 3: METHODOLOGY

3.1. Research process

The research process comprises of several steps, which were done in as much accordance with scientific rigor as possible. Figure 3.1 summarizes these steps, which is based on on a sequence of step-by-step process proposed by Tarhini (2013).

Figure 3.1: The Research Process (Adapted from Tarhini, 2013)



The first step is reviewing different conceptual models that can be used to study e-payment adoptions. It was pivotal in the first stage to gain a comprehensive understanding of the current situation in the field and identify the research problems, where the focus of the research was formed. In this stage, the rationale, objectives, as well as the scope of the research were clearly identified. After that, the researcher proposed a conceptual model with different constructs to test the hypotheses, based on the previous literature (frameworks) by other researchers. Next, the study proposed the methodology to guide the process of the research, where it was decided to follow a quantitative approach. Concurrently, a questionnaire was developed to gain data from the subjects of the study, which includes able people who have used e-payment or not. There is a buffer step, pre-testing, which helps to achieve content validity by clearing out any problems with the wording and different cultural terminologies of the questionnaire. Then, the questionnaire was ready to be distributed, generating data for analysis. Before analysis, data were screened for normality and outliers. In the analysis stage, data is processed to describe statistics, test reliability, analyze factors using EFA, CFA, and test hypotheses generated from the conceptual model using SEM. Finally, meaningful conclusions will be drawn to provide appropriate implications recommendations on how to improve e-payment use in major cities like Hanoi.

3.2. Research Method

There are several reasons why the researcher decided to employ a quantitative approach to this study. First, using quantitative methods means using a deductive approach that is connected with hypothesis testing in order to support or reject the existing theory (David and Sutton, 2004). This is in line with the researcher proposing a research model at the beginning, before survey development, data collection, and data analysis. Furthermore, these methods aim to verify the relationships between variables in a cause-effect way, which fits the purpose of the study: seeking out what may cause people to use e-payment. Thirdly, quantitative methods are prevalent in the field of information systems. Especially in e-payment adoption studies, it is the main approach used by several researchers in Vietnam and internationally (Pham and Ho, 2015; Nguyen and

Huyenh, 2017; Salloum and Al-Emran, 2018; Özkan et al., 2010; Lin and Nguyen, 2011). It is by using the approach that these researchers develop and validate the constructs and their relationships within different models. Finally, regarding the sample size, since the study employed a generalization approach to its findings, it requires adequately big sample size that usually goes with quantitative strategy (Bryman, 2008).

To be more specific, the study employed structural equation modelling (SEM). It is a statistical technique for testing and estimating a set of hypothesised relationships among multiple independent and dependent variables simultaneously (Gefen and Straub, 2000). Thus, the same source states SEM allows the researcher to test a set of interrelated hypotheses in a single and systematic analysis. The decision of using SEM as the main analysis technique was based on three reasons. First, behavioral intention acts as both independent and dependent variables. It was predicted by six other factors while at the same time predicting actual use. According to Tabachnick and Fidell (2007), SEM is better suited than other statistical technique when one endogenous (dependent) variable becomes an exogenous (independent) variable. In the study, the model would be tested simultaneously in one and needs not be divided into several stages. Second, the proposed conceptual framework aims to contribute to the understanding the acceptance of e-payment in the context of Hanoi, a major city in a developing country which may be considered as a more complex model than regression. On this front, Gefen and Straub (2000) states that SEM is more valuable when testing complex mathematical models. Finally, SEM employs confirmatory modelling, which is suitable for testing a set of hypothesized relationships within the constructs (Tabachnick and Fidell, 2007).

3.3. Questionnaire Design

A questionnaire was developed in order to answer the research questions, thus achieving the main objectives of the study. Regarding construct conceptualization, the dimensions (constructs) of the studies are from previous research studies in the field. Regarding construct operationalization, the items (questions) themselves were also adapted from the literature review, specifically

from the proposed framework outlined from chapter 2. The nine constructs in the proposed framework are e-payment use, behavioral intention, perceived ease of use, perceived usefulness, perceived trust, perceived risk, information on e-payment, personal innovativeness in information technology, and perceived behavioral control. The list of the constructs, their items, and the sources are detailed in table 3.1; the codes in the table are for analysis when the data are processed in IBM SPSS and IBM AMOS.

The questionnaire have 9 sections: Section 1 includes demographic information such as age, gender, marital status, educational level, income level, working field, and place of residency. This part have two main purposes: to provide basic understanding of the sample and to clear observations which do not belong to the target sample. Sections 2 covers the dependent variable, which is e-payment use; whereas section 3 deals with the mediator, behavioral intention. Finally, the rest of the sections go through different direct determinants of behavioral intention, or indirect determinants of e-payment use.

Table 3.1: Measurement items (Author compilation)

Code	Constructs and Statements	Adopted and Adapted from
USE	**E-payment Use**	Kim et al. (2010), Shih & Fang (2004)
use_1	I use e-payment more than cash and other payment methods.	
use_2	I increasingly use e-payment everyday.	
use_3	I often use e-payment.	
INTENT	**Behavioral Intention**	Pham & Ho (2015)
intent_1	I plan to use e-payment in the next 3 months.	
intent_2	Assuming I had access to the system, I intend to use e-payment.	
intent_3	I intend to use e-payment and also recommend others to do the same.	

Code	Constructs and Statements	Adopted and Adapted from
PEOU	**Perceived Ease of Use**	Davis et al. (1989), Pham & Ho (2015), Park & Chen (2007).
peou_1	Learning to use e-payment was easy for me.	
peou_2	I found it easy to get e-payment to do what I want it to.	
peou_3	Using e-payment was clear and understandable.	
peou_4	I found e-payment to be flexible to use.	
PU	**Perceived Usefulness**	Venkatesh & Morris (2000), Park & Chen (2007).
pu_1	I perceive that my purchase would be more quickly using e-payment.	
pu_2	I perceive that my purchasing tasks would be more easily using e-payment.	
pu_3	E-payment would enhance my effectiveness in purchasing.	
pu_4	E-payment would enhance my efficiency in making a purchase.	
pu_5	E-payment payment would enable me to make better decisions in making a purchase.	
PR	**Perceived Risk**	Nguyen & Huynh (2017), Pikkarainen et al. (2004)
pr_1	Others may know information about my online transactions if I use e-payment.	
pr_2	I think there is a possibility that my personal information would be leaked and used for unrighteous purposes.	
pr_3	I believe that making transactions with e-payment systems is a risky choice.	
pr_4	I think there is a possibility of losing money when using e-payment methods.	
TRU	**Perceived Trust**	

Code	Constructs and Statements	Adopted and Adapted from
tru_1	I believe that the e-payment services are trustworthy.	Kim et. al, (2010)
tru_2	I trust in the ability of e-payment providers to protect my privacy.	
tru_3	I trust in the technology e-payment is using.	
tru_4	I trust the security mechanisms of e-payment systems.	
tru_5	I perceive the information relating to user and e-payment transactions as secure.	
IE	**Information on E-payment**	Pikkarainen et al. (2004)
ie_1	I have generally received adequate information about e-payment.	
ie_2	I have received adequate information about the benefits of using different e-payment methods.	
ie_3	I have received information about using e-payment from: * A bank * The internet * A friend * An advertisement * I don't know * Another source	
PIIT	**Personal Innovativeness in Information Technology**	Lu et al. (2005)
piit_1	If I heard about a new information technology, I would look for ways to experiment with it.	
piit_2	Among my peers, I am usually the first to explore new information technologies.	

Code	Constructs and Statements	Adopted and Adapted from
piit_3	I like to experiment with new information technologies.	
PBC	**Perceived Behavioral Control**	Pham & Ho (2015)
pbc_1	I have the necessary knowledge to understand e-payment.	
pbc_2	I have the technical competence to absorb e-payment.	
pbc_3	I have a clear understanding of the goals, tasks, and responsibilities of e-payment.	
pbc_4	I have updated information on different e-payment services.	

There are a total of 34 observed items for 9 constructs, most of which are reflective questions. Using a reflective model means that indicators (items) are interchangeable, direction of causality is from construct to measure, and measures are expected to be correlated (Bagozzi, 2011). This is why IBM SPSS and IBM AMOS were utilized in data analysis, since these tools are specifically made for reflective model. In order for participants to indicate their level of agreement or disagreement with different statements, the researcher used Likert seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree) to allow varieties in the answers. This is in line with many scholars in the IS literature (Davis, 1989; Venkatesh and Davis, 2000; Lin and Nguyen, 2011).

The constructs and questions were developed in English before being translated to Vietnamese with necessary wording changes and validation by the researcher, who is proficient in English and Vietnamese. To assure the quality of the questionnaire, a pre-test was sent out to 10 people, including the supervisor, Ms. Phuong To Tam (Ph.D) to check there would be no ambiguous nor confusing questions. The main objective of the research are also kept clear during the pre-

test. Comments from the test were used to contribute to the final questionnaire to achieve content validity.

3.4. Sampling

The research employed a non-probability sampling technique. To be more precise, convenience technique was used for sampling choice. The convenience sampling method enabled the researcher to select the sample subjects from the targeted population based on who are willing and accessible to join the research (Blumberg, Cooper and Schindler, 2008). According to the same source, this method is the least expensive, least time-consuming, and most convenient among all sampling techniques. It also allows for the potential to collect enough observations needed for quantitative analysis. Stangor (2010) says that in behavioural and social science studies, the method was used the most. Due to resource and time constraints in executing the study, the researcher decided to go with the technique.

Nonetheless, there are some caveats to the technique. The first one is not all the of elements within the targeted population have an equal or known chance of selection (Blumberg et al., 2008), which may create potential biases. It also assumes homogeneity in the targeted population and hence the generalisation of findings to the entire population should not be done carelessly but with caution (Stangor, 2010). This should be emphasized since the target population of the study is large, which include all able people residing in the vicinity of Hanoi who may or may not have had experience with e-payment.

Regarding sample size, Kline (2010) proposes a sample size of 200 or larger is appropriate for an SEM model. Likewise, Comrey and Lee (1992) suggest between 200 and 300 observations as fair and good. Therefore, to achieve reliability, the research decided to collect 250 observations.

3.5. Data collection

The questionnaire was published online, using the Internet and words-of-mouth to collect data. The collection period started from May 1st to May 20th. For convenience purposes, the researcher shared the survey among family and friends,

colleagues, acquaintances, posted the survey online where there are a lot of Hanoi people. After that, the study accumulated a total of 256 respondents, exceeding the amount required for sample size.

3.6. Data Analysis techniques

The study follows Hair et al. (2010)'s recommendations of using a two-step approach to structural modelling: evaluate the measurement model first and then the structural model. With the measurement model, there are four steps: normality test, reliability test, exploratory factor analysis, and confirmatory factor analysis. With the structural model, the study employed structural equation modelling to test hypotheses.

3.6.1. Normality Test.

Normal distribution, also known as Gaussian distribution, is one of the most important statistical distributions of statistics, reflecting the value and the extent of data distribution within the study. In data analysis, most statistical tests are only performed when the variables obtained have a normal distribution (Nguyen, 2016). The distribution properties of a sample, according to Hopkins and Weeks (1990), are usually measured through indicators related to the following 4 moments: mean, variance, skewness, and kurtosis. In particular, the most commonly applied measure for testing the normal distribution of samples is to use skewness and kurtosis value.

Skewness is a measure of the degree of asymmetry in the probability distribution of a random variable, which is also known as the asymmetric coefficient. The higher the skew value means the more asymmetrical the distribution (Hopkins & Weeks, 1990). On the other hand, kurtosis reflects the distribution deviation of the sample from the standard curve, measuring the concentration of the probability distribution of a random variable, namely the concentration of the observed variables around the center of the distribution in relationship with two tails (Kotz and Johnson, 1982). According to George & Mallery (2010), if the values of skewness and kurtosis of the sample range from -2 to 2, the sample is considered to have a normal distribution. Therefore, the author

conducted a normality test, focusing on the two measures for skewness and kurtosis. After that, the researcher considered whether these indices were in the satisfactory range and reached a conclusion about the standard distribution of the collected sample.

3.6.2. Reliability Test (Cronbach's alpha)

Scales of measurement are the ways in which variables are constructed and categorized (Hair et al., 2010). In other words, each scale is a set of observable variables capable of measuring and expressing the properties of the factor the variables represent. To determine if a factor is suitable for inclusion in the scale, a researcher would need to conduct a reliability test of that scale.

One such measure to check scale reliability is the Cronbach's alpha, which is one of the coefficients of reliability (Hair et al., 2010). It is a statistical test to check if the items in the scale are related to one another, to check the internal consistency. As for the decision to keep the items on or drop them off the scale, researchers use corrected item-total correlation and Cronbach's alpha if item deleted (Hoang and Chu, 2008).

Firstly, the Cronbach's alpha coefficient will range from 0 to 1 (Hair et al., 2010). The closer the factor is to 1, the greater the internal consistency of the scale becomes (Gliem and Gliem, 2003). According to Hoang and Chu (2008), there are three milestones to evaluate Cronbach's alpha coefficient as follows: $0.8 < \alpha \leq 1$: very good scale; $0.7 < \alpha \leq 0.8$: good use scale; $0.6 < \alpha \leq 0.7$: eligibility scale. For this study, the author proposed that the level of Cronbach's alpha of 0.6 or more is acceptable.

Secondly, in addition, according to Nunnally (1978) the correlation coefficient - the total Corrected Item - Total Correlation must be over 0.3, because if it is below this value, the observed variable will not contribute much to the description of the scale.

Finally, the value of Cronbach's alpha if item deleted reflects what the Cronbach's alpha coefficient could be if the observed variable under scrutiny is removed from the model. If the value is higher than the Cronbach's alpha of the

construct itself, removing the variable means model will increase its scale reliability (Cronbach, 1951). However, this value only provides suggestions, if the Cronbach's alpha is already within the acceptable range, and deleting the item would not increase the coefficient alpha a lot, then there is no need to remove it from the model.

3.6.3. Factor Analysis

In order to understand exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), it is crucial to be informed of what factor analysis is first. According to Hair et al. (2010), factor analysis is a method for identifying a structure (also known as factors or dimensions) that underlies the relations among a set of observed variables. They also state that it can transform the correlations among a set of observed variables into smaller number of underlying factors, yet keeping all the essential information about the relationships among the original observed variables. It can be said to connect the relationship between observed variables (measurements) and the underlying latent factors (Gaskin, 2020).

Two main concepts which revolve around factor analysis are convergent validity and discriminant validity. Convergent validity refers to the extent to which different measured variables fit into a factor (construct) (Gaskin, 2020). On the other hand, discriminant validity addresses how different is one factor to other constructs (Gaskin, 2020). These two concepts, together with reliability and model fit, are the foundation for exploratory factor analysis and confirmatory factor analysis.

3.6.3.1. Exploratory Factor Analysis – EFA

Exploratory factor analysis (EFA) is defined as a quantitative statistical analysis method which is used to determine the correlation among the variables in a dataset (Hair et al. 2010). It is concerned with the grouping of variable and answering the question of how many factors are necessary to make sense of the relationship among a set of indicators using factor loadings (Gaskin, 2020). Gaskin also states that EFA is often associated with theory development, which means it

should always be done when researchers use new scale or add more variables into the scale.

This study is based on the model proposed by Lin and Nguyen (2011). However, the author decided to modify the proposed framework with more variables and more factors, hence the use of EFA is justified. If there is any item in a construct that does not fit well with the rest in the same construct, this is the time to remove it.

According to Williams et al. (2010), EFA is composed of five steps:

Step 1: Assess the appropriateness of the data to conduct a factor analysis. Hair et al. (2010) states that the data is deemed suitable for analysis when the sample size is over 50. In particular, the ideal ratio of observed variable to a construct is 4: 1, meaning that for a factor, there should be 4 observed variables. Moreover, in this step, a number of indices are also used to assess the relationship between variables. For Kaiser-Meyer-Olkin (KMO) test, Kaiser (1974) recommends the KMO index to be over 0.5. As for Barlett's Test of Sphericity, according to Hair et al. (2010), the test must have a meaningful p-value of less than 0.05.

Step 2: Extract the factors. Extraction of factors is performed to reduce a set of observed variables into a smaller number of factors through factor rotation. There are three methods for factor extraction: principle component analysis (PCA), principle axis factoring (PAF), and maximum likelihood (ML) (Gaskin, 2020). The most common method of extraction is PCA (Williams et al., 2010). However, according to Gerbing and Anderson (1988), PAF will reflect data structure more accurately than PCA method. Therefore, in this paper, the author extracted factors using PAF method.

Step 3: Determine the number of factors. There are several methods for determining the number of factors. The most commonly used one is Kaiser's criteria, which is based on the amount of variability explained by a factor (called eigenvalue) combined with cumulative percent of variance extracted (Hoang & Chu 2018). According to Nunnally (1978), only factors with eigenvalue greater than 1 are allowed to retain the analytical model. In addition, according to Hair et

al. (2010), the percentage of cumulative variance explained is usually 50-60%, and the cumulative percentage index will determine the level of explanation of the factors for variation of data. Thus, in this study, the author is interested in 3 indicators: eigenvalue, percentage of variance and cumulative percentage.

Step 4: Select the method of rotation. Factor rotation is a method applied to rotate related variables on the same factor, which helps differentiate factor loadings of observed variables and often required for output interpretation (Gaskin, 2020). There are two popular element rotation types: varimax/quartimax perpendicular rotation and olnimin/promax oblique rotation. Of which, varimax perpendicular rotation is the most commonly used, especially for models with unrelated factors (Williams et al., 2010). However, according to TAM framework, the factors within the study are highly related. Since the proposed framework is based on Lin and Nguyen (2011)'s model, it can be considered a modified TAM. Hence, promax oblique rotation would suit the research model, which has decent correlations among variables. In addition, Gerbing and Anderson (1988) also say that promax rotation reflects data structure more precisely. Therefore, the author chose promax rotation type.

Step 5: Name and explain the factor. Typically, after performing factor rotation, observed variables of the same nature will usually be grouped into the same factor, called latent factor and will be named based on the proposed conceptual framework.

After running EFA, regression output shows the pattern matrix, which includes the factor loadings of all observed variables. According to Hair et al. (2010), if the factor loading is greater than 0.3 then the explanatory power of the variable for the factor reaches a minimum; if it is higher than 0.4 then the explanatory ability of the variable for the factor is quite important; and if the item's factor loading is above 0,5, then the explanatory power of the variable is considered to have practical value. In this study, the author considers for a variable to be retained, it must have a factor loading greater than 0.5. Ensuring these numbers means that the study achieve convergent validity.

As stated above, besides ensuring convergent values, variables must also meet discriminant validity. Cross-loading is the phenomenon of a variable being rotated simultaneously and loads onto more than one factors (Gaskin, 2020). When that happens, to meet discriminant validity, the difference between the factor loadings of that variable in different factors must exceed 0.3 (Hair et al., 2010).

3.6.3.2. Confirmatory Factor Analysis (CFA)

According to Hair et al. (2010), confirmatory factor analysis (CFA) is a statistical method to determine the suitability of the dataset with the theoretical model. When implementing CFA, the number of constructs (factors) and variables within each factor have already been determined. The main purpose of CFA is to check if the number of factors conform to what is expected on the basis of pre-established theory and if items load as predicted on the expected number of factors. It is also a prerequisite to structural model analysis (Hair et al., 2010).

It can be said that the main difference between EFA and CFA is the former is unguided factor analysis while the latter is a guided one (Gaskin, 2020). In CFA, the items are connected directly to a latent construct. In other words, the items are constrained to measure a specific construct. On the contrary, in an EFA, the items are unconstrained by any framework and the software can just freely discover the way in which items are related based on correlations. Besides, it can be said that EFA helps the measurement model to have a better fit when it comes to CFA.

According to Hair et al. (2010), CFA comprises 4 steps as follows:

Step 1: Define the component structure: List the constructs and items that make up the model.

Step 2: Develop a general measurement model: Consider the relationship among constructs and items and build a general model based on those relationships.

Step 3: Research design: Build a scale, model design, identify problems encountered in the model, identify problems regarding different measure estimates.

Step 4: Evaluate the measurement model: Assessing the fit of the model, path estimates, construct validity, convergent validity, discriminant validity, model diagnostics, standardized residuals, and modification indices.

However, in the research, regarding CFA specifically, the author focused mainly on step 4 due to the previous three steps have been covered either by EFA or the previous analysis. In particular, the author evaluated three criteria: convergent validity, discriminant validity and fit indices of the model.

Regarding convergent validity, according to Hair et al. (2010), the author evaluated three indicators, including: the factor loadings of observed variables, average variance extracted (AVE), and composite reliability (CR). The acceptance level of factor loading is above 0.6 (Awang, 2012), whereas the threshold AVE value for the model is above 0.5 (Fornell & Larcker, 1981) and the CR value must be higher than 0,7 (Hu and Bentler, 1999).

As for discriminant validity, according to Hair et al. (2010), the researcher conducted a comparison between the square root AVE of a factor with the the correlation coefficient of that factor with each other factor (inter-factor correlation). Accordingly, if the square root AVE value is greater than all inter-factor correlations, then the model under consideration has high discriminant validity.

For the analysis of the model's fit indices, according to Hu and Bentler (1999), the following five measures are assessed: chi-square over degrees of freedom, CFI, SRMR, RMSEA, and PClose. The same source states that chi-square over degrees of freedom less than 5 is considered acceptable. The acceptable values for CFI, SRMR, RMSEA, and PClose are greater than 0.9, less than 0.10, less than 0.08, greater than 0.01 accordingly.

3.6.4. Structual Equation Modeling (SEM)

One of the most complex and flexible techniques used to analyze complex relationships in causal model is structural equation modeling (SEM). As stated above, it is a statistical analysis technique developed for analyzing the inter-relationships among multiple variables in a model simultaneoulsy (Gefen and Straub, 2000). The inter-relationships among variables could be expressed in a

series of single and multiple regression equations, whereas the SEM technique employs the combination of quantitative data and the correlational or causal assumptions into the model. The relationships are modeled into a theoretical framework represented by a diagram. The diagram presents the hypotheses from the proposed framework which is tested in the study. SEM is capable of estimating a series of inter-relationships among latent constructs simultaneously in a model. In fact, SEM is the most efficient method to handle the Confirmatory Factor Analysis (CFA) for measurement models, analyze the causal relationships among latent constructs in a structural model, estimating their variance and covariance, and test the hypotheses for mediators and moderators in a model (Awang, 2012).

In the study, the researcher applied maximum likelihood estimation (MLE). It is used in statistics to estimate the parameter value of a probability model based on observed data without making predictions about distribution (Awang, 2012). According to Kline (2010), the minimum sample size of the MLE maximum reasonable estimation method is 200. Besides, the sample also needs to reach a standard distribution based on the results of two factors, skewness. and kurtosis.

In analyzing the structural model using SEM, the author conducted a path coefficient assessment to evaluate the causal relationship between the factors in the research model (Hair et al., 2010). By doing an SEM analysis of the structural model also means testing hypotheses of the proposed conceptual model. In particular, according to Gaskin (2020), the process of performing SEM network model analysis is as follows:

Step 1: Test for multivariate assumption.

Step 2: Evaluate structural model fit.

Step 3: Determine the standardized coefficient and its statistical significance.

Step 4: Test the proposed hypotheses and accept or reject the hypotheses.

Especially, within SEM, mediation effect of behavioral intention variable can be tested by employing bootstrapping technique. As hypothesized, behavioral intention mediates the effect between all independent variable and the dependent variable (actual usage of e-payment). Mediation models are used to describe chains

of causation. It is often created to provide a more precise causal effects (Gaskin, 2020). Bootstrapping is a resampling method, running the model several times while replacing randomly the respondents' answer values with the mean values of the dataset (Byrne, 2006). It is important for mediation analysis because it can confirm the mediation effect through its accuracy for computing confidence intervals for mediation effect when the mediation effect is significant (Byrne, 2006). The same source indicates that in bootstrapping output, if the critical ratio value is less than 1.96 then the mediation effect is significant.

3.7. Data Processing Tools

Within the scope of this thesis, data are processed using IBM SPSS (Statistical Product and Service Solutions) version 26.0 and IBM AMOS (Analysis of Moment Structure) version 26.0. SPSS is a statistical software commonly used in market research, sociological investigation research and psychological research (Pallant, 2010; Janssens et al., 2008). The prevalence of SPSS in research can be attributed to its user-friendly interface, with its features being accessible via pull-down menus. In fact, Wellman (1998) even states that SPSS manual is one of the most important book for sociology due its popularity and usefulness in the field. Likewise, AMOS is widely used in the analysis of SEM structure models due to the flexibility in designing and building models with complex relationships between variables (Byrne, 2006).

In the study, the researcher employed SPSS for data analysis including data screening, reliability analysis, and exploratory factor analysis. Moreover, it is involved in the tests for normality and multivariate assumptions. These include checking outliers and extreme values, multicollinearity, skewness and kurtosis, and so on. AMOS, on the other hand, was used to test for model fit, confirmatory factor analysis, and structure model analysis. The most important aspect of AMOS is that it was used to test and examine the relationships among variables within the proposed conceptual model (Blunch, 2008). In addition, various plugins for AMOS developed by Professor James Gaskin at Brigham Young University were also used in the study for easier computation and presentation.

CHAPTER 4: FINDINGS

4.1. Data Screening

It is pivotal to screen data first before conducting any statistical analyses. The reason behind this action is to ensure the data is useable, reliable, and valid for testing causal theory (Gaskin, 2012). The same source indicates two categories: case screening and variable screening.

Case screening refers to the look for abnormality in the responds. To check for cases, one may look for missing data, unengaged responses or outliers on continuous variables. Missing data in this sense is the questions that are left unanswered by the respondents. However, due to the technological advantage of publishing a survey online, the study did not allow any respondents to submit their answers if any of the questions were left blank. Regarding unengaged responses, 5 responses were removed as evidenced by giving the exact response for every single item that used Likert seven-point scale. As for outliers, since all of the questions that are needed for deep analysis are all ordinal-based (Wu and Leung, 2017), which are not continuous. Hence, there is no need to check for outliers in this stage of the study.

Variable screening, on the other hand, refers to finding the abnormality in the different questions themselves. In another word, this is the normality test of the distribution, which looks at skewness and kurtosis. As stated in the previous chapter, the data are considered normally distributed if the absolute value of skewness and kurtosis for for each variable is less than 2 (George and Mallery, 2010). From table 4.1, it can be seen that all of the expected values fall within -2 and 2, which are considered a normal distribution. However, this question is formative and is only used for descriptive statistics and thus would not go through the process involving EFA, CFA, and SEM analysis. In conclusion, after data screening, 251 responds continued to descriptive statistics.

Table 4.1: Normality Test of the Sample (Author compilation).

N=251	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
use_1	-0.38	0.154	-0.765	0.306
use_2	-1.177	0.154	0.966	0.306
use_3	-0.72	0.154	-0.223	0.306
intent_1	-0.629	0.154	-0.649	0.306
intent_2	-0.818	0.154	-0.104	0.306
intent_3	-0.711	0.154	-0.269	0.306
peou_1	-0.916	0.154	0.468	0.306
peou_2	-0.877	0.154	0.459	0.306
peou_3	-0.653	0.154	0.17	0.306
peou_4	-0.855	0.154	0.34	0.306
pu_1	-1.211	0.154	1.541	0.306
pu_2	-1.091	0.154	1.361	0.306
pu_3	-1.129	0.154	1.221	0.306
pu_4	-0.995	0.154	1.003	0.306
pu_5	-0.244	0.154	-0.846	0.306
pr_1	-0.507	0.154	-0.532	0.306
pr_2	-0.769	0.154	0.151	0.306
pr_3	-0.866	0.154	0.347	0.306
pr_4	-0.667	0.154	-0.364	0.306
tru_1	-0.138	0.154	0.219	0.306
tru_2	-0.445	0.154	0.367	0.306
tru_3	-0.28	0.154	0.009	0.306
tru_4	-0.473	0.154	0.643	0.306
tru_5	-0.432	0.154	0.254	0.306
ie_1	-0.594	0.154	-0.11	0.306
ie_2	-0.402	0.154	-0.374	0.306
piit_1	-0.422	0.154	-0.33	0.306
piit_2	-0.01	0.154	-0.774	0.306
piit_3	-0.45	0.154	-0.391	0.306

pbc_1	-0.375	0.154	-0.038	0.306
pbc_2	-0.371	0.154	-0.034	0.306
pbc_3	-0.385	0.154	0.326	0.306
pbc_4	-0.474	0.154	0.185	0.306

4.2. Demographics

Demographic information shows potential biases. There are only about 15% percent of the respondents are male, while the rest are female. Likewise, the overwhelming majority are young people, aged from 20-29 years old (74.5%). Furthermore, while the samples includes people working in many fields, over 50% of them are students. This is in line with the income statistics, where 50.2% of the participants earn less than 200 USD a month.

Table 4.2: Frequency and percentage of respondents' demographic attributes (Author compilation)

Attributes	Categories	Frequency (N=251)	Percentage (%) (Total: 100%)
Gender	Male	37	14.7%
	Female	214	85.3%
Marital Status	Single	201	80.1%
	Married	49	19.5%
	Divorced/ Separated	1	0.4%
Age (years)	Below 20	16	6.4%
	20-29	187	74.5%
	30-39	15	6.0%
	40-49	17	6.8%
	Over 50	16	6.4%
Education	High School	8	3.2%
	Vocational School	1	0.4%
	College	189	75.3%

	Graduate School	53	21.1%
Working field	Education	29	11.6%
	IT Industry	5	2%
	Service Industry	25	10%
	Manufacturing	1	0.4%
	Banking	7	2.8%
	Government Agencies	13	5.2%
	Student	135	53.8%
	Other	36	14.3%
Monthly Income (USD)	Less than 200	126	50.2%
	200-500	83	33.1%
	500-1000	30	12%
	1000-3000	12	4.8%

4.3. Reliability Test

The reliability of the constructs in the study was checked by Cronbach's Alpha (Cronbach, 1951). SPSS was used to analyse the reliability tests which are presented in Table 4.3. The results suggest that the constructs have adequate reliability, with a score ranging from 0.839 for PU to 0.939 for BI. This means that the items related to each construct used in the proposed model were positively correlated to one another (Hair et al., 2010). Even though the coefficient alpha of PEOU, PU, and PR could be improved by removing one of its item (peou_4, pu_5, and pr_1), the effect is not worth doing it. Furthermore, these items are adapted from previous prominent studies which are carefully sketched out. Removing items may even worsen theoretical structure of the scale, which means reducing the variance explained by the model. Regarding item-to-total correlation, the values exceed the cut-off value of 0.5, which is suggested by Hair et al. (2010) for all the constructs used in the questionnaire. Hence, it is adequate to move on. Therefore, the researcher retained these items to help understand the complete picture.

Table 4.3: Reliability Test (Author compilation)

Factor	Item	Corrected Item-Total Correlation	Cronbach's Alpha	Cronbach's Alpha if Item Deleted
EU	use_1	.750	.889	.876
	use_2	.758		.865
	use_3	.850		.781
BI	intent_1	.861	.939	.921
	intent_2	.898		.892
	intent_3	.862		.920
PEOU	peou_1	.836	.922	.894
	peou_2	.869		.882
	peou_3	.866		.884
	peou_4	.715		.933
PU	pu_1	.665	.839	.800
	pu_2	.699		.791
	pu_3	.636		.807
	pu_4	.698		.790
	pu_5	.535		.841
PR	pr_1	.661	.887	.890
	pr_2	.806		.835
	pr_3	.795		.839
	pr_4	.758		.853
PT	tru_1	.734	.881	.851
	tru_2	.704		.858
	tru_3	.745		.849
	tru_4	.698		.860
	tru_5	.698		.859
IE	ie_1	.759	.863	N/A
	ie_2	.759		N/A
PIIT	piit_1	.756	.874	.828

	piit_2	.777		.807
	piit_3	.749		.832
PBC	pbc_1	.770	.898	.871
	pbc_2	.753		.877
	pbc_3	.824		.851
	pbc_4	.754		.878

4.4. EFA

As suggested by Hair, Black, and Babin (2010), the purpose of exploratory factor analysis is to discover a structure of latent dimensions (constructs) among the observed variables reflected in the items of an instrument. In another word, it is to explore the actual correlations between items and not just theoretical ones.

4.4.1. Tests for Adequacy

The KMO and Bartlett's Test gave the appropriate results for continuing data analysis. The KMO value reached 0.890, satisfying the condition of being greater than 0.5 and less than 1.0. In fact, it is considered to be “meritorious” in the word of Kaiser and Rice (1974). It indicates that the variables are well able to be grouped into a set of different underlying factors. In addition, the Barlett’s Test of Sphericity value also achieved a significance level of less than 0.001. In another word, the variables do correlate with one another to a degree that is meaningful to run EFA (Hair et al., 2010). Therefore, the model is suitable for EFA analysis.

Table 4.4: KMO and Bartlett's Test – Initial

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.890
Bartlett's Test of Sphericity	Approx. Chi-Square	6148.955
	df	528
	Sig.	.000

4.4.2. Kaiser's criterion eigenvalue test

Next, the author conducted statistical testing of Kaiser's criterion. It can be seen that all eigenvalue values of USE, INTENT, PEOU, PU, TRU, PR, IE, PIIT, and PBC are all greater than 1 which satisfy the condition. From table 4.5, the smallest eigenvalue value is that of IE (1.040) and the largest is from PEOU (11.506). More importantly, it shows that there are exactly 9 factors (constructs) that explain 70.584% of the variance in data, which is a perfect fit with the proposed model. More than 70% of data variability explained is also a good indicator, since 50% is considered decent. It is because that one does not want more than 50% of the model is explained by error terms (Hair et al., 2010).

Table 4.5: Total Variance Explained – Initial (Author compilation)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
PEOU	11.506	34.867	34.867	11.223	34.009	34.009	6.551
TRU	3.277	9.931	44.798	2.977	9.022	43.031	7.716
PBC	2.576	7.805	52.603	2.317	7.021	50.052	7.018
PR	1.803	5.465	58.068	1.509	4.574	54.626	3.380
PU	1.569	4.754	62.822	1.299	3.937	58.564	6.817
USE	1.431	4.336	67.158	1.160	3.515	62.079	6.578
PIIT	1.330	4.030	71.188	1.036	3.139	65.217	5.994
INTENT	1.244	3.769	74.957	.979	2.966	68.183	6.952
IE	1.040	3.153	78.110	.792	2.401	70.584	3.078

4.4.3. Convergent and Discriminant Validity

Regarding convergent and discriminant validity, factor structure was considered. Factor structure refers to the intercorrelations among the variables being tested in the EFA (Hair et al., 2010). For illustration, table 4.6 shows the pattern matrix of the study using principal axis factoring extraction and promax rotation method. We can see that variables are grouped into factors, or they "load" onto factors to be more precise. It illustrates a clean factor structure in which convergent and discriminant validity are clear by the high loadings within factors, and no major cross-loadings between factors. However, pu_5 appears to be the main problem, since its factor loading is less than 0.55. According to Gerbing and Anderson (1998), for a sample size of approximately 250, the factor loading for each item should exceed 0.55. Therefore pu_5 was removed from further testing, which was in line with the reliability test.

Table 4.6: Pattern Matrix – Initial (Author compilation)

	Factor								
	1	2	3	4	5	6	7	8	9
peou_2	.959								
peou_3	.884								
peou_1	.844								
peou_4	.716								
tru_2		.850							
tru_3		.788							
tru_5		.778							
tru_4		.705							
tru_1		.685							

pbc_2			.882						
pbc_3			.870						
pbc_1			.786						
pbc_4			.696						
pr_3				.860					
pr_2				.860					
pr_4				.791					
pr_1				.762					
pu_1					.855				
pu_4					.745				
pu_2					.738				
pu_3					.589				
pu_5					.491				
use_3						.955			
use_1						.802			
use_2						.776			
piit_2							.909		
piit_1							.804		
piit_3							.743		
intent_2								.947	
intent_3								.818	
intent_1								.795	
ie_2									.889
ie_1									.824

After pu_5 was removed, the researcher decided to run EFA one more time in order to test for better results.

Table 4.7: KMO and Bartlett's Test - Second Time (Author compilation)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.889
Bartlett's Test of Sphericity	Approx. Chi-Square	5988.754
	df	496
	Sig.	.000

The second KMO and Bartlett's Test shows little difference. The KMO value dropped minimally from 0.890 to 0.889. The test of sphericity still maintains the p-value under 0.001, which is significant.

Table 4.8: Total Variance Explained – Second Time (Author compilation)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
PEOU	11.194	34.980	34.980	10.919	34.123	34.123	6.562
TRU	3.275	10.234	45.214	2.979	9.310	43.433	7.466
PBC	2.564	8.013	53.227	2.305	7.203	50.636	6.905
PR	1.755	5.484	58.711	1.482	4.630	55.266	3.356
PU	1.543	4.821	63.532	1.257	3.927	59.193	6.181
USE	1.420	4.436	67.968	1.159	3.622	62.815	6.441
PIIT	1.290	4.031	72.000	1.039	3.246	66.062	5.693
INTENT	1.222	3.817	75.817	.929	2.902	68.964	7.135
IE	1.023	3.196	79.013	.784	2.450	71.414	2.977

For the second Kaiser's criterion eigenvalue test, the number seems to improve somewhat. This time, 71.414% of variance in data was explained by the nine-factor model, all with initial eigenvalue larger than 1, compared to the first time which was 70.584%.

Table 4.9: Pattern Matrix - Second Time (Author compilation)

	Factor								
	1	2	3	4	5	6	7	8	9
peou_2	.959								
peou_3	.890								
peou_1	.853								
peou_4	.719								
tru_2		.847							
tru_3		.780							
tru_5		.769							
tru_4		.710							
tru_1		.685							
pbc_2			.880						
pbc_3			.878						
pbc_1			.785						
pbc_4			.702						
pr_2				.866					
pr_3				.861					
pr_4				.790					
pr_1				.754					
pu_1					.905				
pu_2					.774				
pu_4					.639				
pu_3					.557				
use_3						.957			
use_1						.809			

use_2						.773			
piit_2							.881		
piit_1							.797		
piit_3							.747		
intent_2								.973	
intent_3								.833	
intent_1								.809	
ie_2									.888
ie_1									.820

For more evidence of discriminant validity, the researcher looked at the factor correlation matrix which is shown in table 4.10.

Table 4.10: Factor Correlation Matrix – Second Time

Factor	PEOU	TRU	PBC	PR	PU	USE	PIIT	INTENT	IE
PEOU	1.000								
TRU	.427	1.000							
PBC	.394	.544	1.000						
PR	-.088	-.323	-.109	1.000					
PU	.518	.489	.385	.010	1.000				
USE	.454	.505	.487	-.132	.508	1.000			
PIIT	.336	.484	.608	-.130	.338	.390	1.000		
INTENT	.568	.521	.451	-.230	.503	.538	.441	1.000	
IE	.220	.260	.308	.055	.289	.277	.211	.301	1.000

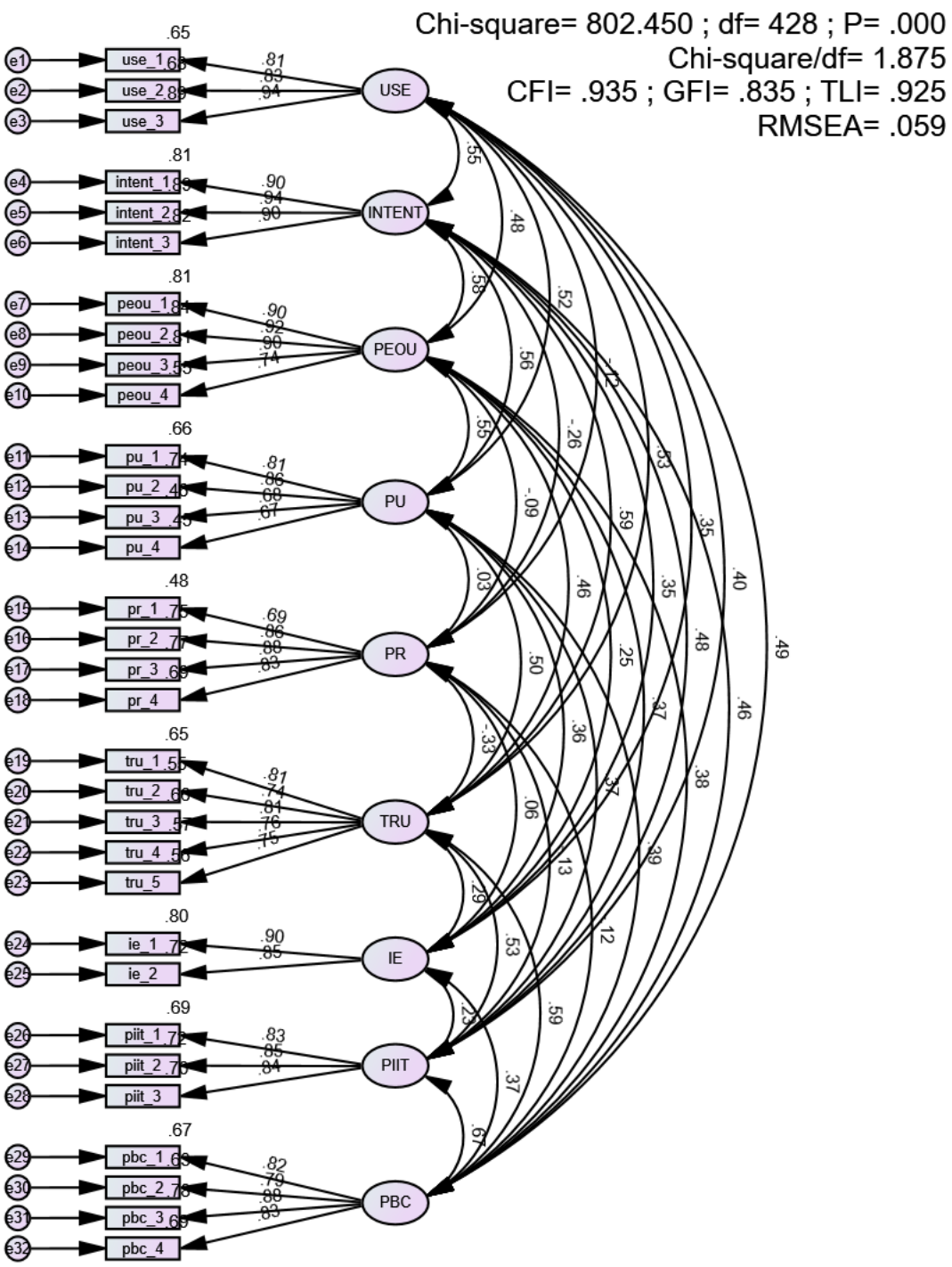
As can be seen in the table, none of the non-diagonal value exceeds 0.700, which means that all correlations between different factors do not exceed 0.700. Because discriminant validity refers to the extent to which factors are distinct and uncorrelated, the rule is that variables should relate more strongly to their own factor than to another factor (Hair et al., 2010). Specifically, the same source indicates that a correlation greater than 0.7 indicates a majority (0.7*0.7=49%) of shared variance. From the factor correlation matrix, there are no discriminant validity concern.

4.5. CFA

4.5.1. Model fit

It is pivotal to begin CFA with initial screening to achieve measurement model fit. In particular, factor loadings and correlation should be promptly checked (Singh, 2017). The CFA initial model presented in figure 4.1 was created with these aims in mind. Using IBM AMOS with maximum likelihood method, the model shows the factor loadings (on single-headed arrows from the constructs to observed variables), the correlations (on double-headed arrows among factors), and the squared multiple regression values (on the top left of the observed variables). Factor loadings are especially important for unidimensionality, which means the extent to which different items within a factor only capture that factor's dimension (Singh, 2017). In order to achieve that, every factor loadings is required to have value greater than 0.5 for a new item that is just developed. Similarly, Awang (2012) suggests a value greater than 0.6 for factor loadings of items that are already strongly established by previous studies, a factor loading of 0.6 or above is required (Awang, 2012). From figure 4.1, the initial CFA model shows that there are no item that is close to the cut-off threshold. As for correlations, none should not be over 0.8 (Hair et al., 2010), which the figure clearly shows.

Figure 4.1: Initial Measurement Model in Confirmatory Factor Analysis



For the model to be fit complately, the researcher computed the values for different fit indices. the results of which were summarized in table 4.11. It shows that at significance level $p < 0.001$, all except one of the measures measures met the requirement to proceed. PClose in this initial version is 0.009, which is less than 0.001 the desired threshold. Therefore, modification indices were consulted

to find ways to improve the model. Accordingly, the researcher covaried the error terms between e13 and e14, since the covariance of these two have the highest index at 18.188. An index of 18 indicates that the chi-square will reduce at least 18 units, thus increasing the fit of the model (Hu and Bentler, 1999). In addition, two other pairs of residual terms: e7 – e10 and e15 – e16 were also covaried. It helped to achieve a good enough model to proceed.

Table 4.11: Initial Evaluation of Model Fit (Author compilation*)

Measure	Estimate	Threshold**			Interpretation
		Terrible	Acceptable	Excellent	
CMIN	802.450	--	--	--	--
DF	428.000	--	--	--	--
CMIN/DF	1.875	> 5	> 3	> 1	Excellent
CFI	0.935	<0.90	<0.95	>0.95	Acceptable
SRMR	0.051	>0.10	>0.08	<0.08	Excellent
RMSEA	0.059	>0.08	>0.06	<0.06	Excellent
PClose	0.009	<0.01	<0.05	>0.05	Terrible

(*) Compiled using model fit plugin for AMOS by Gaskin and Lim (2016).
(**)Hu and Bentler (1999).

There is a debate in academia as to whether or not one should covariate error terms. Hair et al., (2010, p. 675) state that “You also should not run CFA models that include covariances between error terms... Allowing these paths to be estimated (freeing them) will reduce the chi-square, but at the same time seriously question the construct validity of the construct.” On the other hand, Landis, Edwards and Cortina (2009) postulate that there are situations in which covariance between measurement errors is justified. This may be done when correlations

among error terms are unavoidable, such as when multiple measures of the same construct are used in longitudinal research, or when indicator variables share components. In addition, it helps to minimize the redundancy of items in measuring the same construct. Nevertheless, these scholars try to avoid covarying error terms if possible. That is why only three pairs of error terms are covariated: e13 - e14, e7 – e10, and e15 – e16, despite the modification indices stating there are several other error terms that could be covariate and bring about significant effect. It should be noted that each pair belong to the same construct, because error terms of items from different constructs do not match.

After the process, the evaluation of model fit is as follow: at significance level $p < 0.001$, chi-square = 752.970, degree of freedom = 425, chi-square/degree of freedom = 1.772, CFI = 0.943, SRMR = 0.054, RMSEA = 0.056, PClose = 0.080. All of these measures satisfy the requirements: only one indices are acceptable, the rest are excellent. Especially PClose value, it increased from 0.009 to 0.080. The results can be seen in table 4.12. In conclusion, the goodness of fit for the measurement model is sufficient to continue.

Table 4.12: Second Evaluation of Model Fit (Author compilation)*

Measure	Estimate	Threshold**			Interpretation
		Terrible	Acceptable	Excellent	
CMIN	752.970	--	--	--	--
DF	425.000	--	--	--	--
CMIN/DF	1.772	> 5	> 3	> 1	Excellent
CFI	0.943	<0.90	<0.95	>0.95	Acceptable
SRMR	0.054	>0.10	>0.08	<0.08	Excellent
RMSEA	0.056	>0.08	>0.06	<0.06	Excellent
PClose	0.080	<0.01	<0.05	>0.05	Excellent

(*) Compiled using model fit plugin for AMOS by Gaskin and Lim (2016).
(**)Hu and Bentler (1999).

4.5.2. Validity and Reliability

To test for convergent validity, the researcher calculated the average variance extracted (AVE). For all factors, the AVE was above 0.50, which satisfy the required level proposed by Fornell & Larcker (1981). To test for discriminant validity, the researcher compared the square root of the AVE (on the diagonal in table 4.13) to all inter-factor correlations. The values for all inter-factor correlations can be seen off the diagonal in the table as well. The reason why the researcher compared these two types of values is because the variance within a factor should be better explained by its own items than by a correlation with items of other factors (Blunch, 2008). If the square roots of AVE for all factors are larger than the correlations then the criterion is met. An easier way is to compare the AVE and the maximum shared variance (MSV). From the table, it is clear that the different square roots of AVE is bigger than the correlations, or the AVE for every construct is higher than the MSV. Therefore, there is no problem with discriminant validity. As for the reliability, composite reliability (CR) is also computed for each factor. It is a better method for checking scale reliability which is preferred in CFA over Cronbach's alpha (Blunch, 2008). In all of the cases the CR was above 0.70, which is the minimum threshold proposed by Hu and Bentler (1999), indicating that the factors are reliable.

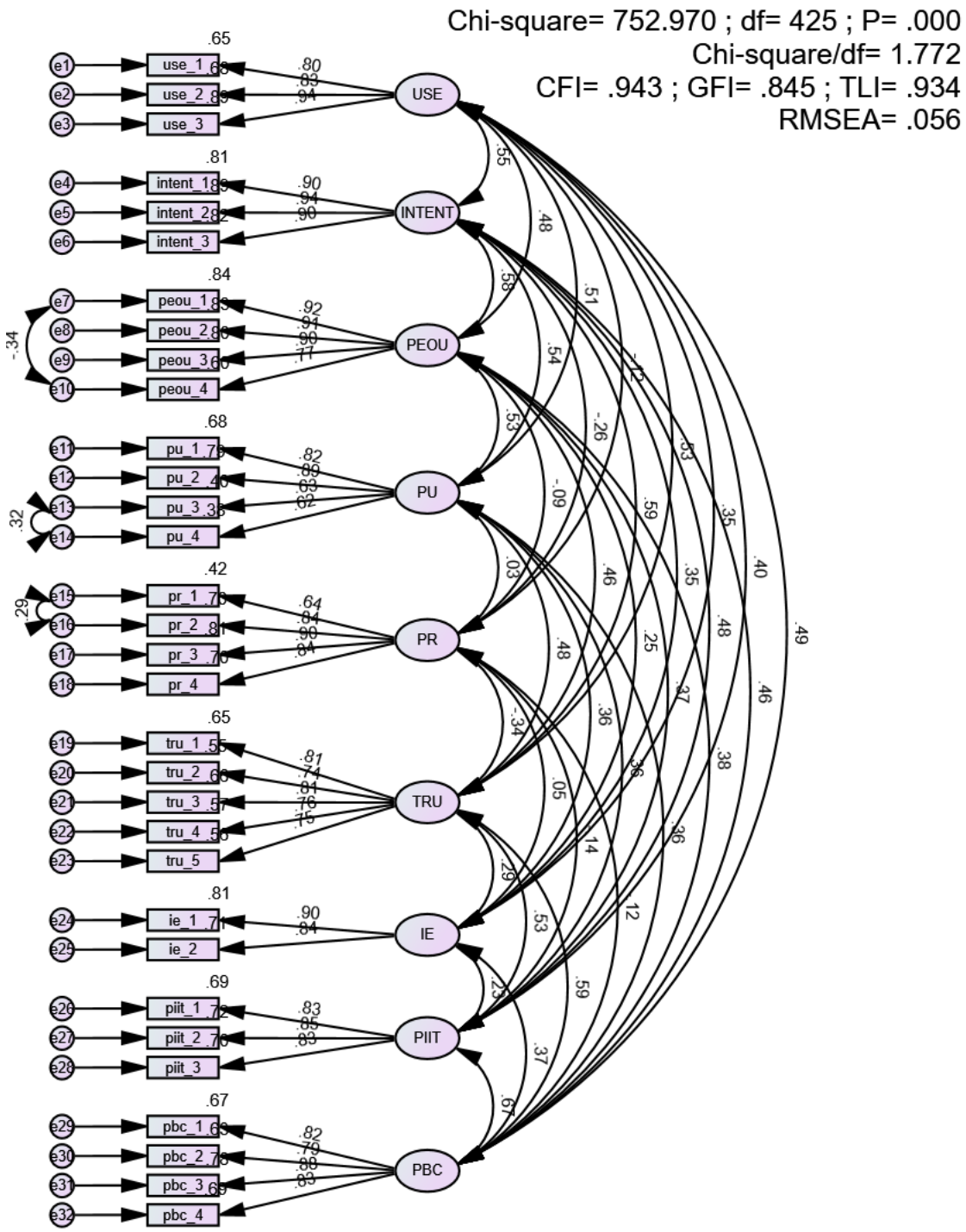
Table 4.13: Validity and Reliability Analysis for Confirmatory Factor Analysis (Author compilation **)**

	CR	AVE	MSV	1	2	3	4	5	6	7	8	9
USE	0.895	0.741	0.306	**0.861**								
INTENT	0.94	0.839	0.346	0.554***	**0.916**							

PEOU	0.929	0.767	0.335	0.478***	0.579***	**0.876**						
PU	0.834	0.563	0.296	0.506***	0.544***	0.529***	**0.75**					
PR	0.883	0.656	0.114	-0.123†	-0.257***	-0.089	0.035	**0.81**				
TRU	0.882	0.599	0.347	0.528***	0.588***	0.462***	0.477***	-0.338***	**0.774**			
IE	0.864	0.761	0.137	0.347***	0.347***	0.247***	0.362***	0.054	0.290***	**0.872**		
PIIT	0.876	0.702	0.452	0.402***	0.478***	0.366***	0.359***	-0.139†	0.529***	0.229**	**0.838**	
PBC	0.9	0.692	0.452	0.491***	0.462***	0.381***	0.364***	-0.118†	0.589***	0.371***	0.672***	**0.832**

Significance of Correlations: † $p < 0.100$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$. **** Compiled using validity tool plugin for AMOS by Gaskin, James, and Lim (2019).

Figure 4.2: Final Measurement Model in Confirmatory Factor Analysis


Chi-square= 752.970 ; df= 425 ; P= .000
Chi-square/df= 1.772
CFI= .943 ; GFI= .845 ; TLI= .934
RMSEA= .056
USE
INTENT
PEOU
PU
PR
TRU
IE
PIIT
PBC

4.6. SEM

4.6.1. Multivariate assumption

After finishing with the measurement model, the researcher turned to the structural model. The first test needed to be done is multicollinearity. According to Pallant (2010), multicollinearity occurs when two or more factors are highly correlated to each other. That means the correlation coeficients among them that exceed 0.8 or 0.9 is considered highly problematic (Tabachnick and Fidell, 2007). Other researchers suggest a value 0.7 or higher is considered alarming (Pallant, 2010). The presence of multicollinearity is determined by two values: tolerance and variance inflation factor (VIF).

Table 4.14: Multicollinearity Test for USE (*) (Author compilation)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-.925	.502		-1.841	.067		
PBC	.290	.104	.214	2.788	.006	.357	2.801
PIIT	-.059	.079	-.053	-.740	.460	.415	2.408
IE	.094	.070	.072	1.337	.183	.723	1.384
TRU	.227	.106	.161	2.130	.034	.369	2.713
PR	-.001	.067	-.001	-.022	.982	.727	1.375
PU	.275	.093	.196	2.960	.003	.482	2.077
PEOU	.132	.076	.108	1.743	.083	.547	1.827
INTENT	.227	.082	.198	2.761	.006	.407	2.454

(*)Dependent Variable: USE

O'brien (2007) suggests that the value of tolerance should be over 0.10 and the VIF one less than 3.0 for there to be no multicollinearity. These values can be seen in table 4.14 and 4.15. Table 4.14 tested all factors that can be considered endogeneous (independent) variables, which among others includes behavioral intention, because it is a predictior of actual usage. Meanwhile, table 4.15 only

tested for pure endogeneous variables only. This is done using the factor scores imputed by AMOS after the measurement model modification. Due to the change in factor score loadings, this step was done after and not before CFA. The values are calculated using SPSS.

Table 4.15: Multicollinearity Test for INTENT (*) (Author compilation)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.591	.389		1.518	.130		
PBC	-.033	.081	-.028	-.411	.681	.357	2.799
PIIT	.159	.061	.164	2.611	.010	.427	2.342
IE	.144	.054	.127	2.671	.008	.744	1.344
TRU	.236	.081	.192	2.903	.004	.381	2.622
PR	-.185	.050	-.172	-3.670	.000	.768	1.303
PU	.284	.070	.231	4.052	.000	.514	1.945
PEOU	.294	.056	.275	5.236	.000	.609	1.642

(*)Dependent Variable: INTENT

Given all the independent constructs had VIF value below 3.0 and tolerance value higher than 0.10, this suggests the absence of multicollinearity. After completion of data screening for multivariate assumptions, the next action is to check for model fit.

4.6.2. Model fit

Figure 4. 3: Fully Latent Structural Causal Model

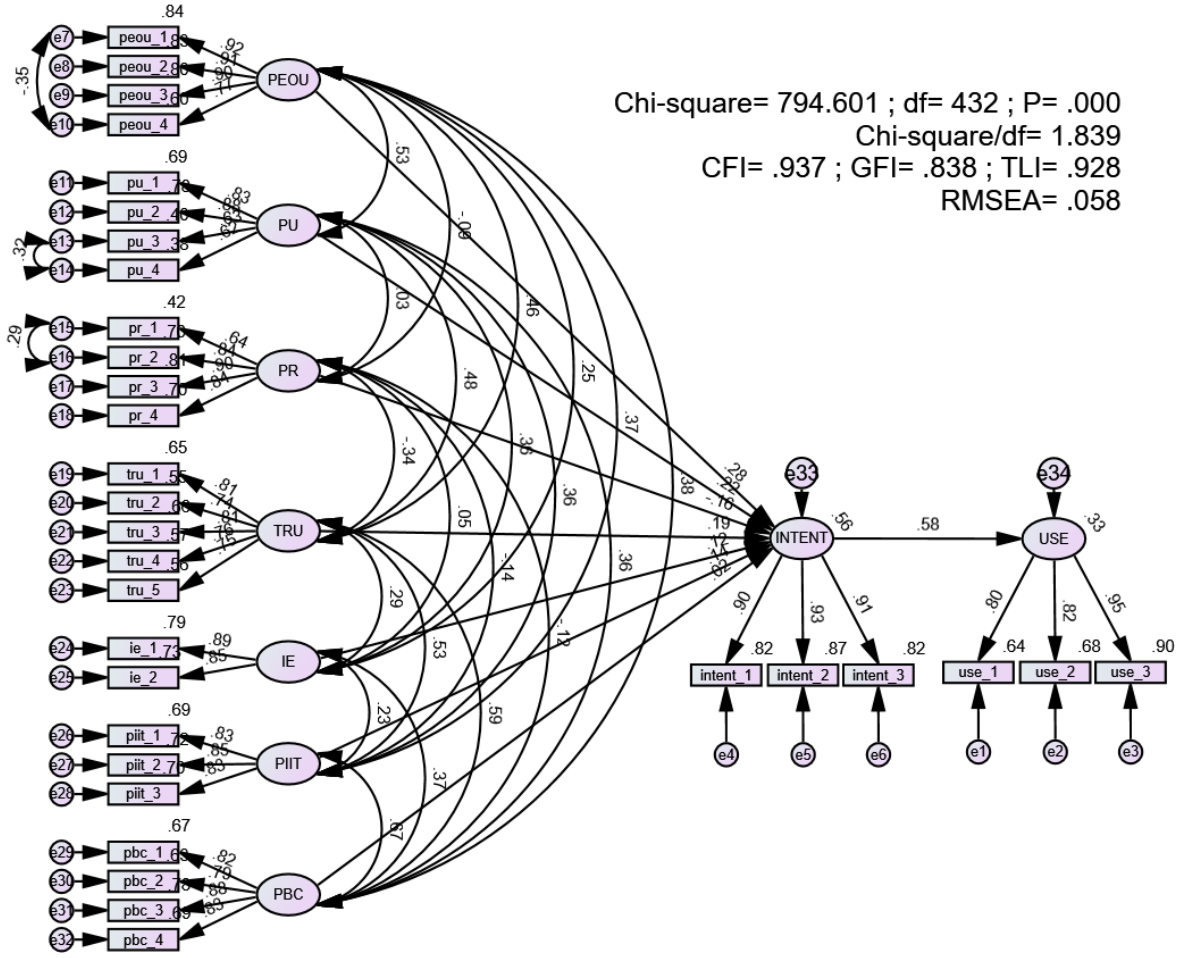


Figure 4.3 shows the fully latent structural causal model for the proposed framework. Even though model fit was assessed in CFA, the researcher utilized different fit indices to test for model fit again for structural model. This is because the model have changed from purely measurement to structural one. Gaskin (2020) states that model fit must be assessed every time the model changes and a hypothesis is tested. It is also said to demonstrate sufficient exploration power of alternative models. The results can be seen in table 4.16. From the table, it is clear that the structural model met all the required criteria to move on to hypotheses testing

Table 4.16: Structural Model Fit Evaluation (*) (Author compilation)

Measure	Estimate	Threshold**	

		Terrible	Acceptable	Excellent	Interpretation
CMIN	794.601	--	--	--	--
DF	432.000	--	--	--	--
CMIN/DF	1.839	> 5	> 3	> 1	Excellent
CFI	0.937	<0.90	<0.95	>0.95	Acceptable
SRMR	0.071	>0.10	>0.08	<0.08	Excellent
RMSEA	0.058	>0.08	>0.06	<0.06	Excellent
PClose	0.021	<0.01	<0.05	>0.05	Acceptable

(*) Compiled using model fit plugin for AMOS by Gaskin and Lim (2016).

(**)Hu and Bentler (1999).

4.6.3. Hypotheses Testing

After assessing structural model fit indices, it is time to test the hypotheses set out in the previous chapters. The first kind of effects that the researcher account for is direct effects. Table 4.17 summarizes these direct effects.

Table 4.17: Hypotheses Testing – Direct Effects (Author compilation)

Parameter			Unstandardized Estimate	S.E.	C.R.	P	Standardized Estimate (γ)
INTENT	←	PEOU	0.299	0.066	4.541	***	0.278***
INTENT	←	PU	0.264	0.082	3.23	0.001	0.223**
INTENT	←	PR	-0.167	0.06	-2.789	0.005	-0.158**
INTENT	←	TRU	0.228	0.095	2.408	0.016	0.19*
INTENT	←	IE	0.13	0.064	2.03	0.042	0.117*
INTENT	←	PIIT	0.136	0.071	1.931	0.054	0.144†
INTENT	←	PBC	0.02	0.094	0.213	0.831	0.017

USE	←	INTENT	0.663	0.075	8.804	***	0.577***

Significance of Estimate: † p < 0.100; * p < 0.050; ** p < 0.010; *** p < 0.001.

The factor loadings (regression weights) output show that 6 out of 7 hypothesised direct relationships were supported: The followings are the details:

For the motivation group, the standardized estimate of both PEOU (γ = 0.278***) and PU (γ = 0.223**) were both positive and significant. In fact, they are the two strongest predictors of BI. Therefore, hypothesis H1a (perceived ease of use has a positive effect on behavioral intention) and H1b (perceived usefulness has a positive effect on behavioral intention) were accepted.

Concerning the uncertainty group, PR (γ = -0.158**) has a strong, negative, and statistically significant path coefficient with INTENT. Therefore hypothesis H2a (perceived risk has a negative effect on behavioral intention). INTENT was also influenced by TRU (γ = 0.19*) and IE (γ = 0.117*). That being said, hypothesis H2b (information on E-payment has a positive effect on behavioral intention) and H2c (Perceived trust has a positive effect on behavioral intention) were also accepted.

Nonetheless, contrary to the expectation of the researcher, concerning the character group, the hypothesised relationship between PBC (γ = 0.017) and INTENT H3b (perceived Behavioral Control has a positive effect on behavioral intention) was rejected. The results turned out that PBC does not impact INTENT. The researcher could confidently say this was the case because the model did have sufficient statistical power to detect significant effects, as indicated by post-hoc power analysis (Gaskin, 2013). Even though the research do not accept H3b, H3a (personal innovativeness in information technology has a positive effect on behavioral intention) was accepted due to PIIT (γ = 0.144†) has an adequate influence on INTENT at significance level of less than 10%.

In addition, it should be noted that BI (γ = 0.577***)have a very strong, significant, and positive influence on actual usage, making the premises for the mediation hypotheses. PEOU, PU, PR, TRU, IE and PIIT account for 56.1% (R-squared =0.561) of the variance of INTENT, while INTENT explained 33.3% (R-squared =0.333) of USE.

Mediation testing happened simultaneously as the direct effect testing. Table 4.18 summarizes the results of mediation testing.

Table 4.18: Hypothesis Testing - Mediation (Author compilation) (****)

Indirect Path	Unstandardized Estimate	Lower	Upper	P-Value	Standardized Estimate
PEOU → INTENT → USE	0.198	0.104	0.363	0.000	0.160***
PU → INTENT → USE	0.175	0.067	0.345	0.001	0.129***
PR → INTENT → USE	-0.111	-0.186	-0.053	0.001	-0.091**
TRU → INTENT → USE	0.151	0.064	0.304	0.010	0.110*
IE → INTENT → USE	0.086	0.008	0.172	0.073	0.068†
PIIT → INTENT → USE	0.090	0.008	0.176	0.049	0.083*
PBC → INTENT → USE	0.013	-0.095	0.121	0.854	0.010

Significance of Estimates: † $p < 0.100$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.
(****) Compiled using mediation plugin for AMOS by Gaskin, James, and Lim (2020)

As can be seen in the table, INTENT clearly mediated the positive and significant effects of PEOU and PU on USE, with the standardized estimates are 0.160*** and 0.129***. Therefore, the researcher accepted hypothesis H4a (behavioral intention mediates the positive relationship between motivation and e-payment use). Similarly, H4b (uncertainty affects e-payment use indirectly through behavioral intention) was also accepted due to significant estimates (-0.091**, 0.110*, and 0.068†). However, since PBC did not affect INTENT, there is no indirect effect of PBC on USE through INTENT. Even though INTENT did mediate PIIT and USE, the author had to reject hypothesis H4c (behavioral intention mediates the positive relationship between characters and e-payment use).

4.6.4. Bootstrap

As indicated in chapter 3, a bootstrap analysis is required if a study run mediation model (Byrne, 2006). After running mediation test, it is critical for the

researcher to check if the model returns reliable mediation results. Mediation was tested using 1000 bias corrected bootstrapping resamples in AMOS. The results can can be seen in table 4.19.

Table 4.19: Bootstrap Assessment (Author compilation)

Parameter			SE	SE-SE	Mean	Bias	SE-Bias	Critical Ratio
INTENT	←	PEOU	0.092	0.002	0.269	-0.003	0.003	-1
INTENT	←	PU	0.088	0.002	0.233	0.001	0.003	0.333333
INTENT	←	PR	0.053	0.001	-0.171	-0.003	0.002	-1.5
INTENT	←	TRU	0.067	0.001	0.122	0.001	0.002	0.5
INTENT	←	IE	0.079	0.002	0.18	-0.005	0.003	-1.66667
INTENT	←	PIIT	0.083	0.002	0.151	0.002	0.003	0.666667
INTENT	←	PBC	0.086	0.002	0.011	0.003	0.003	1
USE	←	INTENT	0.063	0.001	0.576	-0.001	0.002	-0.5

From the table, every absolute value of critical ratio was below 1.96, which means the results from structural model analysis were reliable.

4.7. Key Findings.

After structural model analysis, the study results reveal that most of the factors indeed affect behavioral intention to adopt e-payment in Hanoi and in turn affect actual usage of digital payment.

The factors that influence behavioral intention include perceived ease of use, perceived usefulness, perceived trust, perceived risk, information on e-payment, personal innovativeness in technology. While the others have positive causal relationships with behavioral intention, perceived risk makes people hesitant to use digital payment. The only factor that do not have any statistical significant influence on intention is perceived behavioral control. Therefore, the study accepts hypotheses H1a, H1b, H2a, H2b, H2c, H3a and reject H3b.

Similarly, due to the significant effects of the six aforementioned factors, added with the outcome that behavioral intention is an adequate predictor of actual

usage, intention mediates these effects. In other words, perceived ease of use, perceived usefulness, perceived trust, perceived risk, information on e-payment, and personal innovativeness in technology affect actual digital payment use indirectly through intention. Therefore, the study accepts hypotheses H4a, H4b and rejects H4c.

In terms of factors' strength, perceived ease of use has the most influence on behavioral intention, which is followed by perceived usefulness. This is in accordance with previous research studies in the field. The two factors are fundamental Perceived trust comes third, then goes perceived risk and personal innovativeness in information technology accordingly. Information on e-payment impact intention the least; whereas perceived behavioral control has no significant influence. The path from intention to actual usage has high standardized regression weight estimate ($\gamma = 0.577^{***}$), indicating a strong influence.

With regard to the suitability of the model, there are two important points to note. First, 56.1% of the variance in behavioral intention is explained by the factors. Over 50% is a good indication, since if the number were less than 50%, then it means the majority of the variance in the model is explained by errors or other major factors that were left out (Hair et al., 2010). Second, only 33.3% of the variance in actual usage is explained through behavior intention, which implies that the model could be improved.

Table 4.20 below summarizes the results of hypothesis testing. It includes all the hypothesized relationships, the standardized regression weight of each hypothesized path with significance level, the significance level and the results

Table 4.20: Summary of the results. (Author compilation)

Hypothesized relationship			Standardized Estimate (with p-value)	Accepted
H1a	PEOU	→ INTENT(+)	0.278***	Yes
H1b	PU	→ INTENT(+)	0.223**	Yes

H2a	PR	→	INTENT(-)			-0.158**	Yes
H2b	IE	→	INTENT(+)			0.117*	Yes
H2c	TRU	→	INTENT(+)			0.19*	Yes
H3a	PIIT	→	INTENT(+)			0.144†	Yes
H3b	PBC	→	INTENT(+)			0.017(NS)	No
H4a	PEOU	→	INTENT(+)	→	USE(+)	0.160***	Yes
	PU	→	INTENT(+)	→	USE(+)	0.129***	
H4b	PR	→	INTENT(-)	→	USE(-)	-0.091**	Yes
	TRU	→	INTENT(+)	→	USE(+)	0.110*	
	IE	→	INTENT(+)	→	USE(+)	0.068†	Yes
H4c	PIIT	→	INTENT(+)	→	USE(+)	0.083*	No
	PBC	→	INTENT(+)	→	USE(+)	0.010(NS)	

Significance of Estimates: † $p < 0.100$; * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$; NS not significant

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion of the findings.

Based on the theoretical frameworks laid by previous studies, along with the primary data collected in the month of May 2020, the research has evaluated the relationships between different factors that are perceived by consumers and the decision to use e-payment. The proposed conceptual framework was mostly based on Lin and Nguyen (2011)'s study, with three modifications. It aimed to assess the fitness of the model in the context of Hanoi, Vietnam. The findings shows that:

The analysis of the structural model using SEM provides similar results to previous studies on the effects of different perceived factors (including perceived ease of use, perceived usefulness, perceived trust, perceived risk, information on e-payment, perceived innovativeness in information technology, and perceived behavioral control) on behavioral intention to adopt electronic payment, and finally towards its adoption. There are four conclusions to be made:

- Perceived ease of use, perceived usefulness, perceived trust, information on e-payment, and perceived innovativeness in information technology have positive impacts on the intention to use e-payment in Hanoi.
- On the other hand, perceived risk has a negative influence on the intention to use e-payment in Hanoi.
- Perceived behavioral control has no statistical significant effect on the intention of e-payment in Hanoi.
- Behavioral intention mediates the effect of different perceived factors (including perceived ease of use, perceived usefulness, perceived trust, perceived risk, information on e-payment, perceived innovativeness in information technology) on people's use of e-payment in Hanoi.

In particular, perceived ease of use and perceived usefulness, two traditional factors in the information system field, have the most influence on behavioral intention. Within the two, the stronger indicator is perceived ease of use. Risk, trust, and information on e-payment rank third, fourth, and fifth in regression weight accordingly. Perceived innovativeness in information

technology comes last in predicting the intention to use the technology. With regard to mediation, the six independent predictors above (except perceived behavioral control) do affect e-payment use indirectly through behavioral intention.

Therefore, the implication here is that, in order to attract more people in Hanoi to use e-payment, businesses as well as the state need to focus on promoting e-payment systems' ease of use and their usefulness. Moreover, they should provide information on the safety of the systems, appeal and make consumers trust the method of payment more. At the same time, the consumers should be eased of any troubles they have faced while experiencing e-payment.

5.2. Contributions of the study.

The main purpose of the research was to develop a model that can show a better understanding of what really affects people's acceptance of digital payment. After being conducted, the study has provided insights into several different factors, adding to the established understanding of technology adoption in general, and e-payment systems in particular which has not yet been thoroughly explored in Hanoi, Vietnam. In addition to real life implications, it has significant contributions regarding theory and research methodology as follows:

First, the thesis has shown a critical analysis of different conceptual models of technology acceptance. To test out the proposed conceptual framework and hence accomplish the objectives of this study, the researcher reviewed several different frameworks and chose a modified TAM approach to follow and formulate different constructs due to its explanatory power and popularity in the IS field (refers to section 2.4). Even though the model does predict the adoption rate of technology, there have been some criticisms, in particular regarding its ability to explain usage comprehensively and fully (Bagozzi, 2007). This study concurs with the others, since the model could only explain 33% of the variance in e-payment adoption in Hanoi. Besides, the thesis also contributes in the design of future technology acceptance model in the way of suggesting to remove redundant factors that has no statistical significant influence such as perceived behavioral control.

Secondly, the study confirms that TAM is applicable to e-payment acceptance in Hanoi, a major city from a developing country. Teo, Luan and Sing (2008) criticize that TAM has not been widely tested within developing countries and emphasize that more effort should be focused on testing TAM in different cultures. This also helps to reduce the bias between TAM tested in developed nations and developing ones.

Finally, the thesis contributes to the development and assessment of the validity and reliability of a scale (survey instrument). As stated above, the constructs and items used in the research have been drawn from previous literature which were designed and applied mostly in western contexts. This calls the attention to the validity and reliability of the constructs and their items (measurement scales) in different cultural settings. The results show that an indicator (pu_5) had to be deleted due to low factor loading and thus implies that measures to ensure convergent validity are needed were a scale is to be replicated in different studies. Therefore, the study suggests a comprehensive three-step analysis (EFA, CFA, and SEM) to ensure that any modification is valid and reliable when a study adopts the constructs' items from several contexts and applies them in field research.

5.3. Limitations of the study and future research direction.

The findings of this research are helpful for policymakers, payment service providers, and businesses that want to increase the use of e-payment in the population as they are based on a range of theoretical frameworks and include a decent sample size (N=250). Yet, they are subject to limitations, nonetheless. There are three particular weaknesses which need to be addressed.

First, the study sample may possess potential biases from the convenience sampling method. Most of the participants (74.5%) are young people from 20 to 29 years of age, who are highly educated and often use the Internet. Therefore, it might not represent what the general population perceive regarding the technology related to digital payment. In addition, 85.3% of the subjects are female. For the different segments of people, the assumption of homogeneity must be made to

discover the general feeling toward e-payment. Further empirical studies should seek out peole from different background to increase the generalizability of the study. For example, questionnaire could be distributed offline, at public places such as banks, markets, supermarkets, and so on. Due to physical limitation, this study was conducted over the Internet only.

Second, the proposed conceptual model has focused on extending the modified TAM by Lin and Nguyen (2011) with three modifications only (treat PIIT as an exogeneous factor instead of moderator, separate trust and risk as two constructs, and add perceived behavioral control as another independent factor). Therefore, the power of demographic moderators (UTAUT model) or factors from a more complex model (extended TAM, please refer to figure 2.3) were not accounted in the study. Therefore, future follow-up researches should focus on a more complex framework. The researcher in this study decided to run a simple mediation framework because it is more suitable at undergraduate level.

Finally, the squared multiple correlation (R-squared) of e-payment use is relative (0.33), which means the only 33% of the variance in the model is explained in the variable. That being said, further studies are required to examine the different paths from different exogeneous variables to e-payment use to achieve a better model.

5.4. Practical implications.

The study has practical implications for the government, banks, and merchants. First of all, from the model, it is clear that there are six factors that affect a consumers' intention to use e-payment. To increase the use of digital payment, it is crucial to consider the effects that each factor has on adoption.

In terms of motivation group (PEOU and PU), the results shows that they affect behavioral intention the most. Therefore, it is believed that people who find the system useful and easy to use are more likely to use digital payment. The researcher suggests that promotion of digital payment's usefulness and ease of use are necessary for people with little or no exposure to the payment systems themselves. Like it or not, people will develop their own opinion of using e-payment with or without being exposed to it since e-payment is so prevalent now

as stated in chapter 2. Therefore, in order to attract more users of e-payment, there should be campaigns as well as trials for people to experience with different e-payment systems and let them form positive opinion instead. In addition, e-payment service providers should keep improving their user interface (UI) as well as user experience (UX) that can fit the consumers' needs.

As for the uncertainty group (TRU, PR, and IE), the results shows due concern for these factors. It must be assured that e-payment systems are able to perform financial transactions securely and efficiently in a timely manner. No matter how much digital payment's usefulness and ease of use are promoted, if consumers perceive there is an incapability in the providers, they will not use it. This requires e-payment provider to be always transparent and helpful with their customers. In addition, it implies the major role of the state in regulating different e-payment services to make sure that the reputation of the whole system is not tainted by a few wrongdoing cases.

Concerning character group, it is unlikely that any action from the state, electronic financial service providers, and businesses regarding PIIT will affect the adoption rate, since it is endogenous trait. The only thing that they could do is to provide people as much exposure to the systems as possible. With trials and promotion (such as free-of-charge credit card), consumers would have more positive experience and use more e-payment if they are perceived to have high innovativeness in information technology.

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