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FINGERPRINT START THE NEXT GENERATION OF PAYMENT METHOD

Fingerprint payment: a new mode of mobile payment

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ABSTRACT

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In the generation of mobile internet, fingerprint payment is one of the most popular topics at the moment. China has a big market and many users are using the mobile payment methods. There are a large number of mobile phones equipped with fingerprint recognition technology. As we know, fingerprint payment brings us more convenience and safety. We do not need to use many bankcards, and fingerprint also eliminates the users from the trouble of queuing to pay. However, users send traditional digital password information though the network, and it is easy to hack. Replaced by digital password payment, fingerprint payment has become a new trend in the field of payments.

The purpose of this thesis is to research the fingerprint payment market in China, and research how to promote fingerprint payment. Information about fingerprint payment was summarized and collected from a variety of published sources.

As a result of this thesis, we may conclude that the development of fingerprint payment is in the beginning stage, and Union Pay should take a strong role in its development. Under the controllable risk situation, and according to the supporting industries for consideration, it will promote the fingerprint payment.

Keywords: Fingerprint Payment, Fingerprint recognition, Biometric payment, Marketing

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1 INTRODUCTION

In recent years, with the development of information technology and advancement of people's living quality, people turn to pay more attention on the diversification of the payment method. In this generation of mobile internet, a large number of people expect that mobile payment could be more convenient and safe. Mobile payment change people's lifestyle. However, user always worries about safety of mobile payment, because traditional digital password is easy to hack through the network. The people treat with fingerprint payment and traditional payment differently. Biometric fingerprint password can enhance payment convenience and security effectively. Fingerprint payment will be a new mode of mobile payment.

Currently, cash and bank card payments are still most common methods of payment in all over the world. The current variety of new payment methods are just using some combinations of technical and financial payments. Fingerprint payment of development is still in beginning stage. It needs a long-term market development. Fingerprint uses its uniqueness as payment medium and offers convenience, but also brought a lot of additional risk to users. (Fingerprint payment 2015, cited 4.9.2015) As personal privacy concerns, security and legal issues, even personal safety issues must be taken into account. Additionally, due to the credibility, coordination and financial reasons, fingerprint payments have been promoted and constructed independently by third party company. It is developing slowly in the market. In order to solve these problems, we need to invest substantial capital investment. Likewise the payment legal systems, also fingerprint payment chain need to be perfect (figure1).

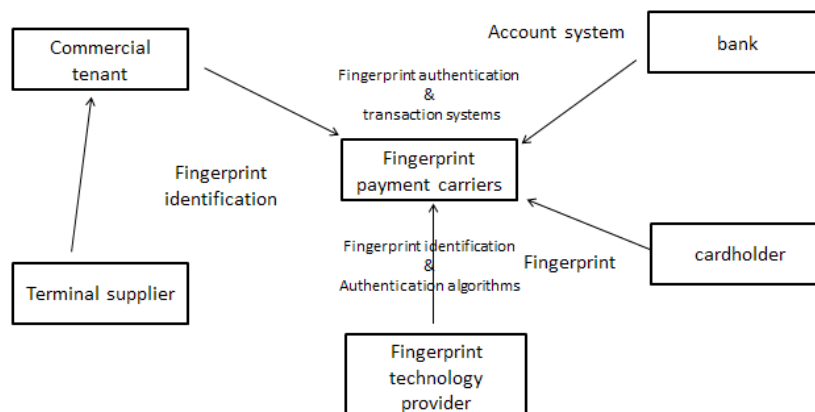


FIGURE 1. Fingerprint payment industry chains (Fingerprint payment analysis report, cited 2013)

1.1 Research questions, problem and methods

The Thesis is completed with the intention to give an overview of fingerprint payment and market in many aspects; the relationship between fingerprint payment and market, and discussion how the fingerprint payment works in China. Therefore, the main issues will be based on these following questions:

What is fingerprint payment? Can fingerprint payment replace bank card payment? Why do we need to promote fingerprint payment in the world? How does fingerprint payment as industry chain work in China? How do fingerprint payments replace traditional payments? Which businesses are needed by fingerprint payment? Why is this fingerprint payment needed? What is the fingerprint payment market environment in China like? How is the fingerprint payment developing in market?

Can fingerprint payments replace traditional payments? Most users do not know fingerprint payments. So the development of fingerprint payments is not easy. The lack of experience about fingerprint payment is the main reason why they are not as widely accepted. But as Vlad Savov said, instead of fearing the new and the unknown, we should embrace it. (Vlad Savov, cited 11.7. 2014)

1.2 The structure of the Thesis work

Consequently, this study consists of three main parts: the first two parts constitute an introduction to fingerprint payment (the payment process and feature), development stage in China, and then the final part is about the relationship between Visa, Union Pay and fingerprint payments, and how the Visa and Union Pay interventional fingerprint payment could become the first choice by users. The thesis work has many elements which are shown in the concept map (figure 2).

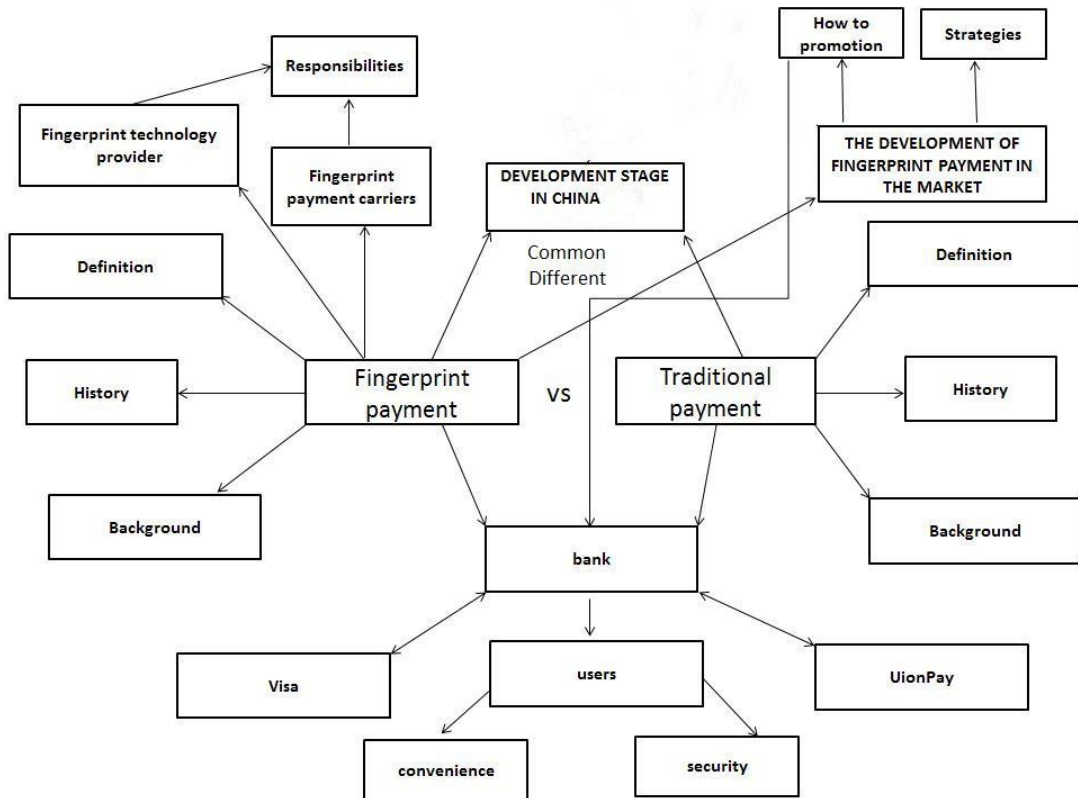


FIGURE 2: The concept map

2 PAYMENT

2.1 The field of fingerprint payment

Fingerprint payment as a kind of biometric payment is a point of sale (Wikipedia 2016, cited 12.8.2016) technology that uses fingerprint authentication to complete payment which is based on finger scanning. And this payment method uses card keeper's fingerprint which has unique and stable characteristics in electronic payment transactions.

2.1.1 The payment process

Fingerprint payment is based on finger scanning. From its principle and process that can be divided into four steps. (automatic system of fingerprint recognition, cited 4.7.2007) Firstly, fingerprints are collected, using different geometric, biometric features and a variety of sensor technology. Then, collected fingerprints are transmitted to the computer and processed, eventually into a digital fingerprint pattern and stored. Secondly, the pre-processing of fingerprint image is segmented from background that ensures the removal of noise, making the images clearly. Thirdly, minutiae extraction means that fingerprint image minutiae extraction is to extract characteristics of image after pretreatment image, including whole and locally features of fingerprint image. Fourth, scanned fingerprints are compared with fingerprint image templates in fingerprint database, and the level of similarity is calculated in order to acquire the matching result. Therefore, based on this structure, fingerprint payments can be divided into two steps. Firstly, fingerprints should be registered and acquired by users and then stored in the fingerprint system. By the time, users have registered fingerprints, the browser can use wise plugin to obtain fingerprints image, so fingerprint minutiae data are combined into the fingerprint template many times. Then it will be stored in a server. Secondly, by the time when users use mobile payments, then the browser through wise plugin acquire fingerprint image and get fingerprint minutiae data. After that, authentication will be used in server. Finally, fingerprint minutiae matching will be found in the fingerprint database. (Fingerprint Identification Using Minutiae Matching, cited 6.6, 2013)

2.2 Traditional payment

Compared with fingerprint payment, traditional payment reflects more directly in payment experience. And nowadays we still use those traditional payments which can be divided in seven kinds of ways.

2.2.1 The payment process

First, exchange is the main payment method in the primitive society. Second, cash payment (figure 3) includes paper money and coins in two forms issued by the state. Third, cheque payment (figure4) is user make a document that orders a bank to pay a specific amount of money from a person's account to the person in whose name the cheque has been issued. Fourth, as a credit voucher (figure5) and a payment tool, the bank card has the superiority of convenience, safety and efficiency. Fifth, exchange fund refers to payer authorize bank to take payment for beneficiary. (Baidu Wenku 2011, cited 14.11.2011)

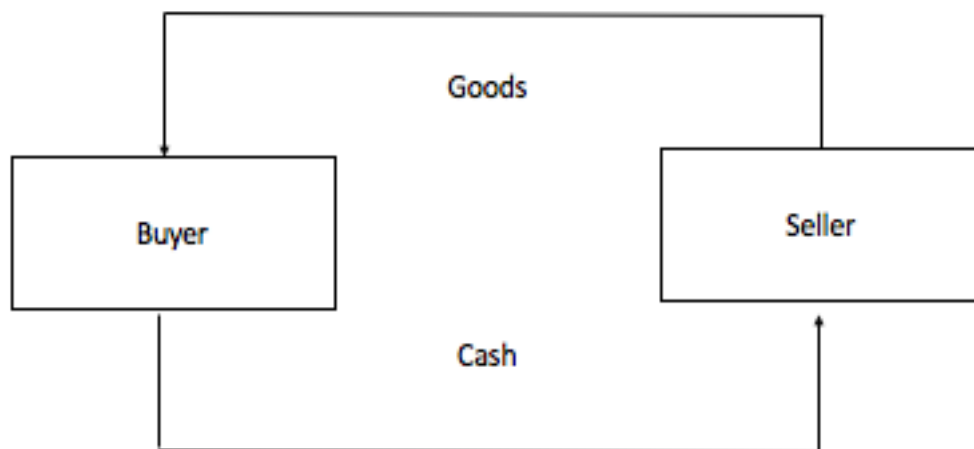


FIGURE 3. Cash transactions

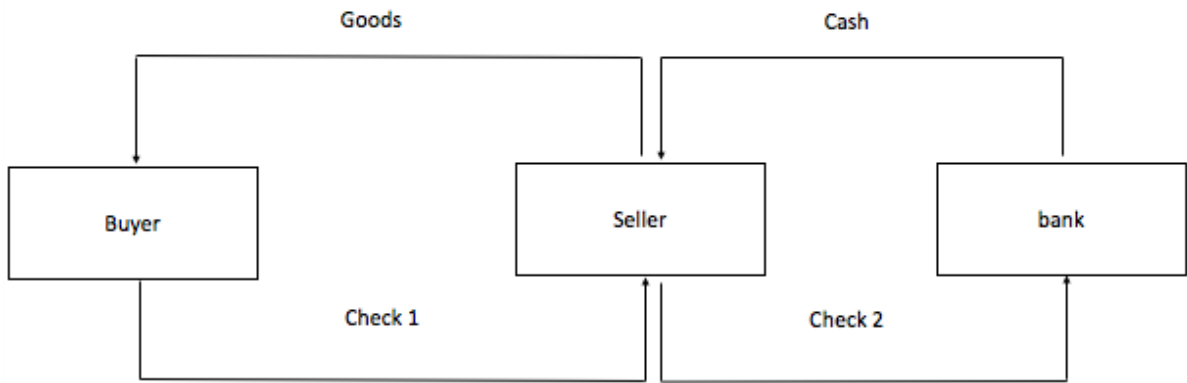


FIGURE 4. check trading

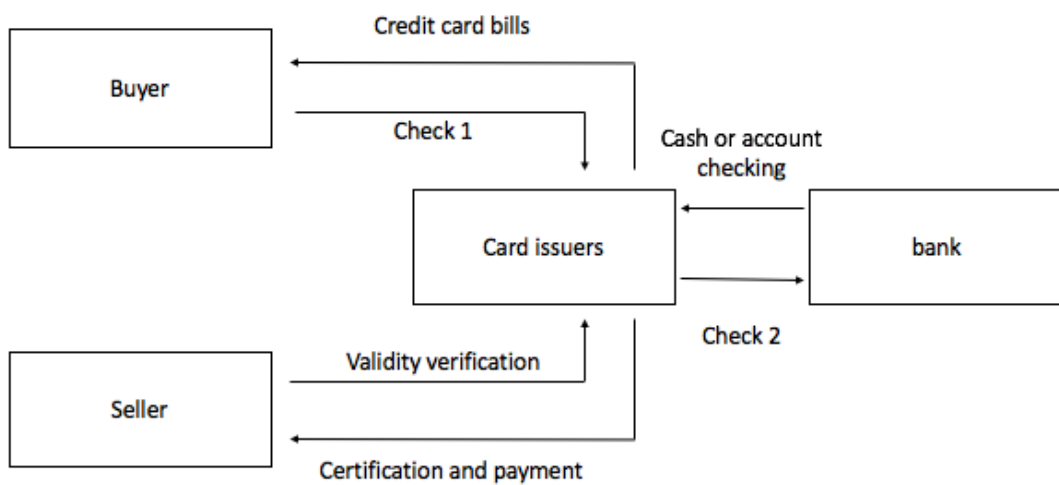


FIGURE 5. Credit card transaction

2.3 Fingerprint payment vs Traditional payment

Compared with other mobile payments, the security and convenience are more outstanding in fingerprint payment. In terms of convenience, according to some public data (Business Plan data, cited 12.6.2014) statistics, each internet user had 26 accounts, 6.5 passwords, and passwords are used to sign in around 8 times in a day. Additionally, users must have different passwords for the security reasons. Generally, you need to input a long-digital password in each mobile payment. If it will not be used in the commonly client, mobile phone verification code will be needed to verify. It is difficult for the users who always forget or feel confused with the passwords. By using fingerprint payment, that situation can be avoided. It can only use fingerprint scanner to complete the payment transaction immediately. It will further enhance the convenience in the payment process and payment efficiency.

As far as security is concerned, a new biometric system based on electronic fingerprints was confirmed to be the most secure identification technology by payment industry. Usually, password will be used in mobile payment and it is easy to input wrong password with small screen on mobile device. Moreover, it can be hacked easily. Currently, most websites can be attacked with unknown hole. But if biometric payment technology replaces the traditional password, it will not cause risks more than before. Nevertheless, the main reason for the security of fingerprint payment that makes users accept the fingerprint slowly. According to the related media, there are many people that cannot get identification with fingerprint ranging from 3% to 5% including for example elderly people, children, long engaged in manual labour, and people with broken fingerprint, in addition to injured finger, environment with high humidity and other exceptional circumstances. It is also possible that the fingerprint identification get fails with normal users. Hence, fingerprint payment server needs to make sure that the fingerprint scanner works well in any times and otherwise some remedial action can be taken. Moreover, the most important thing is that fingerprint belongs to biological information with privacy and it cannot be modified like digital password. So if the fingerprint information got hacked, it will cause great damage to users. (Wikipedia 2016, cited 12.8.2016)

Likewise, the high cost is one of the most significant reasons why fingerprint payment is hard to generalize. Industry insiders report that if mobile phone adds fingerprint sensor and chip encryption technology, the manufacturing costs will grow significantly.

However, there are large numbers of users who still take traditional payment way to close the deal with others in all over the world. The traditional payment, cash is simple, convenient, anonymous and usual payment method. Bill of payment trading is different and avoids the error of counting with cash. Furthermore, it also saves time. Bankcard is the most frequently used way of payment in all over the world. The bankcard with high efficiency has caused cash flow to be significantly reduced, simplifying procedures of payment, improving settlement efficiency.

In conclusion, the benefits from fingerprint payment as a next generation of mobile payment method are indisputable. It just needs more vendors and policies in support under promotion.



FIGURE 6. Fingerprint payment in store

2.4 Case

In 2002, in order to meet customer demands with fast payment and to deal with credit card fraud event, some supermarkets in the USA began to test the fingerprint images payment system. When the users used finger touch on the fingerprint image panel machine, the user's id was authenticated. The purchase amount and history could be recorded directly on the credit card. Additionally, the transaction was completed in ten seconds. (Baidu Xueshu 2015, fingerprint payment, cited 3.4.2015)

In 2006, the fingerprint payment technology was published in Shanghai, China. This technology combined users' fingerprint data information and payment account. Users just needed to go to the designated outlets to complete the fingerprint registration. When you are a registered paybyfinger electronic wallet user, you are no longer in need of a bank card or cash. You can only use fingerprint in a fingerprint image panel machine. Purchase amount and history can be recorded directly on the credit card. (China Daily 2006, cited 8.9.2006)

Since 2013, fingerprint recognition feature has been applied on iphone 5s by Apple inc. After that, smart phone already had privacy, and security environment. However, at beginning with fingerprint recognition feature you could only unlock the phone. (Wikipedia 2013, cited 16.7.2013)

Fingerprint technology combined with mobile payment creates a more efficient and safe payment settlement and other identification system. Fingerprint identification system was applied on

network especially on mobile payment is an innovation. Users do not need to enter password. It is only used with fingerprint sensor on your phone to complete the fingerprint collection and registration. When users make purchase they only tap their finger to complete the payment.

In 2004, Alipay, which is the e-payment system of the Chinese e-commerce giant Alibaba Group Holding Ltd, launched a mobile application which allowed ios and Android users to make mobile payment with fingerprint instead of password. The third-part companies promote the fingerprint payment. (China Daily 2014, cited 10.12.2014)

In 2015, fingerprint payment was applied on mobile application in Wechat (Tencent product). The downside was that you could only use 5000 yuan in a single day by using fingerprint payment. Otherwise, you would need to make payments by using password. (China Daily 2015, cited 13.8.2015)

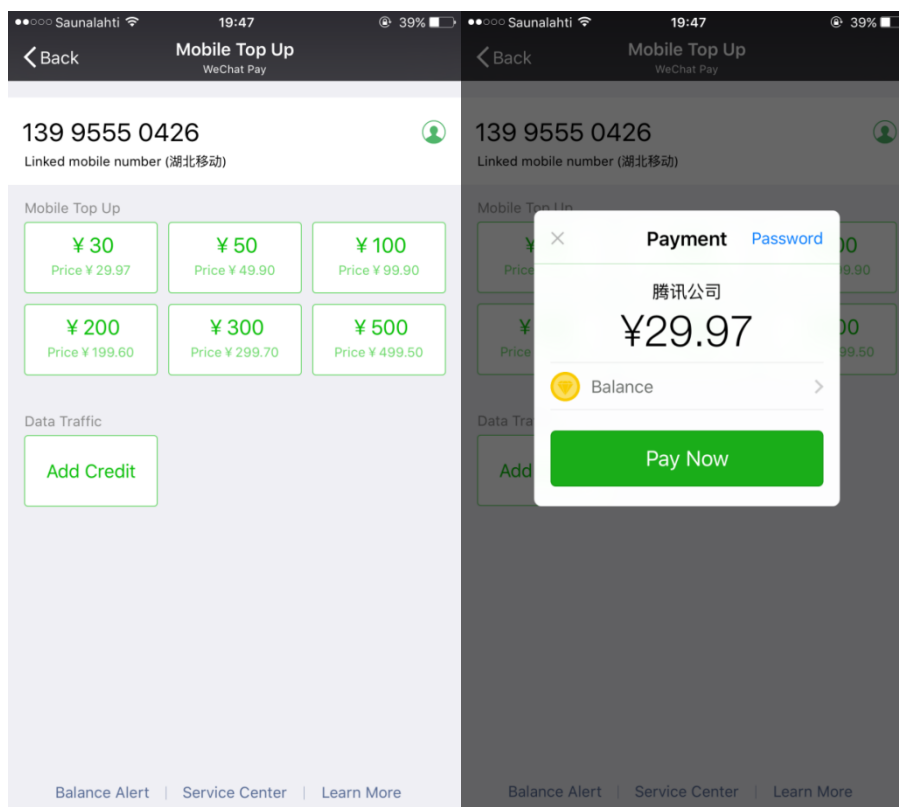


FIGURE 7. Fingerprint payment process with Wechat application

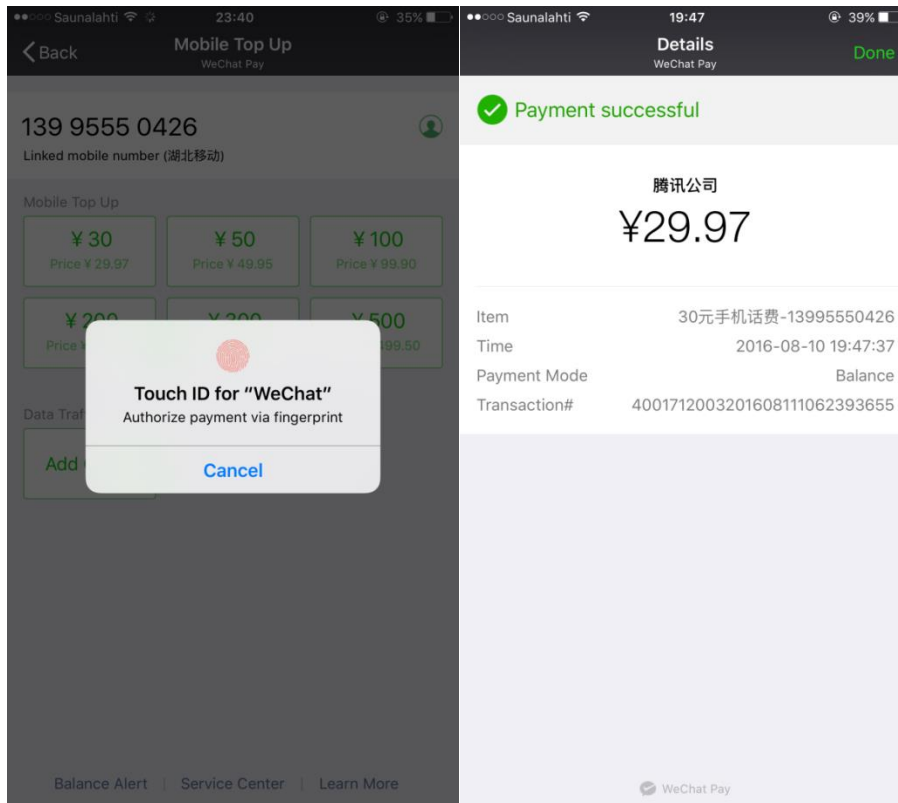


FIGURE 8. Fingerprint payment process with Wechat application



FIGURE 9. Fingerprint payment on mobile phone

3 DEVELOPMENT STAGE IN CHINA

3.1 Chinese environment

As Erel data (Business Plan 2014, cited 12.6.2014) shows China's mobile payments of third-party companies reached 1.21974 trillion yuan in the year of 2013, representing growth of 707.0%. Mobile payment is a huge market, which contains too many temptations and opportunities, so that any of innovative mobile payment products can attract more attention in the Chinese market.

2010-2017 China Mobile payment in third-party market



FIGURE 10. Chinese mobile payment in third-party market between 2010 and 2017 (Business Plan 2014, cited 12.6.2014)

The total number of Chinese internet users reached 620 million people in 2013, of which 500 million people are mobile internet users. The mobile internet users growth rate is more than the overall growth rate of internet users. The data predicts that the number of users of mobile subscribers are expected to exceed half of the population in China. (Business Plan 2014, cited 12.6.2014)

2009-2017 Chinese internet users and mobile internet users

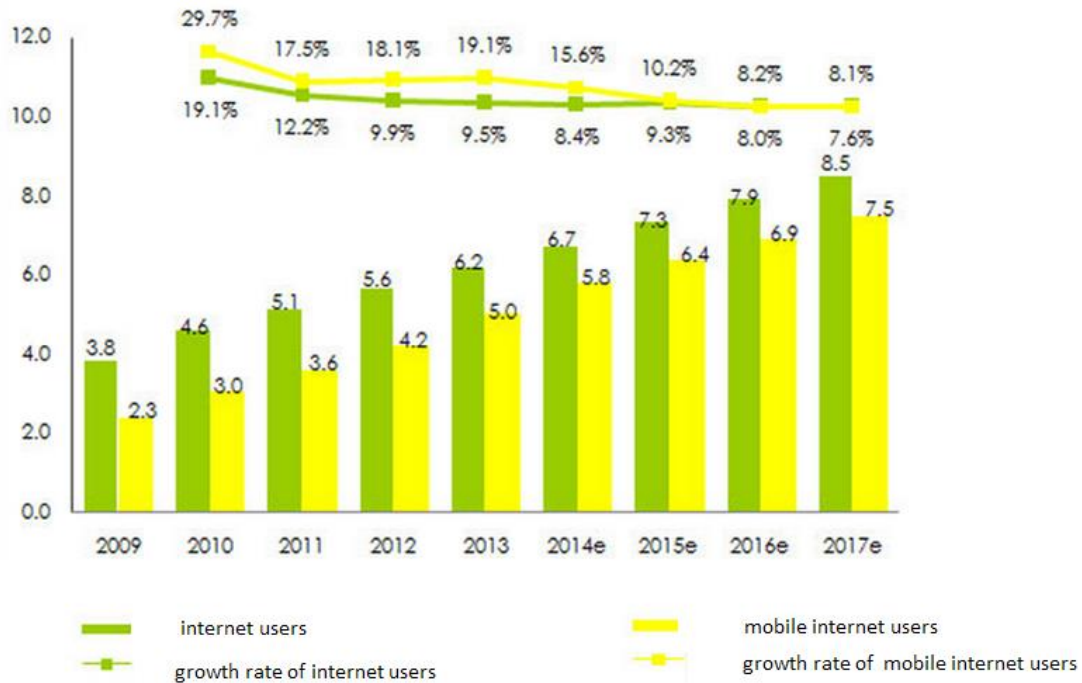


FIGURE 11. Chinese internet users and mobile internet users between 2009 and 2017 (Business Plan 2014, cited 12.6.2014)

Moreover, fingerprint recognition technology became more common among mobile phone and other mobile device users.

Apple launched the first model with touch id fingerprint recognition on iPhone 5s in September, 2013. And then, Samsung Galaxy s5 also launched fingerprint recognition technology in February, 2014. Recently, many Chinese mobile phone manufacturers, such as Meizu, Vivo, Gionee have been using this technology. Fingerprint payment is becoming increasingly common in the world. (China Daily 2015, cited 08.9.2015)

Furthermore, many mobile phone applications such as PayPal, Alipay, WeChat have the function of fingerprint payment on mobile phones or devices. This will greatly contribute to the maturity of the entire industry chain, which accelerates the fingerprint payment process in China.

However, mobile fingerprint payment promotion barriers still exist. Firstly, the mobile hardware with fingerprint recognition is not completely universal. The fingerprint recognition technology has been used on mobile phone less than a year, that is to say technological maturity and popularity are relatively low, and mobile phone equipped with fingerprint recognition technology is expensive. Not all people can buy it. Moreover, mobile fingerprint payment technology is really dependent on hardware support. The release rate of adoption will be limited. Secondly, user acceptance of mobile fingerprint payment is still on a developing stage. Furthermore, the promotion of mobile payment for many companies is a problem. They need to spend more time and money, so active use of mobile fingerprint payment is still a long way to go. Thirdly, the issue with the government policy is something to deal with in the future. Chinese monetary policy is relatively conservative, and mobile payment is no exception.

4 THE DEVELOPMENT OF FINGERPRINT PAYMENT IN THE MARKET

4.1 The business model of fingerprint payment

4.1.1 Fingerprint payment operators model

Fingerprint payment operator is the dominant business model. This means that the transaction message is converted into a non-magnetic message which is then sent to the bank to complete the payment process after the consumer's fingerprint is recognized and certified. In this model, the fingerprint payment operators perform POS equipment development, identification and authentication, business expansion, fund settlement and other functions. Other partners carry out their duties. The advantage of this model is that the market will start faster. Nevertheless, the shortcomings are also extremely obvious. Fingerprint operator is a commercial company which has limited credibility. Because the cardholder can save the card number, password and fingerprint information, it is hard to obtain large-scale market acceptance. Moreover, there are some serious legality issues. Moreover, because the identification and authentication of transaction function is taken responsibility by the fingerprint operators, so there are huge moral hazards. If the fingerprint payment operators get into problems, this will result in a huge loss of fake transactions and funds. This in turn easily causes social instability. (Baidu Wenku 2013. Fingerprint payment analysis report 2013, cited 19.11.2013)

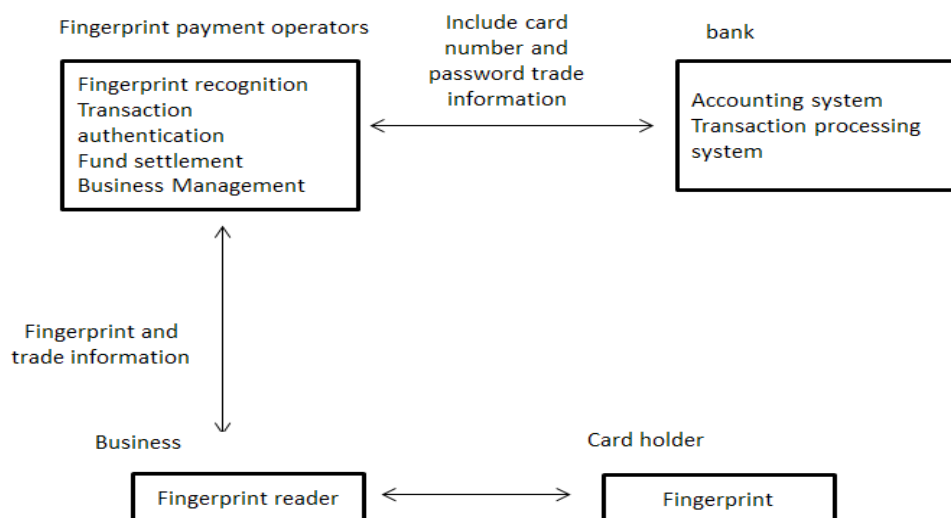


FIGURE 12. Fingerprint payment operators model

4.1.2 Bank based model

In the bank based model the fingerprint is identified and certified by the bank to complete the transaction. The Fingerprint payment operator is responsible for the business, POS machines arming functions, but also fund settlement done by the bank. The advantage of this model is that bank is reliable, it is easy to gain market acceptance, and the industry chain parties to five their contribution. However, the banking system working is huge, and the earnings expectations are not clear. In this mode, the fingerprint payment operators have been transformed into a specialized agency of acquiring services. The risk is small, and gets the profit together. (Baidu Wenku 2013. Fingerprint payment analysis report 2013, cited 19.11.2013)

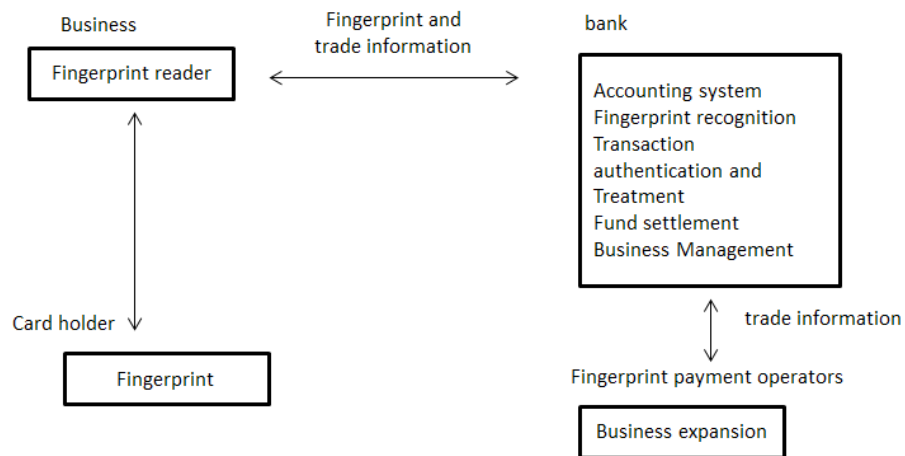


FIGURE 13. Bank based model

4.1.3 Trusted third-party model

The trusted third-party model is divided into two types. The first type involves those third-party companies which are only responsible for transfer function with transaction. The functions of the bank are similar to those of the bank based model. This model solves the problem with the large number of banks are to participate with a clearly defined structure and responsibilities. Union Pay or third-party companies share the trading fees. The disadvantage is similar to that of the bank based model: investment and transformation fees are huge.

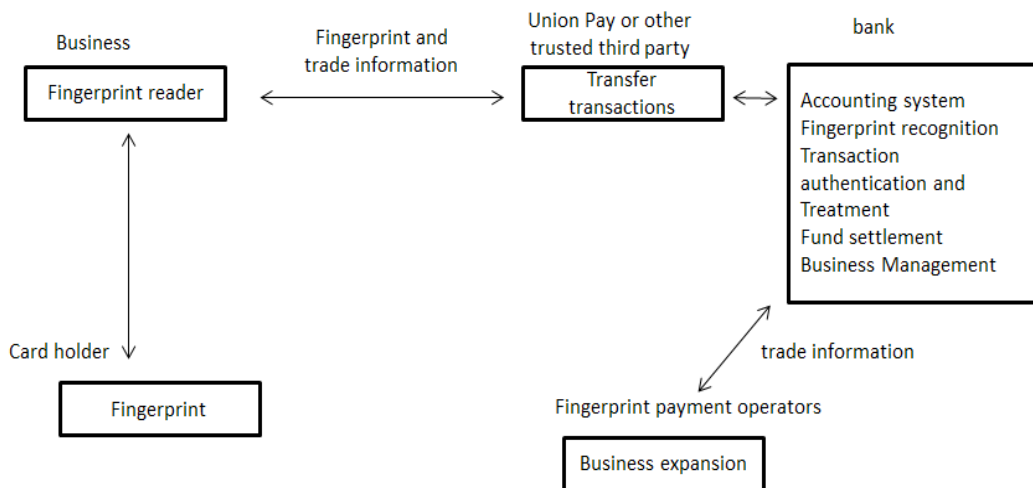


FIGURE 14. Trusted third-party model 1.1

Union Pay or trusted third-party company not only take the responsibility for transfer transaction, but also take the fingerprint authentication and transaction functions. The banking system in this model acts in a traditional role. Moreover, the third-party companies take responsibility for the additional risks. (Baidu Wenku 2013. Fingerprint payment analysis report 2013, cited 19.11.2013)

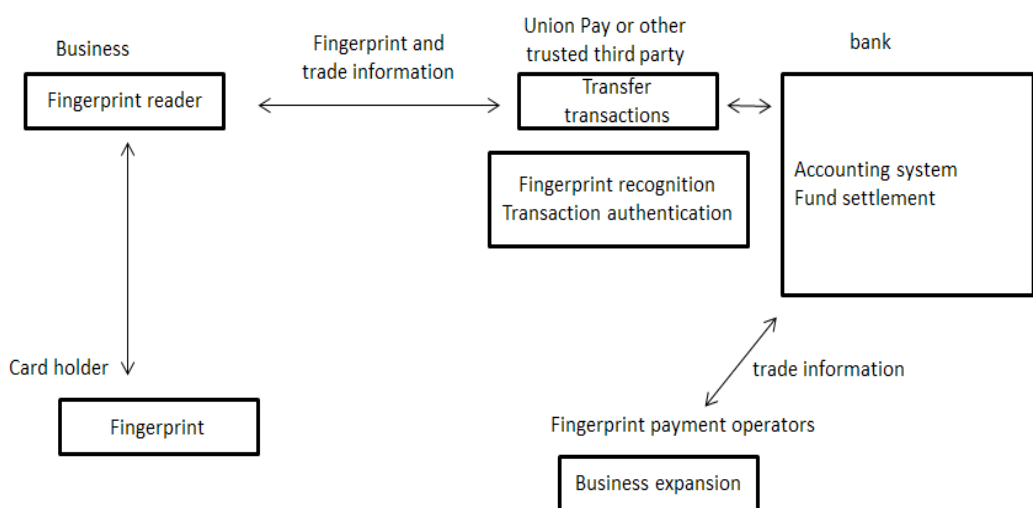


FIGURE 15. Trusted third-party model 1.2

4.2 The role of Union Pay in fingerprint payment

4.2.1 Union Pay positioned in the field of fingerprint payment

Union Pay must determine their status and role in the fingerprint payment industrial chain. Only accurate positioning, and a clear strategy can provide Union Pay with competitive advantage in the fingerprint market. In order to avoid other agencies to close down Union Pay interbank business, Union Pay must become the core of fingerprint payment market. Thus, in the field of fingerprint payment, it is recommended that Union Pay follow these practices:

a) Trading with transit service provider

Union Pay interbank transfer network covers the whole country, and through the intervention of Union Pay, it can optimize the fingerprint payment industrial structure, making the market expansion more easily.

b) Fingerprint authentication and identification service provider

Fingerprint authentication and identification service is the core of the fingerprint payment. If the maturity of the market is higher, the risk can be controlled. Union Pay should take the main responsibility in the market in the right time.

4.2.2 Union Pay policy in the field of fingerprint payment

Union Pay has to focus on building brand payment and transaction switching center. Fingerprint payment is a useful method of payment except with bank cards which can promote the development of the bank card industry, and also change the habits by in the bank card use. In early stage, Union Pay in the field of fingerprint payment should make correct guidance, promoting the development of fingerprint payments. (Baidu Wenku 2013. Fingerprint payment analysis report 2013, cited 19.11.2013)

4.2.3 Recommendation of Union Pay in the field of fingerprint payment

As described in section 4.1.2, Union Pay in fingerprint payment field has two models; the biggest difference between these two modes is awareness of the fingerprint payment market. Inputs, outputs and risk control are also important in the fingerprint payment market. The following table is two-model comparison:

TABLE 1. Compared with two models

| Mode | Role | Input | Output | risk |
|------|---|--------|---------------|---------|
| 1 | Transfer transactions | few | few | general |
| 2 | Transfer transactions Fingerprint identification and authentication transactions | higher | Unpredictable | higher |

In conclusion, the development of fingerprint payment is in the beginning stage, and Union Pay should be transactions adapter way start in fingerprint payment market, following the development of the fingerprint payment actively. Under the controllable risk situation, and according to the supporting industries for consideration, it will promote the fingerprint payment.

5 SUMMARY AND CONCLUSION

The purpose of this thesis was to gather and summarize information on fingerprint payment in China environment, and describe how the Union Pay interventional fingerprint payment functions. Another aim for thesis how the Visa and Union Pay interventional fingerprint payment can be combined. For this purpose, several aspects of mobile fingerprint payment were studied. Through studying and researching fingerprint payment technology and marketing. We can draw some general conclusions.

Fingerprint payment is a cardholder fingerprint feature in a form of an electronic payment transaction voucher which is one type of an e-payment mode. Moreover, the uniqueness of fingerprint combined with some safety measures is utilized to achieve a secure transaction. When combining the cardholder's fingerprint with the bank card, a fingerprint can directly be used as a payment method to complete the transaction. It is a useful supplementary way in the field of electronic payment technology.

Currently, fingerprint payment is mainly used in micro-payment devices. The target user group is based on potential customers who are in a need of goods and services, and who are curious and want to try out fingerprint payment technology. The target age group is between 20 and 50 years. This type of payment mode is easier, and eliminates the risk of losing the bank card. The convenience will attract some bank card holders to become target users.

However, fingerprint payment is paid by independent third-parties which are responsible for developing the technology. Due to lack of credibility, coordination, financial and other resources, is slowing down market growth. Credibility is the main problem in the fingerprint payment market. Second, there are also some technical challenges, so it is the banks that need to address this problem. Union pay interventional fingerprint payment makes the market increasingly attractive, and more people will accept fingerprint payment as their first choice.

6 DISCUSSION

The thesis took approximately in total six months to complete, even though the original goal was only five months. Of all the chapters, the chapter 4 was the most difficult one to complete. It took me a long time to collect data and other information.

In recent years, with the development of information technology and advancement of people's living quality, people pay more attention on the diversification of the payment methods. A large number of people expect mobile payment to be more convenient and safe. I found out that fingerprint payment can be the best choice. Moreover, this easy new payment method attracts me a great deal. And I also participated in some courses such as Marketing Thinking and Practice, Software Business, and Information Security. The purposes of this thesis was to research the fingerprint payment market in China, and also study how to promote fingerprint payment. Not all users are very familiar with the fingerprint payment. So the developing of fingerprint payments might be challenging.

What I have learnt by doing this thesis, is the history of traditional payment and fingerprint payment, the different types of mobile payment, the relationship between the bank and fingerprint payment system, the development stage for fingerprint payment, and a relationship between technical issues and marketing, I used a lot of diagrams and pictures to illustrate my viewpoints.

The most challenging part of the thesis was chapter 4. However, I learn that the development of fingerprint payment is in the beginning stage, and Union Pay should be transactions adapter way start in fingerprint payment market, following the development of the fingerprint payment actively. Under the controllable risk situation, and according to the supporting industries for consideration, it will promote the fingerprint payment.

Finally, I hope fingerprint payment can be developed faster than before, and in the future this types of payment could be used all over the world.

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