Use Intention of Mobile Fingerprint Payment between UTAUT and DOI in China

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Abstract

Purpose – With the rapid growth of Chinese mobile pay market, it's necessary to run a study of the aims why users prefer to intention of use for mobile fingerprint payment. To reach this goal, UTAUT added Perceived Security and DOI.
Research design, data, and methodology – The researchers conducted this study by using collected 3126 responses and the collected data was analyzed by applying statistical techniques factor analysis, AMOS, and Cronbach's Alpha and SPSS 22.0.
Results – The result shows that compatibility and relative advantage of mobile fingerprint payment have positive effect on performance expectancy and effort expectancy separately, and the performance expectancy and effort expectancy have positive effect on people's use intention of mobile fingerprint payment. Social influence has a positive effect on the users' use intention of mobile fingerprint payment, Facilitating conditions has a slight effect on the users' use intention of mobile fingerprint payment, Perceived security has the most significant effect on he users' use intention of mobile fingerprint payment.
Conclusions – The research showed that compatibility is one of the most important elements that make users continue to use the product. The mobile fingerprint payment must own clearer advantages than other ones that it can reach the biggest market. The Social Influence has a positive influence on the intention of use.

Keywords: UTAUT, DOI, Mobile Fingerprint Payment.

JEL Classifications: M10, M15, M16.

1. Introduction

The mobile internet era is convenient for consumption, so more users are looking forward to making easier and safer payment experience while using mobile payment. This situation has been changing people's lifestyles(Suh, 2015; Wu & Lee, 2016; Kim & Kim, 2017). However, people are concerned about the security of mobile payment, traditional numeral password could be copied and saved easily, and even the computer could be invaded and the information would be stolen easily, which made mobile payment dangerous(Kim et al., 2011). Moreover, the huge amount of numeral passwords has brought users too many troubles because people have a trouble in remembering tons of different complex passwords(Jung & Kim, 2016). With the development of mobile internet, the biological recognition-

mobile fingerprint payment will effectively improve the efficiency and security of payment, which will become a new mode of payment in the future. This study's aim is to investigate the effective factors of people's use intention of this new payment mode-mobile fingerprint payment, so that a better service to users and better practical guide of the development of this payment can be provided. Compared with PC nowadays, smartphones and the related mobile communication are better-developed, they can be used with less limitation on space and time, especially the mobile pay service, which is more convenient to deal with the business in daily life(Lee & Suh, 2012; Lee & Dae, 2014). But as for the situation where open wireless network is taking the place of closed cable network, people are taking more risks when they are using the former one, like wiretapping, monitoring, revealing of personal information, and forgery(Sohn & Liu, 2015; Rouibah et al., 2016; Miao & Jayakar, 2016). Since 2010, the sales volume of smartphones worldwide is more than that of personal computers, and the website design in mobile environment is preferred(DCCI, 2011). People who use smartphones via mobile can get as good service as cable network. Among

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all the services that people want, smart business is the most essential(Chun & Park, 2015; Yang & Kim, 2015). Moreover, As more and more people are using, the sales strategy of smartphones is getting more attention(Oh & Lee, 2012; Liu, 2015; Lee & Dai, 2015). According to the data from CNNIC, in 2015, there were 688 million people using internet, among which, there were 620 million people were using wireless network. Until 2017, the number of net users will be 850 million, and the number of net users that are using mobile devices will be 750 million(CNNIC, 2016). Which means, as predicted, in the year 2016 to 2017, the amount of mobile net users will be more than half of China's population(CNNIC, 2016).

Recently, as people pay more and more attention to mobile network industry, their attention on mobile payment is getting more and more as well. Mobile Payment makes the pay process both easier and more convenient(Guo et al., 2010). What's the most important is the improvement of sales through mobile payment(Baghdadi, 2013). According to the "China's third-party payment market survey report" released by iResearch in China, people paid 1.220 trillion by third-party mobile payment in 2013, the number was increased by 707.0% than the same period of time in 2012. In 2014, people paid 6 trillion by third-party mobile payment, the number was increased by 391.3% than the same period of time in 2013(iResearch, 2016). In 2015, people paid 9.31 trillion by third-party mobile payment, the number is increased by 57.3% comparing to the same period of time in 2014. The growth rate is rapidly increasing(iResearch, 2016).

The mobile payments are developing rapidly and the forms of hotspot are various, there are some problems coming along, one is the weak structure of mobile devices and the threat of external security system problem (Karnouskos & Vilmos, 2004). In 2012, Google released a smartphone pay service called "Google Wallet", which was found that even if the personal information has been deleted, those information would still be remained in Host OS, and the personal information has been used maliciously, with several cases like that happened, they finally stopped that system. In China, during the first three months in 2014, there were 150 thousand smartphones were detected that they've been invaded by virus, which destroyed the economic conditions of 43 million people(Kim, 2014).

The present network computing device is based on the routers of cable network users, only certificated users are able to use in closed spaces(Lee & Ahn, 2009; Chakchai et al., 2016). However, since there's a huge amount of people are using smartphones, compared with wired LAN, the mobile devices based on the activity of wireless network are still working with monitoring and forgery(Seo et al., 2016). Because the mobile devices are portable, uncertificated users can use that easily(Au & Kauffman, 2008). Therefore, the security of data and the authentication technology of certificated users are the most essential.

The two-factor authentication technology in common systems is knowledge-based and possession-based authentication. Knowledge-based authentication means PIN (Personal Identity Number), while possession-based authentication refers to the tangible or intangible stuff like an ID card that can prove someone's identity. But the disadvantage of the present PIN or security code is that the storage device in portable mobile devices has a lower level of defense against external attack.

Biometrics technology can identify the person according to his related information and some individual features(Rivera et al., 2010), plus, the identification system will identify a person by approaching to a part of one's body through RFID without portable mobile device, which is simple and easy(Hosseini & Shahriar, 2012).

Biometrics technology is possession-based, it makes use of people's natural features that cannot be copied or stolen by someone else(Wu et al., 2015). Since a part of people's body is the identification basis, people need not to carry other identification devices(Liu et al., 2015). So, it's an easy step that can be finished with people themselves(Derawi, 2010).

Biometric fingerprint reader is the identification technology that will be used in the high-security places like laboratories and military bases(Chuang & Chen, 2014). Nowadays, the mobile devices are installed with biometric fingerprint reader to make sure that the smartphone is safe to use.

With the widely use of high-performance smartphones, the ability to use facial recognition, fingerprint reader and sound identification technology, there are some commercial product that will use smart phones sensors(Hosseini & Shahriar, 2012).

Fingerprint identification technology is the most fundamental biometrics, it's convenient, and people don't refuse doing it, so it's a pretty widely-used technology(Eom & Jeon, 2011; Sadhya & Singh, 2016). Fingerprint identification system is one of the Biometric System, in essence, it compares the result with the presetting of one's natural features to identify accurately(Chuang & Chen, 2014). Among all the biometric information, fingerprint is the most convenient, easiest and the cheapest one, therefore, it's widely used in all different kinds of areas in daily life(Lee, 2012; Ohana et al., 2013). Through this kind of biometric identification technology, since the natural personal information cannot be conveyed or changed or stole, people will be able to know whether the security system has been invaded or not, it also has functions like tracing and auditing, which is one of its advantages(Ohana et al., 2013). Fingerprint identification system works like this, after it gets an individual's fingerprint, it'll get a sample from the fingerprint database, and compare that with the presetting model. The Biometric Technology works in register-certificate-identify mode. This kind of fingerprint identification system has the best performance in recognition time and accuracy.

In 2013, iphone company added fingerprint identification

system into their smartphones, which made it safer to use smartphones in public places. The fingerprint identification system was initially used to unlock the phone, with the rapid development of communication technology, the fingerprint identification system started to be used in mobile computing process. In July, 2014, Alipay and Samsung co-released Fingerprint Pay service, when people are using Samsung S5 Smartphone or Alipay for mobile payment, people can put their fingers on the HOME key(the fingerprint sensor) instead of inputting security code to pay online. The combination of fingerprint identification function and mobile payment is more convenient and safer, which also innovated Mobile payment mode. The mobile payment with fingerprint identification function is a new mode of mobile pay mode, which can be called Mobile Fingerprint Payment.

The present pay service improved the disadvantages of traditional payments, and is turning to mobile pay service (Manvi et al., 2009; Lee et al., 2011). With the rapid development of ICT technology, it's easier for users to accept the mobile pay service that's more convenient and safer(Schierz et al., 2010). Though it's safer than the traditional payment, users are still worried about the security problem(Dahlberg & Mallat, 2002; Min & Ko, 2005; Park & Lee, 2014; Martins et al., 2014; Yang et al., 2015; Kerviler et al., 2016). It has a higher risk of theft when using the traditional payment with numeral security code(Yang et al., 2015; Martins et al., 2014; Kerviler et al., 2016). And because of the diversity of numeral security code, it caused people a lot of trouble, while the Fingerprint Payment provides high security and convenience.

There are many researchers about the mobile computing related study of Chinese mobile Payment, but there are not so many researches about the mobile fingerprint payment, especially the research of the analysis of examples of mobile payment. With the rapid growth of Chinese mobile pay market, it's necessary to run a study of the aims why users prefer to intention of use for mobile fingerprint payment. To reach this goal, UTAUT(Unified Theory of Acceptance and Use of technology) added Perceived Security and set Compatibility and Relative Advantage of DOI(Diffusion of Innovation).

This study consists of five parts, this chapter is the first chapter. The second chapter is about the related theory study of mobile fingerprint payment, UTAUT and DOI model. The third chapter is the study model and study assumption based on theoretical backgrounds. The fourth chapter is the analysis methods of the study assumption, the implementation of related examples and the result of the research. At last, the thesis will end up with the conclusion, practical implications, study limitation and the research prospect based on the researches' results.

2. Theoretical Background

2.1. Mobile fingerprint payment

In the current Mobile Payment market, users will have different problems while they are being recognized or authenticated via password, user's name or authentication code (Kim, 2014; Yang et al., 2015). While people are using mobile payment, there are many users fail to be recognized or authenticated because they forget their passwords, user's name or authentication code, therefore, it's actually hard to balance the security and the convenience in mobile payment, which has a limit to mobile payment(Badra & Badra, 2016). To solve these problems, comparing with the recognition ways like password, user's name or authentication code, the mobile fingerprint payment, which is more convenient and safer, has a greater trend.

With the development of mobile fingerprint payment service in smart phones, mobile services like ipad and the third-party payment services, people are more looking forward to the development of fingerprint reorganization skills in mobile payment field.

Because of the needs and convenience of Open Banking that could be applied to nearly all the payment service, it shows a great need of the reorganization way based on public key and the instead of E-certificate(Kim, 2011). People use fingerprint identification technology to install a fingerprint information input device to recognize people's fingerprints, since there is no other simpler way than this, mobile fingerprint payment are wildly used instead of other mobile payments(Eom & Jeon, 2011).

Mobile fingerprint payment works with Grafting fingerprint recognition technology on mobile devices, therefore, it could be used without any attached device, education or additional fee for users or a long time to wait for it, which is both convenient and quick(Lee, 2012).

As for the security of fingerprint payment, people's fingerprints wouldn't change from the day they were born to the day they die(Lee, 2012). Even when the fingerprint gets broken sometime, the fingerprint will recreated to the same as before. Moreover, fingerprint has its uniqueness, the rate to meet two fingerprints that are the same is nearly zero(Eom & Jeon, 2011). Fingerprints payment uses people's biological information to reduce the insecurity of copy, theft or loss, so the mobile fingerprint payment is more widely used than traditional password payment(Ohana et al., 2013). There is no chance that the fingerprint is being used without the notification of the person, so high security is a very significant advantage of mobile fingerprint payment(Lee, 2012).

Based on the background above, it can increase the security and convenience of the fingerprint payment via biological recognition over all the other payments, so it'll be a new mode to pay via mobile fingerprint payment in the

future.

2.2. Unified Theory of Acceptance and Use of technology: UTAUT

During a long period of time, whether the new information technology will be accepted and used by users is always the subject among the Business Information Science, there are many theories about this subject though, the TAM (Technology Acceptance Model) that brought by Davis in 1989 is the most widely used. In Social Psychology Science, TAM was designed to research the attitude of users of information technologies, according to TRA(Theory of Reasoned Action) to decide actions and aims. And the actions and the aims are the basis of the basic frame.

TAM is the behavioral theory that suits all kinds of information technologies so far, it explains information technology through perceived usefulness and perceived ease of use(Davis, F. D., 1989), then TAM2 added social influence process and cognitive instrumental process to extend the TAM model, after that, TAM3 explains the individual accept and adoption information technology (Venkatesh & Bala, 2008). With the development of the researches about acceptance of technologies, relevant models and theories are developing also, and the variate related are getting increased. There are three features in the acceptance of users and the development of models, individual theory, continuous model relations and the combination of models(Im et al., 2011; Wu & Lee, 2017).

The model related of the acceptance technology of Venkatesh and Davis is that they found TRA(Theory of Reasoned Action), TAM(Technology acceptance model), MM(Motivational Model), TPB(Theory of Planned Behavior), MPCU(Model of PC utilization), DOI(Diffusion of Innovation), SCT(Social cognitive theory), these eight theories all have corresponding explanations in each field, so they mixed and matched all the relevant 32 concepts, created UTAUT model, the core theory of which is 3 variate influenced action-aims, 1 variate influenced actions and 4 moderator variate.

The 4 variate that influence the action-aims in UTAUT models are: PE(performance expectancy), EE(effort expectancy), SI(social influence) and FC(Facilitating Conditions)(Venkatesh et al., 2003). Among that, performance expectancy(PE) and perceived usefulness in TAM model are related, they are about the level that business performance will be improved and helped in the current information technology system. EE(effort expectancy) and perceived ease of use in TAM model are corresponding, they are about the definition of the level of convenience of the information system(Venkatesh et al., 2003). SI(social influence) is the influence of people's attitude to the information technology system(Venkatesh et al., 2003). On the other hand, FC(facilitating conditions)is the definition whether objective conditions while people are using the information technology system will support users for further

using. Except these 4 core variates, gender, age, experience and voluntariness of use are moderator variate in UTAUT models(Venkatesh et al., 2003).

UTAUT model is more specific in explaining the acceptance actions in information technology system than other theory models, its explanation level is 70% while TAM model's is only 40%(Venkatesh et al., 2003). In recent years, the influence and applied range of UTAUT theory are more and more widely. As an information technology, mobile fingerprint payment could be researched on acceptance and using actions. Therefore, this research can base on the UTAUT model, studying the influential elements of the mobile fingerprint payment's intention of use aims.

2.3. Diffusion of Innovation: DOI

DOI(Diffusion of Innovation) theory's guiding ideology is that there is a majority of people who are more open-minded than others, they are more willing to accept innovation(Rogers, 1995, 2003; Wei et al., 2016). That network is an efficient way of spreading the idea of innovation, and during the period, information technology can provide relevant knowledge and information effectively (Rogers, 1995, 2003). Innovation is an idea, time or stuff that could be accepted by individuals or groups as a fresh and new thing. An innovation includes 5 elements, elative advantage, Complexity, Trialability and Observability(Rogers, 1995, 2003).

First of all, Relative Advantage refers to the degree of advancement between the idea of innovation and the old one (Rogers, 1995, 2003). Relative Advantage can provide people fortune and fame (Rogers, 1995, 2003). Second of all, Compatibility refers to the coordination among the idea of innovation, existing values, the past experience of potential acceptance and the individual needs(Rogers, 1995, 2003). If the compatibility between an innovation and old one is high, people can apply the innovation better(Rogers, 2003). Third of all, Complexity refers to the degree of difficulty of the applying and understanding of the innovation. After the innovation is accepted, the way people feel about its influence varies because of people's different innovation types and usages(Rogers, 2003). Fourth of all, Trialability means the possibility of the test of an innovation under some certain conditions(Rogers, 2003). As for innovation, the decision based on personal experience works better than people's advice, and the former is also better accepted than the latter. At last, Observability means that the innovation has an intuitive result that could be noticed(Rogers, 2003). Many innovations are intuitive and noticeable, like software, which is harder to observe, so it takes longer time to be accepted(Rogers, 2003).

Rogers thinks it doesn't matter whether the idea, action, stuff and method of innovation themselves are new or not, what matters more is whether people think them are new or not (Rogers, 1995, 2003). Diffusion refers to the spread via

market and other ways, which is the result of innovation, the process of the technology being spread or transferred to other businesses or individuals(Rogers, 1995, 2003). Without diffusion, innovation would have no influence on economic and society(Wu & Chen, 2014; Zhu et al., 2006). The process of diffusion includes five different stages, cognition, persuade, decision, implement and confirmation(Rogers, 1995, 2003).

In recent years, the researchers from all over the world have made many researches with this theory, and have extended the DOI applicability. They combined DOI model and other theoretical models, drew a new theoretical model. Wua & Wang (2005) put DOI, perceived risk and cost into TAM model and got an extended TAM model, which was used to investigate the influential factors of people accepting mobile business, and it proved that except PEOU(perceived ease of use), the other variate also influence behavioral intention of the users a lot, among which, compatibility has the greatest influence. Moreover, Miltaen et al. (2013) combined and applied TAM, UTAUT, DOI together in the research of Biology Information Technology. Touray et al. (2014) also put UTAUT and DOI together and studied the information network.

Based on this kind of studies, DOI model be suitable for the studies in Biology Information Technology, and the combination of DOI model and UTAUT model could study the actions of users accepting and using. Therefore, this research investigate the influential factors to users accepting fingerprint payment by empirical research with the combination of the DOI model and UTAUT model.

3. Research Model and Research Hypotheses

3.1. Research model

This research is to investigate the influential factors of users accepting fingerprint identification applying to mobile payment with the combination of UTAUT model and DOI model. There are two reasons, one is the innovation idea of mobile fingerprint payment is suitable for the Compatibility and Relative Advantage in DOI model; another one is because mobile fingerprint payment is an innovative information technology so far, in order to do further study in action aims of users accepting new technology, the UTAUT model's senior explanation to action aims of users accepting new technology is helpful.

Therefore, these studies based on current theories, put Perceived security into UTAUT model and make a UTAUT extension mode, combining with DOI model in order to study in action aims of users accepting new technology.
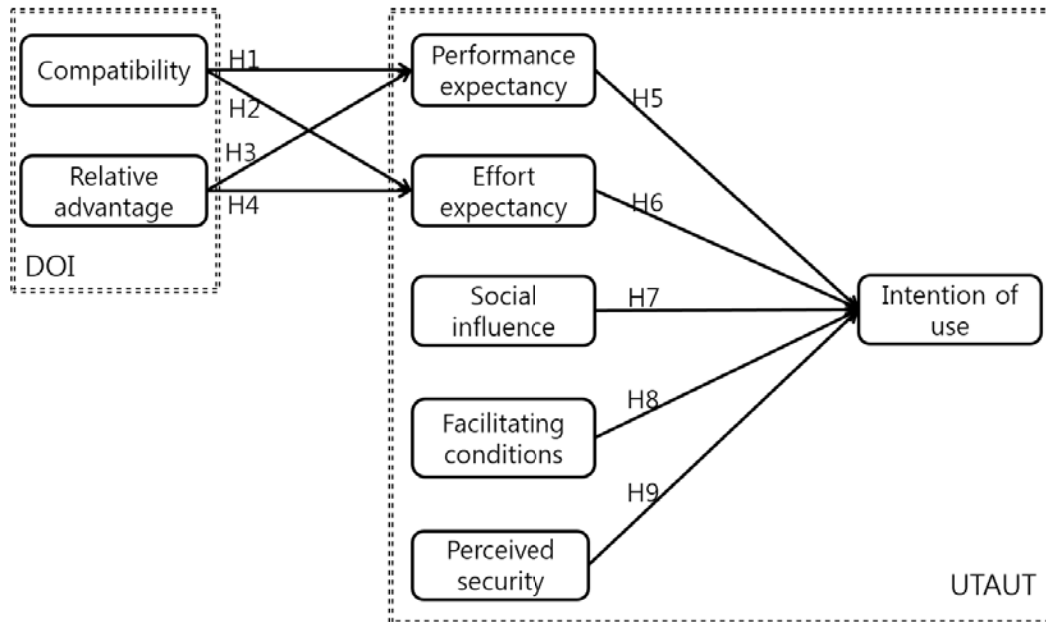
<Figure 1> Research model

3.2. Based on the Research hypotheses of DOI model

In the field of mobile service, Compatibility has both direct and indirect influence on users' attitudes to new information technologies(Schierz et al., 2010). Especially as claimed in the study of mobile payment of Schierz et al.(2010) and Kim et al.(2010). Compatibility influences perceived usefulness and perceived ease of use and the action aims of users.

There is uncertainty in the application of mobile fingerprint payment, as for users, the higher the compatibility is, the lower the uncertainty is Generally speaking, compatibility has a great influence on users' approval of mobile fingerprint payment. In addition, as for mobile fingerprint payment, there are two important parts of compatibility, one is the compatibility of mobile fingerprint payment and the users' value, which is abstract, the spreading of mobile fingerprint payment happens in a certain social system, the structure of social system and users' habits are vital issues of people considering using mobile fingerprint payment. And the mobile fingerprint payment refers to a value preference, since there are more and more people are using mobile fingerprint payment, so the mobile fingerprint payment businesses have more humanity. If the change is exactly what people are looking for, the spreading process will be faster and faster. On the other hand, compatibility also refers to the mobile fingerprint payment and the original software and hardware. During the using apply period, the compatibility of the mobile fingerprint payment and the original software and hardware is a very important factor. Especially for customers, if the standard and functions of the mobile fingerprint and the mobile payment are not compatible, hey will give it up and it will cause a waste of the cost of time and human force. To draw a conclusion from the analysis above, the compatibility in the study refers to the mobile fingerprint payment and the current payments, the connectivity of software and hardware, And users' by using the mobile fingerprint payment can suit their previous mobile payments habits well; what's more, there are 2 hypotheses.

    <H1> The compatibility has positive influence on users' result expectation.
    <H2> The compatibility has positive influence on users' effort expectation.

Relative advantage is a degree to represent how better the new information technology is than the current one(Touray et al., 2014; Rogers, 1995, 2003). The Relative advantage in this study refers to the degree how better the new information technology makes people's lives than the current one does. This relative advantage is the advantages that mobile fingerprint payment brings to users' work and life efficiency and quality. For instance, users don't need to press long and complex passwords when they are using mobile payments, all they need to do now is put his or her finger on the fingerprint sensor, and then the payment will

be done in a minute. The easier and more convenient the mobile fingerprint payment is, the higher the value is, the faster it gets spread and accepted in the market. Chang and Park(2010) claimed in the study of the obstacles factors of the spread of smart phones, the better the comments of the relative advantage of smart phones, the lower the resistance to innovation is. However, in the current market, there are not enough studies about how relative advantages influence users' acceptance willingness(Lee & Lee, 2006). Therefore, in order to research more about the influence of mobile fingerprint payment's relative advantage to users' intention. Here are the 2 hypotheses from this study.

    <H3> The relative advantage has positive influence on users' result expectation.
    <H4> The relative advantage has positive influence on users' effort expectation.

3.3. Based on the Research hypotheses of UTAUT model

The relevant study of mobile payment shows that the PE(performance expectancy) is a variate that has positive influence on users' aims (Morosan & DeFranco, 2016; Oliveira et al., 2016; Kijsanayotin et al., 2009). The PE (performance expectancy) refers to the degree of how much mobile fingerprint payment could improve work efficiency and life quality. Comparing with other mobile payments, mobile fingerprint payment can provide a faster and more convenient payment. When users are using a mobile payment, if they feel better while using mobile fingerprint payment, they'd like to use it again and again. According to the analysis above, there is a hypothesis in this study.

    <H5> Users' performance expectancy of mobile fingerprint payment has positive influence on users' intention of use.

In the UTAUT model theory, the EE(effort expectancy)is a variate evolved from the perceived use of use in TAM model. In many studies, EE(effort expectancy) has a positive influence on behavior intention(Chang & Hwang, 2007; Kijsanayotin et al., 2009; Wang & Shih, 2009). And the study of Oliveira about mobile payments shows that EE (effort expectancy) has a positive influence on behavioral intention to adopt(Oliveira et al., 2016). And the EE(effort expectancy) refers to the degree about people thinking mobile fingerprint payment is easy and convenient. To use mobile fingerprint payment efficiently, users need to install a driver on the mobile device and get familiar to all the functions it has. Thus, the study claims that if users think it's easy and convenient, they would be willing to use it in long term. Based on the analysis above, there is a hypothesis.

<H6> Users' effort expectancy of mobile fingerprint payment has positive influence on users' intention of use.

SI(Social Influence) is the result of the combination of subjective norm and image, it refers to the influential degree of how users are influenced by the different thoughts, ideas and actions around(Oliveira et al., 2016; Venkatesh et al., 2003, 2012). SI(Social Influence) has an significant influence on Behavioral Intention(Oliveira et al., 2014). Oliveira's study of mobile payments shows that SI(Social Influence) has a positive influence of the reasons why users behavioral intention to adopt mobile payments(Oliveira et al., 2016). Human beings are social animals, their thoughts and actions are influenced by the people around them to some extent. The characteristic well inflected in the acceptant actions of new information technology is called SI(Social Influence). If most people are using mobile fingerprint payment, even if there are a small amount of people think it's hard for them, they still want to use it. Moreover, Mobile and ubiquitous, as information technologies, have a great influence on the relations between people living in the society. Based on the analysis above, SI(Social Influence) in the study refers to the approval and influential degree how other people influence the users' thoughts about mobile fingerprint payment. Here comes the seventh hypothesis.

<H7> Users' Social Influence of mobile fingerprint payment has positive influence on users' intention of use.

FC(Facilitating Conditions) is combined from the perceived behavioral control of TPB(Theory of Planned Behavior) and facilitation condition of MPCU(model of PC utilization), it refers to the degree how users think objective conditions help them to use mobile payments(Oliveira et al., 2016; Venkatesh et al., 2003, 2012). Oliveira has a study about mobile payment in 2016, it shows that FC(Facilitating Conditions) has a direct influence on the intention of users. Considering of the technology and infrastructure of mobile fingerprint payments are still under development, FC(Facilitating Conditions) is very important to the intention of users. Draw a conclusion from the analysis above, the FC(Facilitating Conditions) refers to the degree of users think the service assistance and technical support could help them to use mobile fingerprint payment. Here is the eighth hypothesis.

<H8> The Facilitating Conditions of mobile fingerprint payment has a positive influence of users' intention of use.

Mobile payments are convenient though, the security is always the biggest concern of users. And all the unstable factors in security cause a lot of negative attitudes towards users' intention. Many researchers think(Parasuraman et al., 2005; Shen et al., 2010; Yoon, 2010) that security is important to internet bank and mobile payments, and it has a great influence on the users' intention. This study is not studying the security of mobile fingerprint payment, it's studying the attitude of users thinking whether the mobile fingerprint payment is safe or not. Schierz et al.(2010) has a study on mobile payment, it claims that Perceived Security will influence users' attitude and intention to the mobile payment directly; Plus, Morosan and DeFranco(2016) claims in his study about mobile payment based on UTAUT theory that Perceived Security will influence the users' intention to mobile payment. Therefore, the Perceived Security in this study refers to the degree how safe it to apply mobile fingerprint payment into mobile payments. This is the ninth hypothesis.

<H9> Users' Perceived Security of mobile fingerprint payment has positive influence on users' intention of use.

4. Empirical Analysis and Hypothesis Test

This study did a questionnaire survey among the Chinese crowd who had used mobile fingerprint payment to verify the research hypothesis. The survey lasted for 6 months from February 20th to August 20th in 2016.

3668 questionnaires were got through website (http://www.sojump.com/). To ensure the validity, the questionnaires were filtered, among which 542 invalid or dishonest questionnaires were deleted, there are 3126 valid ones left, so the validity rate is 85.2%.

All the data will be analyzed by IBM Statistics 23.0 and IBM SPSS AMOS 23.0.

This study's Demographical Analysis is as follow. From the standpoint of sex, there are 1982(63.4%) male and 1144(36.6%) female among the samples. Males have a bigger proportion than females. From the standpoint of age groups, there are 168 people aged from 0-20(0.5%), 1827 people aged from 20-29(58.4%), 835 people aged from 30-39(26.7%), 296 people aged from 40-49(49.4%). There into, people aged from 20-29 has the largest proportion, which shows that this age group is the most interesting to mobile fingerprint payment.

From the standpoint of education background, there are 435 high school graduates(11.1%), 1964 bachelors(62.8%), 815 masters and doctors(26.1%), among this, most mobile fingerprint payment users are bachelors, which is nearly half of the whole users.

From the standpoint of occupations, students use the mobile fingerprint payment the most, the number is 1413 (45.2), self-employed people are 269(0.09%), civil servants are 322(0.10%) and office workers are 968(31%).

To draw a conclusion, the survey covers all walks of life, all age groups and different educated groups, these groups

are very important current users of mobile fingerprint payment, the survey has a great effect on learning the acceptance rate of users, and builds a significant sample base of the research.

4.1. Evaluation of Measurement Item

The measurement item's overall coefficient is 0.928, the Cronbach's α of every variate is above 0.9, surpass the normal standard 0.7 according to the Reliability analysis via SPSS, which shows that every measurement item is reliable.

<Table 1> Demographical Analysis

Division	item no.	Cronbach's α
Compatibility	4	0.923
Relative Advantage	5	0.942
Performance Expectancy	4	0.922
Effort Expectancy	4	0.926
Social Influence	4	0.927
Facilitating Conditions	4	0.924
Perceived Security	4	0.924
Intention of Use	5	0.938

4.2. Confirmatory Factor Analysis

The survey was tested convergent validity by AMOS, the SMC(Squared Multiple Correlation)surpasses normal standard 0.4, and the St.Est.(Standard Estimate)of each measurement item is above 0.7, the(Composite Reliability) of every variate is more than 0.7, plus, the AVE(Average Variance Extracted) of each variate is more than 0.5, the CR of each variate is over 0.9, AVE is more than 0.7, all of these data show that the measurement item has significant convergent validity.

The structural model is tested by Confirmatory Factor Analysis, normally, the GFO and CFI should be more than 0.05, while the CMIN/DF should be less than 2, RMR, AGFI, NFI, RFI, IFI, TLI and PGFI should be more than 0.9, which usually shows a decent degree of fitting. Also, some scholars said that the fitness CMIN/DF could be 1-5, because when the amount of samples is too many, the CMIN will increase, when the amount if samples are more than 500, it becomes normal if the CMIN/DF is less than 5, instead of 2. In this research, the structural model's fit index (X^2=2078.561, P=0.000, DF=499, X2/DF=4.165; CFI=0.983, NFI=0.977; GFI=0.960, AGFI=0.952, RFI=0.975, IFI=0.983, TLI=0.981; RMR=0.019)are all advanced than normal standard, it shows that the structural model has decent degree of fitting.

The index of discriminant validity to estimate and measure model is: Each potential variable value is greater than the average variance extraction of the variable and the correlation coefficient of all the other variables. It shows that the separate outcomes are good. The discriminant validity is as <Table 3>, the number above the diagonal is the square root of the average variance to extract value, while the number beneath the diagonal is the relation between the variate and other variate.

Measure average variance of the underlying variables in the model to extract the value of the square root value(the value of the principal diagonal) is greater than peers with column values on the diagonal, measurement model has good validity.

<Table 2> Convergent Validity and Confirmatory Factor Analysis

Factor	Item	St. Est.	SMC	CR	AVE
Compatibility	CO1	0.855	0.730	0.923	0.761
	CO2	0.891	0.793		
	CO3	0.880	0.775		
	CO4	0.841	0.707		
Relative Advantage	RA1	0.864	0.747	0.941	0.751
	RA2	0.874	0.763		
	RA3	0.870	0.757		
	RA4	0.870	0.757		
	RA5	0.898	0.807		
Performance Expectancy	PE1	0.876	0.768	0.923	0.749
	PE2	0.875	0.765		
	PE3	0.859	0.738		
	PE4	0.847	0.717		
Effort Expectancy	EE1	0.854	0.730	0.925	0.756
	EE2	0.880	0.774		
	EE3	0.887	0.787		
	EE4	0.860	0.739		
Social Influence	SI1	0.882	0.778	0.927	0.757
	SI2	0.881	0.776		
	SI3	0.877	0.769		
	SI4	0.847	0.720		

Factor	Item	St. Est.	SMC	CR	AVE
Facilitating Conditions	FC1	0.875	0.766	0.927	0.759
	FC2	0.869	0.755		
	FC3	0.852	0.725		
	FC4	0.873	0.761		
Perceived Security	PS1	0.852	0.726	0.935	0.784
	PS2	0.875	0.765		
	PS3	0.878	0.770		
	PS4	0.867	0.752		
Intention of Use	IU1	0.862	0.743	0.946	0.780
	IU2	0.867	0.752		
	IU3	0.871	0.759		
	IU4	0.862	0.744		
	IU5	0.875	0.766		
X^2=2078.561, P=0.000, DF=499, X^2/DF=4.165; CFI=0.983, NFI=0.977; GFI=0.960, AGFI=0.952, RFI=0.975, IFI=0.983, TLI=0.981; RMR=0.019					

\<Table 3\> Discriminant Validity

Factor	1	2	3	4	5	6	7	8
1. Compatibility	**0.867****							
2. Relative Advantage	0.363**	**0.872****						
3. Performance Expectancy	0.393**	0.243**	**0.864****					
4. Effort Expectancy	0.338**	0.172**	0.516**	**0.870****				
5. Social Influence	0.346**	0.213**	0.341**	0.352**	**0.872****			
6. Facilitating Conditions	0.337**	0.217**	0.281**	0.265**	0.299**	**0.867****		
7. Perceived Security	0.465**	0.411**	0.336**	0.311**	0.337**	0.352**	**0.868****	
8. Intentions of Use	0.426**	0.396**	0.292**	0.290**	0.297**	0.288**	0.671**	**0.867****

PS：**<0.001

\<Table 4\> Results of Hypothesis Analysis

Hypotheses	Estimate	S.E.	C.R.	P-value	Result
H1: Compatibility→Performance Expectancy	0.380	0.020	18.809	***	Accepted
H2: Compatibility→Effort Expectancy	0.328	0.020	16.742	***	Accepted
H3: Relative Advantage→Performance Expectancy	0.119	0.019	6.255	***	Accepted
H4: Relative Advantage→Effort Expectancy	0.059	0.018	3.179	0.001	Accepted
H5: Performance Expectancy→Intention of Use	0.040	0.013	3.008	0.003	Accepted
H6: Effort Expectancy→Intention of Use	0.061	0.014	4.477	***	Accepted
H7: Social Influence→Intention of Use	0.038	0.014	2.765	0.006	Accepted
H8: Facilitating Conditions→Intention of Use	0.027	0.015	1.245	0.065	Rejected
H9: Perceived Security→Intention of Use	0.602	0.019	32.474	***	Accepted

PS：***in P-value column means P<0.001

4.3. Hypothesis Analysis

Comparing with other apps, AMOS is easier and more convenient to use. From the analysis above, the tables of this survey has high reliability and validity, being testified by the model degree of fitting test, therefore, during the analyzing of AMOS, there's no need to correct model but set the model and input the data. The path coefficient and the result are in \<Table 4\>.

5. Conclusion

So far, the mobile fingerprint payment is develop rapidly domestic and overseas, the amount of users is improving with its thoughtful service, at the same time, it advertises the new shopping model for the companies, and affects people's consuming and lifestyles greatly, it has an enormous developing space.

The theory and method of this study is based on DOI and UTAUT model, with the result of perceived security theory and related researches, combining with the advantages of mobile fingerprint payment, corrects the models' variate.

It shows the main issue and relations that influence users' willingness of using mobile fingerprint payment, and designs the questionnaire based on this, also made Empirical analysis. The purpose of this research is to learn users' features and influential factors why users use this payment, and then provide advice of the advertising and developing of mobile fingerprint payment.

5.1. Results

The Compatibility has a positive influence on the Performance Expectancy and Effort Expectancy of mobile fingerprint payment. When users are using the mobile fingerprint payment, its software settings, hardware settings, and all the electronic products are compatible with the fingerprint recognition technology, users will tend to use this and improve the payment quality. Therefore, the higher the compatibility of a creative technology is, the easier will users use and the higher the work efficiency will be. The relative advantage has a positive influence on the Performance Expectancy and Effort Expectancy of mobile fingerprint payment. The research shows that when people are choosing a new mobile payment, they think about the features it has, mobile fingerprint payment in a renovation of traditional mobile payment. The action of users who are used to use tradition ones use renovation one shows that the renovation one has relative advantages, no matter it's the payment efficiency or usage, it's clearly better than other mobile payments, otherwise, users wouldn't take risks and waste time to try a new payment method.

The performance expectancy of users to mobile fingerprint payment has a positive influence on the intention of use. The result of this study shows that people trusting mobile fingerprint payment can help improve the payment efficiency to the greatest extend, for instance, it fastens the speed to pay and makes it more convenient. If the service can not make their lives easier, they'd rather use traditional mobile payments.

The effort expectancy of users to mobile fingerprint payment has a positive influence on the intention of use. The result of this study shows that if the procedure of mobile fingerprint payment is easy, users can learn how to use that easily and fast without wasting big amount of time and effort, their hard working and time will pay off.

The Social Influence that users can feel has a positive influence on the intention of use. To put it in another way, if there are some important friends or relatives around the user who are using the mobile fingerprint payment and recommend this payment, it'll stimulate the desire of the user's of using this payment. More and more new

technology users are used to learn new products from other people's experience and their comments, which also shows the group psychology when people get to know a new stuff.

The Facilitating Conditions of mobile fingerprint payment has a slight influence of users' intention of use. There are some objective issues outside that will influence people to use mobile fingerprint payment, the positive ones will accelerate people using it, on the contrast, if there's no relative technology condition supports, for example, if it cannot recognize people's fingerprint after it breaks, it will fail to improve users' use intention.

The Perceived Security that users can feel has a positive influence on the intention of use. Mobile fingerprint payment is a new and unknown stuff, many people will worry a lot before they use it, like the insecurity of the product if it's not well-developed, or money loss because of their misoperation. However, mobile fingerprint payment is a well-developed technology that based on multi high-tech, testified by authoritative departments. As long as people get to use mobile fingerprint payment and as people get to know it more, the strangeness and distrust are decreasing, at the meantime, people get to know the higher security than any other payments, hence, the Perceived Security that current users can feel has a positive influence on the intention of use.

The Compatibility and relative advantage of mobile fingerprint payment has a positive influence on users' Performance Expectancy and Effort Expectancy. It claims that compatibility and relative advantage influence users' use intention mainly through Performance Expectancy and Effort Expectancy, it simplifies the procedure, improves the payment experience and enhance people's use intention of mobile fingerprint payment.

UTAUT model is used to the study of mobile payment users of China current stage. UTAUT model shows that during the technology accept period, effort expectation, result expectation, social influence and facilitating conditions all have a positive influence on users' use intention. To draw a conclusion from this study, apart from all the hypothesis are right except facilitating conditions, the result of this study still shows that this conclusion is right in the China's mobile payment field.

5.2. Implications

Compatibility is the most important. Perceived ease of use and perceived usefulness of users make users motivated. The research showed that compatibility is one of the most important elements that make users continue to use the product. Take mobile fingerprint payment as an example, experts can increase the investment into software and hardware, complete the current technology, which can make the system link more stable and faster. And it also adds advertising activities of technology improvement and applied range expansion to improve users' confidence in the

technology, This will let users find that it not only suits the previous mobile payments habits well, but it's also more convenient, practical and efficient.

The mobile fingerprint payment must owns clearer advantages than other payments that it can reach the biggest market scale. When it's being advertised, the advantages must be emphasized, remind people that mobile fingerprint payment is easier, more efficient and more popular. Improve users' perceived ease of use and perceived usefulness. The convenience of mobile fingerprint payment is attractive to consumers, in order to survive in the mobile payment market, experts need to make people feel better while using the product, by making the procedure easier to use, easier to learn, making it simpler and more concise. As for the senior, easy procedure is more important for the senior, thus, the senior can get instruction from experts and so on. They can improve the space rationality of mobile fingerprint payment, to make mobile fingerprint payment easier and faster. The fast development of mobile fingerprint payment market is related to users' permit, according to users' research data of Every Consulting, there's a large proportion of users who are still suspect the technology, so mobile payment businesses need to enhance the education of users and cultivate habits to use it. On the other hand, when user side is too expensive, the product's related hardware spend need to be decreased, and this will be an efficient way to spread in the market.

The Social Influence that users can feel has a positive influence on the intention of use. This shows that as for the mobile fingerprint payment internet companies, social relations, oral spreading are crucial to the spread of mobile fingerprint payment, individual and groups around people have further impact on people using mobile fingerprint payment. Therefore, mobile fingerprint payment companies should exploit the advantages to the full of ora spreading, at the meantime, make it more common and popular through internet, activities and multi-ways of advertising, including strengthen advertising's range, expand advertising ways and enrich advertising forms, like hot Weibo topics, Wechat moments and other social communication platforms, trying to make people notice the advertisement of mobile fingerprint payment everywhere and anytime, make users accept mobile fingerprint payment, cultivate and establish the habit and loyalty of using the technology. During the whole period of advertising, mobile fingerprint payment internet company need to positively lead users' oral spreading, actively advertising, build good and nice brand image, exert a subtle influence into users' daily life.

The Facilitating Conditions of mobile fingerprint payment has a slight influence of users' intention of use. Because the technology and environment of mobile fingerprint payment are increasing constantly, the operators are spreading the mobile payment market, in order to decrease the loss rate of users, the problems of users while they are using the technology need to be solved and explained in

time. The businesses need to enhance technology support and after-sale service, always keep users company and make users more comfortable with the mobile fingerprint payment.

Continue to improve the security of mobile fingerprint payment. No matter what field it is, as long as it's related to money, security problem is always the biggest concern of people. Although the security of mobile fingerprint payment is better than other mobile payments, there is still technical risk. Hence, the technical risk needs to be tested seriously to protect the security of users' information. Mobile banks should reinforce firewall, monitoring system, intrusion detection system and mechanism of reduction, therefore, the completeness of data could be ensured. And then, cooperate with mobile operators to co-establish a more perfect and reliable system platform and internet structure.

5.3. Limitations and Future Research

The study is centered with the mobile fingerprint payment users' intention of use. The study is rigorous and creative in documents reading, theory models building and questionnaire designing though, it's restricted by people and other objective conditions, there are still some limits and flaws.

The people to respond should be more. This study was mainly about people aged from 20 to 40, and the main group is bachelors, and the differences between places, occupations, incomes and other elements, there will be differences when people are using mobile fingerprint payment, so the samples can not reflect the overall situation. Therefore, in the follow-up studies, it should expand spaces, age groups and social stages, which is in favor of the actions that people using mobile fingerprint payment.

Hypothesis impact elements. The study brought hypothesis according to UTAUT and DOI. Although these two model theories have been tested for several times by people, but as the development of economics and the changes of environment, the applicability of UTAUT and DOI will decrease as well. When the study brought hypothesis of mobile fingerprint payment, it was just based on the most basic study content and goals, in which there is a developable potential factor. Therefore, future research can be based on different theories and practical experience, put forward the hypothesis that more diverse factors, make the marketing strategy formulation is more accurate and perfect.

The variate of UTAUT includes sex, age, experience and voluntary. But because the sex and age of samples are not balanced well, And the samples of this study are all experienced users of mobile fingerprint payment, because it's more sensible to ask people who have used this payment why they started to use mobile fingerprint payment than those people who haven't used this payment. At the same time, accepting and using mobile fingerprint payment belongs to voluntarily action, involuntarily actions are rare, so the

four variate are abandoned. In the future, adjusting variate can be discusses.

Questionnaire investigation has its own limitations. The study gathered the questionnaire by people voluntarily filling in the questionnaire, when people are filling up the form, they may get bothered by related elements, like lack of time, personal emotions, surroundings and so on, a strict

filtration has been done on the questionnaires, there may still be some deviation with the truth, so it's hard to get it a hundred percent accurate. In the follow-up study, more age groups and more sex columns should be taken into consideration, like questionnaires combined with interviews, continuous dynamic tracing and so on.

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