

An empirical study on the factors affecting on the consumer behavior of intention to adopt Mobile Payment in Hong Kong

Zhenhua Xu¹, Khunanan Sukpasjaroen² and Thitinan Chankoson^{3,*}

^{1,2} Chakrabongse Bhuvanarth International Institute for Interdisciplinary Studies (CBIS),
Rajamangala University of Technology Tawan-OK, Thailand

^{3*} Faculty of Business Administration for Society, Srinakharinwirot University, Thailand

*Corresponding author

Abstract.

The global epidemic caused by Covid-19 is the most widespread in a century. Regarding this issue, every country in the globe is doing all possible to fight the outbreak. In 2015, the Hong Kong Monetary Authority issued its first mobile payment license, and 16 Hong Kong institutions have since become licensees for value-saving payment instruments. The rapid growth of mobile payments, especially in the two years since the covid-19 epidemic, has led Hong Kong citizens to switch to contactless mobile payment methods by cash and credit cards. The goal of this research is to study the current situation of Hong Kong consumers' intentional usage of mobile payments and to identify elements affecting consumers' intentional use of mobile payments in Hong Kong. This extensive research and development survey collected data from 400 respondents who had used mobile payment technologies in Hong Kong using questionnaires, and the questionnaires were analyzed using the UTAUT model. The results showed that facilitating conditions have the greatest impact on consumers' mobile payment user behavior, merchants of mobile payment tools can promote mobile payment behavior by improving the hardware and software environment in which consumers live and work. Increased awareness and guidance to groups with low usage of mobile payment tools can quickly increase the use of mobile payment tools.

Keywords: COVID-19, Mobile payment, User behavior, UTAUT model, Hong Kong

¹ Zhenhua Xu, Email: xu-zh@hotmail.com

² Khunanan Sukpasjaroen, Email: hokchicago@hotmail.com

^{3*} Thitinan Chankoson, Corresponding author Email: thitinanc@g.swu.ac.th

1. Introduction

1.1 Background

Since 2019, COVID-19 has been widely spread around the world, and more and more people are worried about this rapidly spreading disease. (Auer, Cornelli, & Frost, 2020) study tells us that after COVID-19 began to spread, the keyword search of the paper money transmitted virus in the search engine increased rapidly. While no confirmed cases of COVID-19 infection have been definitively confirmed through paper money transmission, there is an increased risk of transmission through paper money, credit card transactions, and the use of PIN codes. Online shopping and contactless mobile payment are becoming more and more popular.

According to the Global Payments Report 2021 (Worldpay from FIS, 2021) released by Worldpay, a leading financial services payment service provider FIS, more Hong Kong consumers will shop online as a result of the COVID-19, while the use of cash in physical stores has dropped sharply. Although credit cards are still the most popular method of paying for online purchases, the report says electronic wallets are expected to replace credit cards by 2024. In terms of in-store spending, cash transactions in Hong Kong accounted for 9% of in-store spending this year and are expected to account for only 1.6% of in-store spending in 2024, with a year-on-year decline of 17%. Rapid electronic payment transfer has become more popular amid the epidemic, with Hong Kong's rapid transaction volume reaching 149.217 billion yuan in September 2020. During the COVID-19 epidemic, instant transaction volume in Hong Kong and China increased by 115% year on year, and transaction value increased by 124% in mainland China. The average daily turnover of Hong Kong's FPS system during the study period reached 163,149, while the average daily turnover exceeded 2.63 billion yuan. The average daily transaction volume in mainland China was 38.3m and the average daily transaction volume was Rmb303.5bn. Six countries, including Bahrain (657%), Ghana (488%), the Philippines (309%), Australia (214%), India (213%) and Poland (208%), saw their real-time payment transactions double or more in the past year, according to the report.

According to information from the Hong Kong Monetary Authority (Register of SVF Licensees, 2021), Hong Kong started issuing the first batch of licenses for stored value payment vehicles, or mobile payments, in August 2016, and as of May 5, 2020, a total of 18 licenses for stored value payment vehicles had been issued. At present, Hong Kong has not only the electronic wallet developed by local operators, but also the Hong Kong version of Alipay, Hong Kong version of WeChat payment, Hong Kong and Macao UnionPay cloud flash payment APP developed in cooperation with mainland operators, and mobile payment tools developed by international operators, such as Apple Pay. Now, international mobile payments such as Apple Pay and Google Pay have created competitive pressure on Octopus and cash payments in Hong Kong. The Hong Kong version of Alipay, which has its origin in the mainland, it is now widely used by individual users and merchants in Hong Kong. WeChat Pay has established cooperation with all 7-11 stores in Hong Kong. The merchant network covers clothing, food, housing, entertainment, public utilities, living payment and so on...

According to Qi Cong's (qi, 2021) research results, although mobile payment has many advantages and the penetration rate of mobile devices is high, the usage rate of mobile payment is very low. With the rapid development of mobile payment, especially in the two years of

COVID-19 pandemic, Hong Kong citizens began to switch to contactless mobile payment methods. Through the research, we hope to understand more clearly what factors affect citizens' choice of mobile payment methods.

1.2 Scope and purpose of the study

The objective of research is to study the current situation of Hong Kong consumers' intentional usage of mobile payments and to identify elements affecting consumers' intentional use of mobile payments in Hong Kong.

1.3 Study limitations

Through the research on the current situation of consumers' intentional adoption of mobile payment in Hong Kong and the influencing factors of consumers' intentional adoption of mobile payment in Hong Kong, it can be seen that the following restrictions need to be paid attention to:

1. Limited research area, budget and time; Data collection is only to collect visitors through the Internet, and the scope of the collection is also limited to the respondents who access the Internet. This undermines the accuracy of the study and is not representative of the actual attitudes of Hong Kong consumers as a whole, including retirees who have little or no access to the Internet.

2. The sample groups come from different backgrounds, which may have an impact on the questionnaire. Some people understand the questionnaire, others need more explanation. All of these may affect the accuracy of the answers given.

2 Literature review

The literature review provides information on relevant factors that other studies have found in their studies. Although there are some researches before can provide relatively model to support this study or research, but the sudden arrival of a global pandemic covid-19, changed the way people accustomed to the original before, in order to adapt to the new market environment, people in the choice of mobile payment than covid-19 pandemic disease before also had the new change. In order to provide preliminary data for the design of the research framework, key concepts of the research methodology and research theory need to be described as follows:

2.1 COVID-19 situation in Hong Kong

As the most densely populated region in the world, Hong Kong has a local population of 7.45 million. Faced with this novel coronavirus, which has a rapid spread, it is vulnerable to the outbreak of large-scale virus transmission (Zhang, et al., 2021). Since 31 December 2019, the Centre for Health Protection (CHP) of the Department of Health has recorded a total of 12,431 cases of COVID-19 as at 29 November 2021 (HKCHP, 2021).

2.2 Mobile payments in Hong Kong

The HKMA regulates stored value payment instruments under the Payment Systems and Stored Value Payment Instruments Ordinance (Cap. 584) (the Payment Systems and Stored Value Facilities Ordinance, 2021), which came into force on 13 November 2015. The Ordinance covers physical stored value payment instruments, such as stored value Octopus cards and prepaid cards, as well as electronic stored value payment instruments including e-wallets.

An article on the website of Hong Kong's Legislative Council explains: An e-wallet or digital/mobile wallet is a payment tool that allows users to make purchases online and/or in physical stores with a smartphone or computer. Users can add value to e-wallets through debit cards/credit cards, bank accounts and/or other designated channels (YU, 2018).

2.3 Unified Theory of Acceptance and Use of Technology, UTAUT

The Unified Theory of Acceptance and Use of Technology was proposed by Viswanath et al (Venkatesh , Morris, Davis, & Davis, 2003). UTAUT(Fig. 1) shows that the direct determinants of behavioral intention and final behavior include four core structures, namely, performance expectation, effort expectation, social influence and facilitation conditions, which in turn are affected by gender, age, experience and voluntariness of use (Venkatesh , Morris, Davis, & Davis, 2003).This model is based on The Theory of reasoned action (TRA), The technology acceptance model (TAM), Motivational model (MM), Theory of Planning Behavior (TPB), combilized TAM and TPB (C -TAM-TPB), and model of PC Based on eight theoretical models, including Utilization (MPCU), Innovation Diffusion Theory(IDT) and Social Cognitive Theory(SCT), a comprehensive model is formed by integrating major factors.

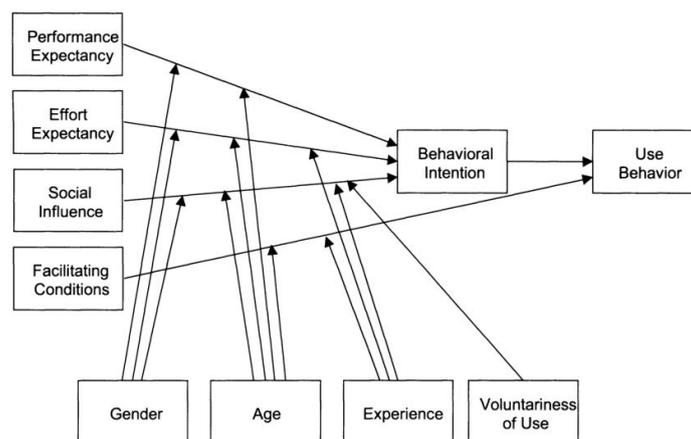


Fig. 1: UTAUT (Venkatesh , Morris, Davis, & Davis, 2003)

According to the UTAUT model, variables include: performance expectation, effort expectation, community influence, convenience, behavioral intention, user behavior, gender, age, experience, and voluntary use.

3 Research methodology

In this study, quantitative research method will be adopted to promote the research, and first-hand information will be collected through questionnaire survey. This study used a closed self-filled questionnaire.

3.1 Research architecture and assumptions

UTAUT models have been used to understand user behavior in various information technology domains, such as learning management system under COVID-19 (Raza, Qazi, Khan, & Salam, 2021), course management software system (Marchewka & Kostiwa, 2021), mobile banking (Baptista & Oliveira, 2015), mobile payments (Ibrahim & Siddiqui, 2021), etc. The researchers (William, Rana, & Dwivedi, 2015) re-examined the UTAUT model and provided some useful insights for researchers and practitioners. For the application of the UTAUT model, the above researchers adopted the assumptions of the original UTAUT model developed by Venkatesh et al (Venkatesh, Morris, Davis, & Davis, 2003). In this research, we also analyze the four main variables in the original UTAUT model (Performance Expected, Effort Expected, Social Influence and Facilitating Conditions). In addition, there are four interfering variables that play an indirect role, namely gender, age, experience and voluntariness of use.

Operational definition of variables and problem assumptions

Performance Expectations (PE): the performance expectation rate is defined as an individual's perception of the use of the information system, which contributes to task completion and job performance (Venkatesh, Morris, Davis, & Davis, 2003). Especially during the COVID-19 pandemic, mobile payments allow users to conduct transactions in a contactless manner, while users are more concerned about payment efficiency and accuracy. As a result, users will choose mobile payment methods over traditional payment methods when they see them as a useful way to complete a transaction during a pandemic. Therefore, this paper proposes the following hypotheses.

Hypothesis 1. Performance expectations have a positive effect on behavioral intention to adopt mobile payments during the COVID-19 pandemic.

Effort Expectation (EE): according to UTAUT, effort expectations are referred to as "ease associated with the use of the system" (Venkatesh, Morris, Davis, & Davis, 2003). In Yu's (Yu, 2012) study on factors that influence individuals' use of mobile banking based on UTAUT model, three structures of performance expectation, effort expectation and social influence were adopted to respectively discuss factors that affect individuals' willingness to accept mobile technology and data services. Both studies support efforts to expect a significant impact on human willingness to use mobile technology or services. Therefore, based on UTAUT, the following hypotheses are proposed in this study:

Hypothesis 2. Efforts to expect a positive impact on behavioral intent to adopt mobile payments during the COVID-19 pandemic.

Social Influence (SI): in the UTAUT model, social influence is defined as "the extent to which an individual perceives that significant other believe that he or she should use the new

system” (Venkatesh, Morris, Davis, & Davis, 2003). Especially during the COVID-19 pandemic, the uncertainty of everyone about what is happening around them makes people more dependent on the advice of their important stakeholders to adjust their decisions and actions. In addition, social influence, as a determinant of user attitudes, significantly influences users' perception of multiple benefits of using mobile payment services (Zhao & Bacao, 2021). Therefore, this paper proposes the following relevant hypotheses.

Hypothesis 3. Social influence has a positive effect on behavioral intention to adopt mobile payments during the COVID-19 epidemic.

Facilitating Conditions (FC): convenience is defined as the degree to which an individual believes that the organizational and technical infrastructure to support the use of the system exists. This definition encompasses concepts embodied in three different constructs: perceptual behavioral control, facilitation conditions, and compatibility (Yu, 2012). Each of these structures is operable and encompasses various aspects of the technical and/or organizational environment, designed to remove barriers to use. The compatibility structure from IDT includes projects that explore the suitability between an individual's work style and the use of the system in an organization (Venkatesh, Morris, Davis, & Davis, 2003). Therefore, this paper puts forward the following relevant hypotheses.

Hypothesis 4. Convenience has a positive effect on mobile payment adoption behavior during the COVID-19 epidemic.

Behavioral Intention (BI): in the UTAUT model study, think and proves that the behavior intention of technology use have a significant effect (Venkatesh , Morris, Davis, & Davis, 2003) .in yu's (Yu, 2012) study, mentioned in view of the enterprise (that is, the bank's ultimate goal is to attract consumers use bank service, rather than using service will, extensive research examines the relationship between behavior intention and actual use. There must be a relationship between the intention of the action and the use of the action. In view of the behavioral intentions of users during the COVID-19 pandemic in our study, we made the following hypotheses regarding user behaviors:

Hypothesis 5. Behavioral intention has a positive effect on mobile payment adoption behavior during the COVID-19 epidemic.

3.2 Data collection and questionnaire design

To verify the hypothesis proposed in the study and facilitate the issuing and recycling of the questionnaire, online questionnaire survey and recycling were conducted through the Facebook group, WhatsApp group and WeChat group. In the process of questionnaire design, variables in the UTAUT model include: Performance Expectancy(PE), Effort Expectancy(EE), Social Influence(SI), Facilitating Conditions(FC), Behavioral Intention(BI), user behavior(UB), gender, age, experience, and voluntary use. The questionnaire consists of two parts: the first part includes gender, age, mobile payment experience. The second part is developed through conditions derived from previous assumptions and consists of 20 measurement items as indicators to account for Performance Expectancy (PE), Effort Expectancy (EE), Social influence (SI), Facilitating Conditions (FC), behavioral intention (BI) and user behavior (UB). For this study an online questionnaire is used to fulfill the objective of getting data from large

irradiation population. Five points "Likert Scale (Boone & Boone, 2012)" is used for getting responses where Strongly Agree with is Given value 5, Agree is 4, Neutral is 3, Disagree is 2 and Strongly Disagree is 1 (Asghar & Usman, 2013). To achieve, divide by the measurement range of each variable the calculate formular is $(5-1)/5 = 0.8$. An average score between 5.00 and 4.21 is considered a strong agreement, 4.20-3.41 is considered consent, 3.40-2.61 is considered neutral, 2.60-1.81 Deemed to disagree, 1.80-1.00 is considered a strong disagreement. In order to calculate the sample size of the study, the Random

sample size of the study on mobile payment tool users in Hong Kong was calculated according to the Yamane formula (Israe, 1992) as follows: The sample size was 400 respondents using mobile payment tools in Hong Kong.

3.3 Data analysis

Identify the factors that influence consumers' willingness to use mobile payments in Hong Kong. Quantitative analysis was carried out through questionnaire survey data. After collecting and inputting the data, SPSS data analysis software was used to test the reliability of the data and the consistency level of each factor using reliability analysis, descriptive statistics. Kaiser-meyer-olkin(KMO) and Bartlett's tests were used to test the structural relationship among independent variables. Through correlation analysis and linear regression analysis, the correlation and influence relationship between independent variables FE, EE, SI and BI, as well as the correlation and influence between BI, FC and UB were analyzed. Analysis of variance (full name: one-way analysis of variance) was used to study the influence relationship of men, women and people of different ages on UB in gender.

4 Data analysis and results

This chapter analysis of Hong Kong mobile payment in Hong Kong and the preliminary research data obtained from the questionnaire designed through the conceptual framework, and tests the hypotheses of the research in the paper.

4.1 Respondent description

In the questionnaire feedback collected this time, more than 50 percent of the gender sample chose "female". A further 49.75% of the sample was male. The ratio of male and female is close to 50% of the total; In age, more than 44.25% of the samples choose "18 to 35 years old". In addition, 34.25% of the samples were from 36 to 65 years old, and 21.5% were from 17 years old and below. In terms of use distribution, all the samples are "used", 400.0 in total, accounting for 100.00%. As the objects of this survey are Hong Kong citizens who have used mobile payment tools, all the collected questionnaires are valid. According to The Average Frequency of Use of Mobile Payments, 47.5% of The samples are "used every day". A further 35.25% of the samples were "used two to three times a week". "Once a week" accounted for 11.5% of the sample, "once a month" for 4.75%, and "once a year" for 1%.

4.2 Linear regression analysis

4.2.1 Linear regression analysis of PE,EE,SI and BI

Table 4.2.1: Parameter Estimates (n=400)

	Unstandardized Coefficients		Standardized Coefficients		t	p	V IF	R ²	Adj R ²	F
	B	Std. Error	Beta							
Constant	0.589	0.177	-		3.329	0.001***	-			
PE	0.204	0.050	0.184		4.112	0.000***	1.756	0.547	0.544	F (3,396)=159.481,p=0.000
EE	0.294	0.042	0.295		6.996	0.000***	1.559			
SI	0.375	0.042	0.396		8.982	0.000***	1.701			

Dependent Variable: BI

D-W: 1.900

* p<0.1 ** p<0.05 *** p<0.01 **** p<0.001

Analysis in Table 4.2.1 shows that: The regression coefficient of PE was 0.204(t=4.112, P =0.000<0.01), the regression coefficient of EE was 0.294(t=6.996, P =0.000< 0.01), the regression coefficient of SI was 0.375(t=8.982, P =0.000<0.01), indicating that PE, EE and SI have a significant positive influence on BI.

4.2.2 Linear regression analysis of FC, BI and UB

Table 4.2.2: Parameter Estimates (n=400)

	Unstandardized Coefficients		Standardized Coefficients		t	p	V IF	R ²	Adj R ²	F
	B	Std. Error	Beta							
Constant	1.938	0.258	-		7.512	0.000***	0.179	0.175		F (2,397)=43.390,p=0.000

Table 4.2.2: Parameter Estimates (n=400)

	Unstandardized		Standardized	t	p	V	R	Adj	F
	Coefficients	Coefficients	Coefficients						
	B	Std. Error	Beta			IF	²	R ²	
FC	0.325	0.079	0.279	4.088	0.000***	2.248			
BI	0.223	0.088	0.173	2.537	0.012*	2.248			

Dependent Variable: UB

D-W: 1.732

* p<0.1 ** p<0.05 *** p<0.01 **** p<0.001

Analysis in Table 4.2.2 shows that: The regression coefficient of FC was 0.325(t=4.088, P =0.000< 0.01), the regression coefficient of BI was 0.223(t=2.537, P =0.012< 0.05) indicates that both FC and BI have a significant positive influence on UB.

4.3 ANOVA of age, gender and UB

4.3.1 ANOVA of age and UB

Table 4.3.1: ANOVA

age (Mean±Std. Deviation)	UB
17 years old and below (n=86)	3.78±1.16
18 to 35 years old (n=177)	4.45±0.75
36 to 65 years old (n=137)	4.23±0.81
F	16.992
p	0.000****

* p<0.1 ** p<0.05 *** p<0.01 **** p<0.001

As can be seen from Table 4.3.1:Age showed a 0.01 level of significance in UB (F=16.992, p=0.000), and specific differences showed that the mean scores of the groups with significant differences were "18 to 35 years old >17 years old and below; 36 to 65 years old >17 years old

and below; 18 to 35 years old > 36 to 65 years old ".In conclusion, different age samples show significant differences for all UB samples.

4.3.2 ANOVA of gender and UB

Table 4.3.2: ANOVA

gender (Mean±Std. Deviation)	UB
male(n=199)	4.38±0.84
female(n=201)	4.08±0.95
<i>F</i> □	11.449
<i>p</i> □	0.001****

* $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$ **** $p < 0.001$

As can be seen from Table 4.3.2, Gender showed a 0.01 level of significance for UB ($F=11.449$, $P=0.001$), and the average gender of males (4.38) was significantly higher than that of females (4.08).In conclusion, all the gender samples showed significant differences on UB

5 Conclusion and recommendation

The conclusion is based on the research objective of this study, the UTAUT theory analysis method are used to study the current situation of consumers' intention to use mobile payment in Hong Kong and the factors influencing consumers' intention to use mobile payment in Hong Kong. After analyzing the data and results of chapter 4, this article further summarizes and discusses the discussion, conclusions and recommendations of the study.

5.1 Hypothesis verification results and discussion

The hypothesis verification results are shown in Table 5.1. All the hypotheses are validated

Table 5.1 Hypothesis Verification

Hypothesis	The verification results
Hypothesis 1. Performance expectations have a positive effect on behavioral intention to adopt mobile payments during the COVID-19 pandemic.	The results established
Hypothesis 2. Efforts to expect a positive impact on behavioral intent to adopt mobile payments during the COVID-19 pandemic.	The results established
Hypothesis 3. Social influence has a positive effect on behavioral intention to adopt mobile payments during the COVID-19 epidemic.	The results established
Hypothesis 4. Convenience has a positive effect on mobile payment adoption behavior during the COVID-19 epidemic.	The results established
Hypothesis 5. Behavioral intention has a positive effect on mobile payment adoption behavior during the COVID-19 epidemic.	The results established

At the same time, the influence of gender and age on UB was analyzed, and the results were the different gender samples show significant differences on UB, and the average value of men is higher than that of women. The results indicate that men are more willing to use mobile payment than women.

In conclusion, different age samples show significant differences for all UB samples. The comparison of average scores of different groups was as follows: "18 to 35 years old >Age 17 and below; 36 to 65 years old >Age 17 and below; 18 to 35 years old>36 to 65 years old ". The age of 18 to 35 years old categories, the highest for the use of mobile payment will explain in society has been work young people are the main force of the use of mobile payment tool, and as a haven't stable income 17 years old and below categories, in with the increase of age, will also become the main users of mobile payment.

5.2 Conclusion

This study examines the factors contributing to consumers' willingness to use mobile payments in Hong Kong. According to the analysis in chapter 4, the respondents studied the influencing factors of PE, EE, SI, FC and BI in using mobile payment in Hong Kong. In addition, the influence of gender and age on UB is also analyzed. This is a quantitative study, which mainly conducts research on Hong Kong residents who have used mobile payment on the Internet, and adopts the method of questionnaire survey to collect the data of respondents' feedback. In the data collection, a total of 400 valid questionnaires were collected.

In view of the research results and conclusion: in mobile payments are the main factors causing the UB, FE, EE, SI for BI are positive influence, the SI for the influence of the BI is the largest, followed by EE and PE, and the result shows, the user's BI are particularly important people around you, such as relatives and friends, etc.

Among the influences of FC and BI on UB, FC has a greater impact on UB than BI. Therefore, FC has the greatest impact on the final use of mobile payment tools, that is, the conditions that users can meet to use mobile payment have the greatest impact on the use behavior of mobile payment.

Therefore, if consumers want to rapidly increase their use behavior of mobile payment tools, Merchants of mobile payment tools can facilitate mobile payment behavior by improving the hardware and software environments in which consumers live and work. Consumers can easily use mobile payment tools at any time. At the same time, the results show that the men more than women for the use of mobile payment behavior, at the same time, 17 years old and under age group of consumers is used in this research consumers at the lowest frequency, so the increase in women under the age of 17 and the promotion of mobile payment tool users, can be rapidly increased their use of mobile payment tool.

5.3 Suggestions for future research

1. Future research should cover all consumers, including retired people over the age of 65. This requires that the Internet is not the only way to collect questionnaires when conducting research.

2. There should be more studies of different variables, the impact of different variables on the final results and the economic and political environment or other variables related.

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