




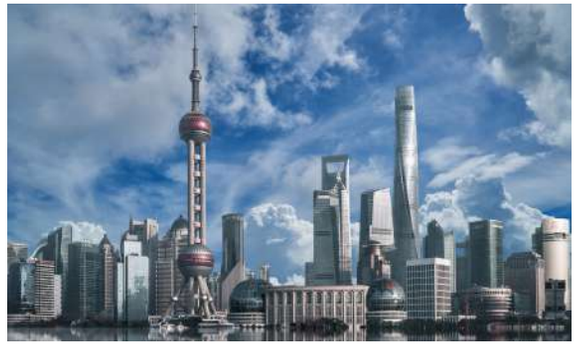

Understanding Mobile Payment's Development in China, its Challenges and Growth Potential






By Haojun Feng, Jorgo Gushi, Mingxi Liu, Shiyu Wu, Mingxiao Zhao

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Understanding Mobile Payment's Development in China, its Challenges and Growth Potential

An Interactive Qualifying Project
Submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
In partial fulfillment of the requirements for the
degree of Bachelor of Science

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Report Submitted to:

Project Sponsor:
Alipay

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ABSTRACT

Utilizing mobile devices to pay for all sorts of services has become a daily gesture in China. Along with convenience, mobile payments also bring issues that have to do with security, aging society adaptability, internet dependence, and currency transfer. In this project, we surveyed 134 mobile payment users and interviewed 5 users/experts in the field to identify potential issues of mobile pay. We worked with our sponsors at Alipay on identifying the growth factor behind mobile payments' booming and on projecting its global growth potential in the future. Our results suggested that mobile payments have been widely accepted in China and that users are mostly satisfied with the services this kind of technology offers.

EXECUTIVE SUMMARY

Introduction

Over the past few years, paying for a service with a mobile device has become a daily gesture in China. The country's eagerness to embrace this kind of technology is apparent in usage at grocery stores, airports, hotels, and every other place that you can think of. It is as easy and convenient as pressing a button or scanning a Quick Response (QR) code, but many still worry about mobile payment's security and reliability. The impact mobile payment applications have on the Chinese economy and on the life of the average Chinese citizen is great and is the subject of interest for our sponsors at Alipay.

Our sponsors wanted to know how to deploy mobile payment applications in the future, including what played an important role in the development of mobile payment in China, what are some outstanding issues within this industry, and what is the global growth potential of it? By researching and presenting these questions, we were able to assist our sponsors in projecting the global growth potential of mobile pay in the future. In order to understand the dynamics of the mobile payment industry in the present and how this can be more successful in the future, our team closely worked with our project sponsors to collect information on what mobile payment looks like and what is the success rate of their mobile payment application in terms of acceptance, ease of use and adaptability.

The goal of this project was to understand China's mobile payment industry development, to address potential shortcomings, and to create recommendations that will transform these shortcomings into short- and long-term growth opportunities. To achieve this, we utilized key stakeholder interviewing and surveying techniques to gain an understanding of what consumers use mobile payment applications for, how easy they are to use, and what issues they face when using such applications. As the outcome of this project, the team identified shortcomings and growth opportunities of the existing mobile payment systems, and subsequently made recommendations to the sponsor for addressing these issues for continuous improvement and future growth.

Literature Review

Throughout our project we reviewed many scholarly sources. In our literature review section we talked about the the e-commerce industry in China, its development and history. The two giants of this industry in China are Alipay and WeChat, that is why our research focus mostly on these two. Additionally, we talked about the implementations of mobile payment applications, that included: transportation, credit card payment, financial investment.

As mobile payment booms, new questions rise. Nowadays, although mobile payment provides benefits to citizens, it also creates social problems. Sometimes, it pushes a group of people to the edge of society. These problems include: issues with the aging society, information leakage (security), and fraud.

Along with the drawbacks, the mobile payment industry has a high growth potential. To predict how the mobile payment industry will shape up in the years to come, we had to look into the industry's effect on household welfare, the expansion and sophistication of the financial industry, the adoption of Alipay and WeChat overseas, and the revolution of mobile payments through the use of biometrics.

Methodology

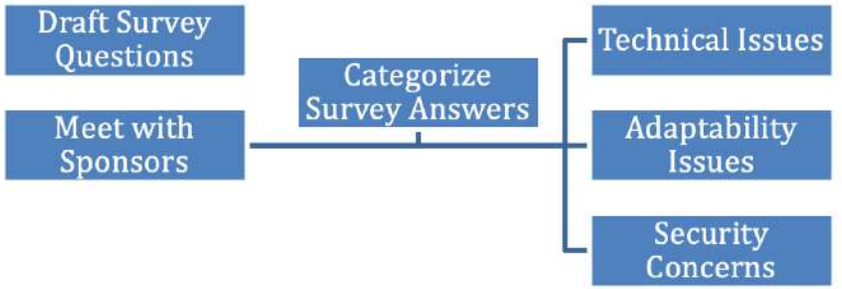

Figure E.1: Overview of the approach followed for the first objective

The goal of this project was to understand China's mobile payment industry, to address potential shortcomings and to create recommendations that will transform these shortcomings into short and long-term growth opportunities. In order to achieve this goal, we developed the following research objectives:

1. **Identify AliPay's potential shortcomings.**
2. **Assess key stakeholders' perception of Alipay.**
3. **Identify mobile pay's growth opportunities.**

We collected users' opinion and experiences through the design of a web-based survey using Qualtrics (Appendix A). A total of 134 mobile pay users were surveyed. With Mayring's seven step-method in mind, we determined the research questions and decided to use both open and close-ended questions (Assarroudi et al., 2018)

The survey was distributed via email through an Uniform Resource Locator (URL) link and QR code. After receiving the survey results, we translated all answers from Chinese to English, combining the use of Google Translate with our team members' proficiency in the Chinese language. We coded the survey responses by carefully reading all of them, identifying common themes among the answers and dividing them into three categories: technical issues (usage of Alipay or specific problematic features), adaptability issues (aging society difficulties) and security concerns.

Additionally, we set out to understand what the perception of certain individuals was regarding the use of Alipay in their everyday lives. To identify common themes between our research and the literature review, and to get the perspective of the mobile payment industry's insiders, we decided to conduct semi-structured interviews with the project's key stakeholders.

Findings

We interviewed a staff engineer of our sponsor company, Alipay, a university researcher in the mobile payment field, and three mobile payment users. We constructed interview transcripts for each of the sessions and we numbered and anonymized the transcripts to protect the stakeholders' identities. Regarding the analysis of interview transcripts, we developed a preliminary coding scheme which was defined by a specific set of words and phrases. Interview transcripts are included in this report in the form of an appendix.

Moreover, to further identify the growth potential of the mobile payment industry and present our project sponsors with a list of opportunities for them to explore when coming up with their future strategic initiatives and mobile payment products, we conducted a SWOT analysis. To achieve this objective, we used some of the results generated from the survey and interviews outlined in Objectives 1 and 2, and also, we conducted further research during our Interactive Qualifying Project.

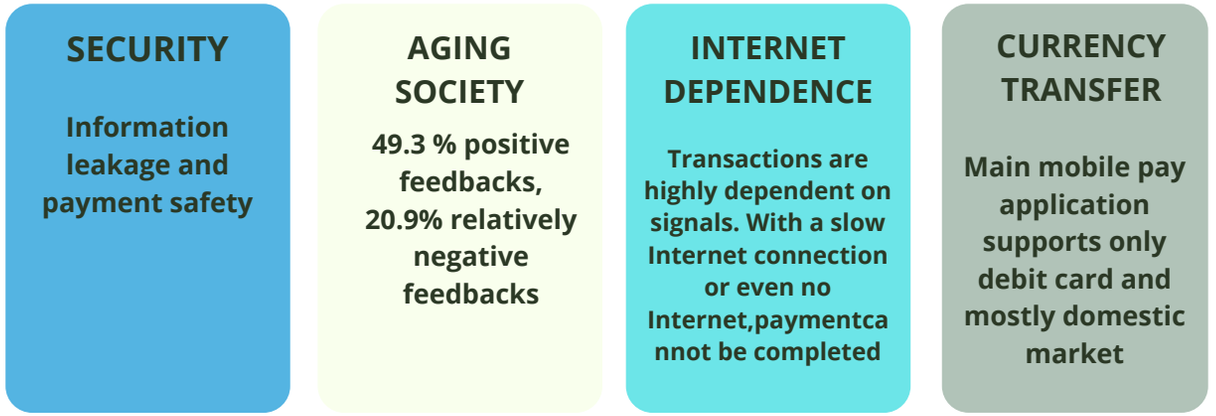

Figure E.2: Mobile payment applications' shortcomings (Survey Results)

Our web-based survey mainly targeted Alipay users, but was also open to users of other mobile payment applications. We hoped to collect between 100-150 responses, and we ended up with 134, which meets our target. After carefully analyzing the results, we found out that most mobile pay users are satisfied with mobile pay, however, there are still several issues mobile payment users are concerned the most about (listed in Figure E.2):

Our survey results showed that we had an even distribution based on location and gender. When it comes to age, 67.3 % of our survey respondents were between the ages of 18 and 30. We expected these results, as younger generations are more prone to using mobile payment applications and are more eager to answer web-based surveys.

Our project's first objective focused on identifying mobile payment's potential shortcomings that is why in our survey we included questions that related to users' experience. When asked how satisfied they are with the overall experience with mobile payment applications, 62.75% of the respondents reported to be "very satisfied," 36.27% were "somewhat satisfied" and only 0.98% were "not very satisfied" (see Fig. 4.1.8). The majority of respondents were very satisfied, but still a large percentage were somewhat satisfied. Additionally, we were interested in knowing if these users ever had a negative experience with mobile payment, and if yes what were the reasons for such experiences. Out of 101 respondents, 76 responded to not have had a negative experience and 25 of them reported to have had one.

We asked our survey takers to report how worried they are about information leakage from mobile payment applications and the data generated is quite troubling (see Fig. E3).

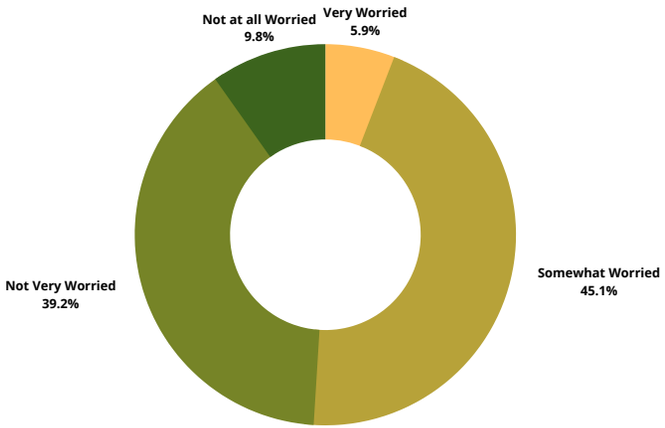

Figure E.3:How worried users are about information leakage)

We realized that even though these users utilize mobile payment applications in such a large scale in their daily lives, they are still not confident enough that their personal information is safe and well-guarded.

We then asked those whose elder members of their family were mobile pay users, to describe the experience of their elder family members with mobile payment. Out of 67 responses, 20 responded that the experience of their elder family members with mobile payment was very good, 33 answered with "somewhat good", and 14 said their experience was not very good (see Fig. 14).

Interview Results

To investigate more on the mobile payment applications in China's market, we conducted in total five interviews with different roles of people who have connections to mobile payment: a university professor studying on the information security, a principal staff engineer of our sponsor Alibaba, and three normal users of mobile payment applications. All of them are Chinese and all the interviews obeyed the protocol. We will not identify our interviewees' names, genders, or address information.

Through the interviews, we generated information regarding:

- Effects of mobile payment on the Chinese economy
- Essential role during Covid-19
- Potential and existing problems
- Opportunities and developments

Based on the interviews, mobile payments are considered to reduce transaction friction and increase the economic efficiency. Three interviewees including the professor said that mobile payment is a cleaner payment method because it allows people to finish money exchange without actual touching others.

S.W.O.T Analysis Results

To guide our sponsor's market strategy for the years to come, based on the information described in section 3.3.1, we conducted a SWOT analysis. Essentially, we took a detailed look into the mobile payment industry to determine where this industry was strong (what markets and target groups), where it could strengthen its positions, areas of growth, and outside factors that could alter this industry's outcomes. After the information was placed and divided into each of the four categories, we started looking for connections. We attempted to draw clear lines between strengths and opportunities, as these two factors contribute to the development of mobile payment. Nevertheless, we did not disregard the weaknesses and threats. A final comparison between the strength-opportunities and the weaknesses-threats duo was conducted. As in the previous objectives, the findings for objective 3 are presented in the form of an animated infographic with an engaging and understandable SWOT table.

Recommendations

Based on our findings we divided our recommendations into two categories: recommendations for mobile payment platforms and recommendations for researchers. These recommendations are illustrated in Figure E.4.

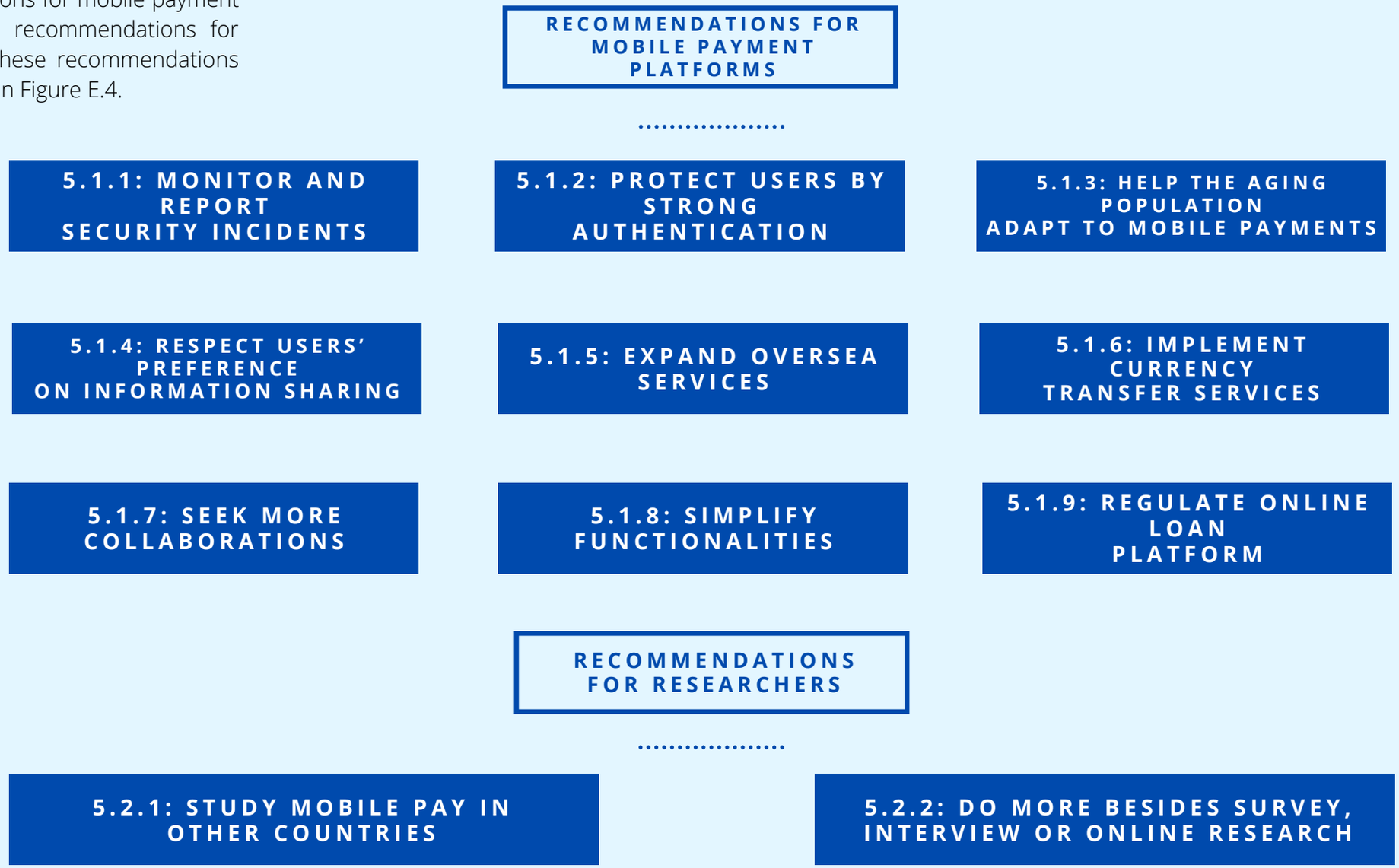

Figure E.4: Summary of Recommendations

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Our survey respondents who spared valuable time for completing the survey and sharing their views with us.

Our interviewees Professor Hui Zhang and Dr. Wenxuan Guo for providing us with useful resources and sparing their valuable time for the interview. Additionally, we would like to thank three of our teammates who participated in the key stakeholder interviews.

Finally, **our teammates,** for the extraordinary contribution, determination and hard work put towards the successful completion of this project.

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1:INTRODUCTION

The Internet first came to China in 1994 and within 20 years, it quickly penetrated the Chinese industry and commerce by bringing many fundamental changes to the traditional business model. Such changes positively affected the e-commerce of China, which refers to the process of exchanging products or information via the use of Internet. Today, most payment services in China are operated under financial regulations and are performed using a mobile device. This process is widely known as mobile payment. Mobile payment is a norm in China. In 2018, more than 80% of Chinese consumers used mobile payments in their daily lives (Rooney, 2019 as cited in Shen, 2020).

The country's eagerness to embrace the mobile payment technology is apparent in usage at grocery stores, airports, hotels, and every other place that you can think of. Strategies for improving the ease of purchasing and paying via a mobile system enabled the establishment of the use of Quick Response (QR) for mobile payments. By placing your smartphone's camera over a Quick Response (QR) code one is able to order food, transfer money, purchase a ticket, etc. From scanning QR code to confirming order, the only operation users need to do is to enter the payment password which is only 6-digits long. The users' smartphone devices contain all the information needed, so they do not have to worry about logging in. Additionally, if face identification (ID) or fingerprint recognition feature is supported by the smartphone, the user can always make purchases with it instead of entering passcode. It is as easy and convenient as that, but many still worry about mobile payment's security and reliability.

Alipay, owned by Alibaba Group, and WeChat, owned by Tencent Holdings, are pioneers in the mobile payment applications industry. Together, they control over 90% of the Chinese market (Shen, 2020). Additionally, Alibaba is considered to be China's (and the world's) biggest online commerce company. In 2004, Alibaba established Alipay, a third-party mobile and online payment platform that currently holds the first place in the world when it comes to mobile payment. The impact these applications have on the Chinese economy and on the life of the average Chinese citizen is great and is the subject of interest for our sponsors at Alipay.

Our sponsors wanted to know how to deploy mobile payment applications in the future, including what played an important role in the development of mobile payment in China, what are some outstanding issues within this industry, and what is the global growth potential of it?
By researching and presenting these questions, we were able to assist our sponsors in projecting the global growth potential of mobile pay in the future.

Though there is an existing body of research regarding the mobile payment industry, the majority of this literature has looked at the factors that made mobile payment flourish and barriers to adoption (Shen, 2020). Yet very few sources, have looked into what shape this industry will have in the future, and into what the level of implementation will be at the international scale.

Researchers have found that consumers face a series of challenges with mobile payment ranging from security, reliability, and fraud protection to the difficulty in adaptation to this new payment system from the aging society. Given the evolving nature and fast pace of this industry, periodical review and further research is needed to identify the aforementioned and other potential shortcomings. In order to understand the dynamics of the mobile payment industry in the present and how this can be more successful in the future, our team worked with our project sponsors to collect information on what mobile payment looks like for Alipay and what is the acceptance rate of their mobile payment application.

The goal of this project is to develop an understanding of China's mobile payment industry to address potential shortcomings, and to create recommendations that will transform these shortcomings into short- and long-term growth opportunities. To achieve this, we will utilize key stakeholder interviewing and surveying techniques to conduct research of what consumers use mobile payment applications for, how easy they are to use, and what issues do they face when using such applications. By addressing the sponsor's challenges, we hope that Alipay can address the mobile payment's shortcomings and that they will focus on the areas that have a growth potential within the mobile payment industry.

2:LITERATURE REVIEW

2.1: The E-Commerce Industry

According to Kotler (2017), the definition of the e-commerce is the buying and selling process that is supported by electronic means. Put simply, it is a term that describes the process of exchanging services, products, and information through the use of computer network. E-commerce became possible in 1991 when the Internet was first introduced to the public and opened for commercial use. In 1992, CompuServe started the first online retail, and it was the first time that people purchased things directly from their computers (Mourya & Gupta, 2015).

2.1.1 Development of E-Commerce

The notion of e-commerce in China sprouted in 1996 under the lead of a small group of innovators who saw business opportunities in combining the Internet with the traditional business model. In 1999, e-commerce websites such as 8848 and Alibaba were founded. Some of these companies are still the mainstay of China's e-business today. During the development process of China's e-commerce, the Chinese government played an irreplaceable role in creating an environment for e-commerce to thrive and bringing about the prosperity to this field. Based on the study done by Yue Hongfei (2017), the current development of China's e-commerce can be categorized into the following ways:

I. Explosive growth in E-commerce transactions

According to the Ali Research Institute (2016), up to 2016, the average annual growth rate of E-commerce transactions in China is over 38% over the 5 years period. Additionally, on 11 November 2016, where China's largest online shopping sale taking place, the trading volume on this single day was more than 120.7 billion yuan (1 yuan approximately equals 0.15 U.S dollar).

II. A strong trend of online shopping

Based on the data given by Ali Research Institute (2016), in 2001, among the total retail sales of goods, online shopping only accounted for 0.01%. However, in 2016, this number has grown to 14.3% and this number still keeps growing.

III. O2O model penetrated to traditional industry rapidly

The O2O (Online to Offline) model is the notion of combining offline goods with online goods. Orders are generated online while the payment is completed offline. Starting from 2011 to 2016, the Shenzhen online flight booking increased 23% and the online car service user penetration rate reached 19.4% in Beijing. Many traditional enterprises are stepping into this emerging business model and further stimulate the O2O penetration (Yue, 2017).

IV. The advantages of agriculture E-commerce

In order to accelerate the modernization of agriculture, the Chinese government launched several projects to support the joint of e-commerce platforms and agricultural products. Many mainstreaming e-commerce platforms sell agricultural products and this cooperation has generated many new business models in China such as farm to consumer (F2C), or Consumer ordering from farm(C2F) (Yue, 2017).

2.1.2 The History of Mobile Pay in China

China's mobile payment industry began with the launch of Alipay in 2004. Boosted by the rapidly growing use of smartphones, China's mobile payment businesses quickly expanded. In 2014, WeChat Pay, one of the dominant mobile payment services in China, attracted millions of users by distributing red packets (cash) during the Lunar New Year.
This distribution of red packets and other important holidays in China symbolize blessings and good luck, and mobile payment companies utilized them as a form of advertisement.People now can simply send the red packets to other people using their phones with few more clicks.

Additionally, with the adoption of QR codes in mobile payment, more and more commercial outlets in China, even for many roadside stands and groceries, started using QR codes as one of their primary methods to receive payment. China soon leapfrogged the mobile payment services in other countries and became the largest market in the mobile payment business (Huang et al., 2020). According to the report by the People's Bank of China (Zhang, 2018), there are over 60 billion transactions are made by mobile payment in 2018.

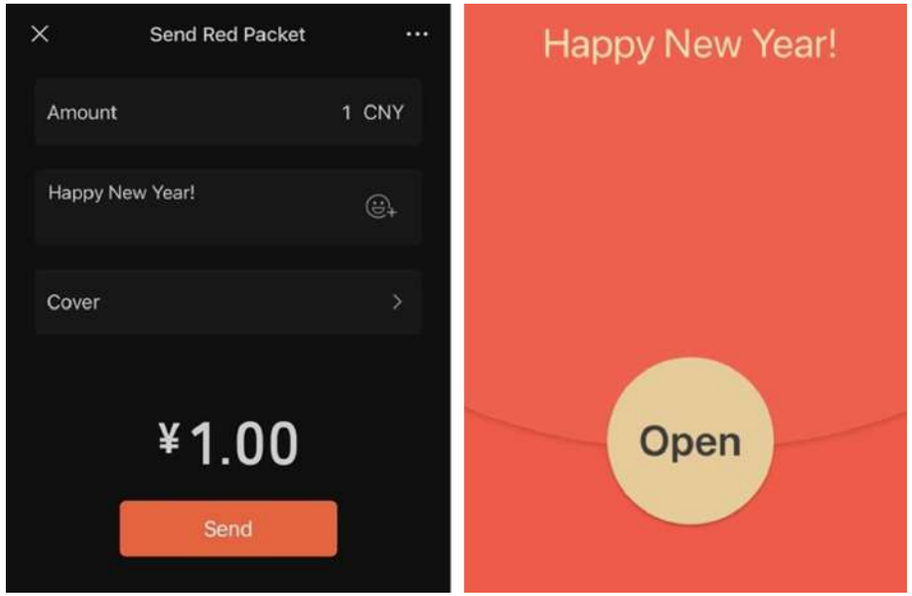


Figure 2.1: Sending and Receiving the red packet using mobile payment on WeChat

2.2: Companies in the Mobile Pay Field

AliPay by Alibaba group and WeChat Pay by Tencent Holdings dominate the mobile payments market of China. Even though, China-based Alipay and WeChat are giants in the mobile payment industry, there are other international companies that focus on mobile payment and have entered the Chinese market in the recent years. Among them, Apply Pay, and PayPal are the two most well-known foreign payment platforms.

2.2.1 Alipay

Alipay was originally launched by Alibaba at the very end of 2004 in order to facilitate transactions for Alibaba's e-commerce platform called Taobao (see Fig. 2.1). Starting from 2011, Alipay was redesigned and granted to offer third-party payment services (Shen et al., 2020). The mobile payment business has experienced a rapid boom in recent years and the active users of Alipay quickly grew from 100 million in 2012 to over 900 million in 2018 (Huang et al., 2020). In China today, the number of active users is still increasing. Alipay provides services to its users in various areas, for example, users can use Alipay for ordering taxis or food, they can also use it for making investments in stocks or funds. One feature of Alipay is its implementation of Sesame Credit, a digital social credit system that is generated based on each Chinese citizen's activities. The algorithm gives each customer a score according to factors such as purchasing behavior and loan history. It can be used to reflect each consumer's traits and morality and such a credit system in China has already become an indispensable factor in everyone's financial life. Until today, there are still debates and concerns regarding the intrusive nature of the Sesame Credit (Chong, 2019).

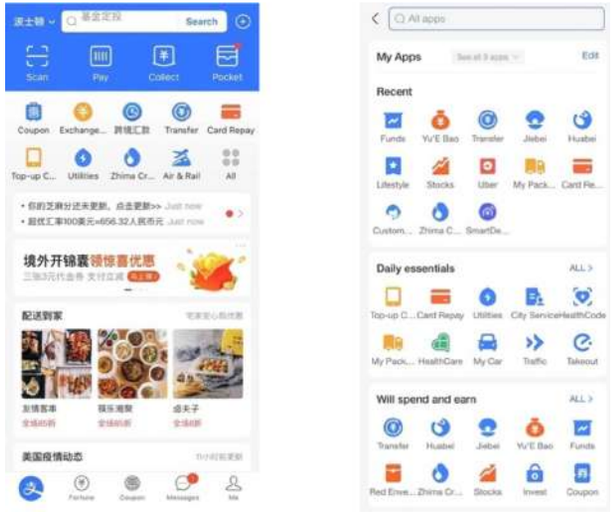


Figure 2.2: Screenshot of Alipay and its partial services, ranging from Transportation to Investment

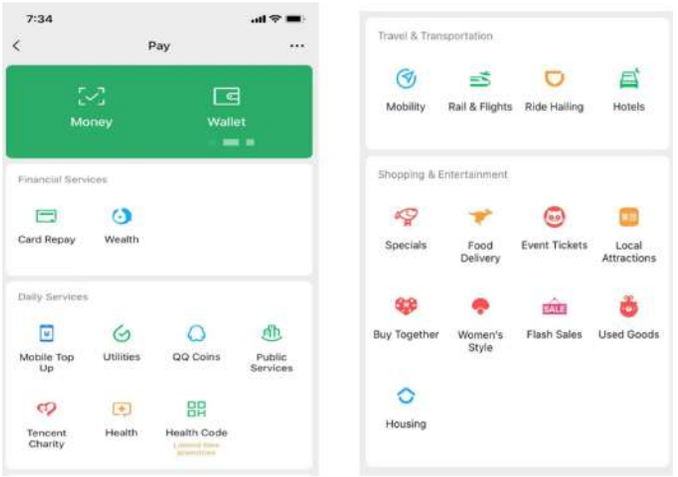


Figure 2.3: Screenshot of WeChat Pay

2.2.2 WeChat

WeChat Pay was launched by Tencent Holdings' WeChat group in 2016. It was reported that in the last quarter of 2020 WeChat already had 1.2 billion monthly active users from a wide range of age groups (Thomala, n.d.).

This large user base helped WeChat Pay rapidly become one of the two biggest mobile payments platforms and digital wallets in China. As mentioned in Section 2.1.2, the first large step of development of WeChat Pay was brought by the Lunar Chinese New Year and the related traditional manners. Also, as the biggest competitor of AliPay in China's market, WeChat Pay provides diverse services including credit card repay and transportation. While AliPay holds the largest capital when it comes to monetary transactions, WeChat Pay holds the first place when it comes to the largest number of users.

2.2.3 PayPal

PayPal, launched in 1999, is one of the earliest and biggest online payment platforms. Starting from 2006, PayPal entered the field of mobile payment and published the mobile payment product Venmo in 2016.

In 2017, PayPal established connections and strategic cooperation with Baidu and Alibaba, two internet technology giants in China (Russel, n.d.). This represents the accomplishment that PayPal became the first foreign mobile payment platform in China. Although PayPal is not a familiar payment platform for most Chinese consumers due to the strong market occupancies of AliPay and WeChat, it still became the most popular payment product for Chinese companies and individuals to accept or transfer foreign currency.

2.2.4 Apple Pay

Apple Pay was published in autumn of 2014 by Apple Inc. It is a mobile payment product, allowing users to make payments in iOS apps and online Its development history is similar to the one of WeChat Pay. With the help of the market occupancy of Apple Inc, Apply Pay develops at a high speed. In 2016, Apple Pay entered China's market.

And in 2018, with the NFC (Near Field Communication) technology Apple Pay supports the Shanghai Public Transport Card and Beijing Transportation Card for local public transportation including buses and subways, which is one of Apple Pay's strategies to adapt to China's market (Where You Can Ride Transit with Apple Pay, n.d.). However, its influence in China is not enough to challenge AliPay and WeChat Pay even just on transportation payments. Most payments made by Apple Pay in China are still just for the purchases in iOS AppStore.

2.3: Implementations for Mobile Pay Applications

Nowadays, as the amount of information we are exposed to becomes bigger, the devices used to access this kind of information are getting smaller. It is said that being more space-efficient is the tendency of the development of the world, that is why mobile payment applications were invented. Their primary goal is to be efficient and easy to use and to combine various functionalities in a single application. Such functionalities will be explored in this section.

2.3.1 Transportation

China is well-known for having the world's biggest population. This high population density leads to many problems, and problems with transportation are some of the most severe ones.

In the past, Chinese citizens used cash, transportation cards or one / two-way tickets for transportation. According to Chen, G's team, "the service efficiency of the cash as the first choice is higher than that of the integrated circuit (IC) card which is usually used to pay for buses or subways- as the first choice under the uncrowded condition but lower under the crowded condition." though using QR code to pay for the ticket takes longer time per se during spare time, it has a better performance at peak times. What is more, QR pay has more potentials, because the only drawback for that is the possibility of scan failure that could be caused by bad Internet connection, environment interface or even the light conditions, however, they can all be improved by the technology development.

Recently, HUAWEI announced an innovative technology, which enables the cell phones to automatically display the QR code when being detected by the turnstile. Also, the experiment of Chen, G's team is based on the payment process without taking the time to find payment items into account, which can also be time consuming.

The convenience when it comes to using mobile payment applications as transportation cards is great. During peak times, small pieces such as coins or transportations card can be easily lost, but cell phones seldom have that issue, not to mentioning the heavy usage of cell phones, according to Shen, H's team, Mobile Pay is so important in daily lives in China so that people are likely to lose their cell phone. In conclusion, Mobile Pay is a satisfactory replacement for traditional transportation payment.

2.3.2 Credit Card Payment

Due to the safety policy in China, everyone who is getting a mobile payment account needs to follow a real-name system procedure, in addition, a bank account, or a credit/debit card is also required. Given mobile payment's convenience, its users are able to pay their credit card bills using their mobile device. It is common for credit card holders to fail to pay bills in time, that is where mobile payment applications come in with their automatic and scheduled payments.

2.3.3 Fund/Stock

This can be considered as an extension functionality of the mobile payment applications. To buy stocks or funds, we had to set up a special account in the bank or exchange, but with the help of a Mobile Pay account, which can be connected to a bank account directly, it can be accomplished by a few taps in the app. Take Alipay as an example, its Fund / Stock function attracts average 32-millions of people's attention per day. Fund / Stock services provided on Alipay also offer categorized related news so that the consumers would be able to better analyze and finish their investing. Indeed, thanks to this service and a large base of users, Alipay successfully bring Fund / Stock to the public, which was normally sold to a small target group, but there could be both advantages and disadvantages.

On the positive side, Alipay improves people's attitude towards fiscal management, something existed, but not familiar to most of the people. On the negative side, anyone who has spare money can easily buy Fund / Stock. In other words, the threshold of entering the market decreases in a significant amount, which could be bad for those followers who have little knowledge about the market, because they are likely to be influenced by market volatility and even rumors.

2.4: Potential Problems

As mobile payment booms, new questions arise. Although mobile payment provides benefits to citizens, it also creates several social problems that include: problems with the aging society, information leakage, fraud etc. This section provides an overview of the plethora of social problems mobile payment applications can lead to.

2.4.1 Aging Society

Today, China is facing an aging society issue. In a survey from 2019, in China, young individuals use information technology far more frequently than the elderly generation (Song et al., 2019). When mobile pay is universal everywhere, elderly individuals using information tech rarely will have lots of inconvenience and even troubles in their daily life. For example, some elderly people have to memorize the passwords of credit cards or bring enough cash to buy items from a store while most young people just need to bring their cellphones. The generational gap of society is considered to be intensified. Thus, helping more aging people to be familiar with smartphones and mobile-pay apps is significant for the boom in mobile payments.

There is a possible way to solve this issue. Elderly individuals tend to pay more attention to their physical and mental health. One research from Hao (2019) used statistical methods to find the relationship between internet use and mental health. As a result, he concluded that frequent use of the Internet reduces the risk of suffering psychological and mental diseases. Thus, advertisments combined between mental health and Internet use may inspire old people's active learning of information tech.

2.4.2 Information Leakage for Data Security

Most apps require its user to authorize other functions or accesses like position, text message, and storage. It is reasonable for most mobile apps, but inconsistency happens sometimes. Inconsistency means apps provide text descriptions for their functions and requirements different from the fact. From the research of Takuya's group (2018), this inconsistency sometimes allows the third party to view everything on the device. If those risky apps are installed and having your authorizations for information on your device, it is easy for criminals to extract data related to mobile-pay apps. As a result, money in the mobile-pay platform is easily stolen. Thus, an appropriate shield program is necessary for a mobile-pay app to defend from invading.

Also, mobile-pay apps require to upload identification documents always. It seems good to prevent some potential crimes. However, information leakage may lead to worse results. From research in 2020, 90 percent of their samples have experienced at least once from online theft of financial assets, reception of spam emails, unauthorized access to online personal accounts, and experiences of online bully and harassment because of information leakage (Chen & Atkin., 2021). Thus, data and privacy protection are necessary and required for mobile-pay apps.

2.4.3 Fraud and Fake QR Code

QR Code is a kind of matrix barcode with black and white squares. Nowadays, it has been widely applied in many fields, like education, mobile payment, and basic sciences. In China, people only need to scan the QR code to finish the transaction wherever they are. Admittedly, QR codes bring a lot of convenience to our life. However, problems appear. In 2020, the Guangzhou police department published details of a case where a man adjusted a seller's payment QR code to his to make profits in the night (Wu & Zhang., 2020). Obviously, committing crimes utilizing QR codes does not require any kind of technological expertise, so caution in this area is important for mobile payment companies in particular and society as a whole.

Also, as mobile payment marches into our everyday lives with a fast pace, scams are everywhere to be found. An article presents that although the real-name system has been applied, it is hard to give punishment to scammers since they can use the fake identities (Li, 2020). Furthermore, more distinct types of scams have been found on WeChat. Li (2020) and her group, in their article, came across a WeChat business fraud, an abroad purchasing agent fraud, the hacking of a WeChat account, and 6 more frauds. There are no guarantees that there will be no new scams on WeChat and other mobile-pay platforms. Thus, preventing mobile payment users from exposure to such scams, is important.

2.5: Growth Potential

Factors that have contributed to mobile payment's flourishing around the globe will continue to do so in the next 5 to 10 years (see Figure 2.4). China is the best case to be used as an example, as mobile payment has invaded almost every aspect of its economy. Sources predict that the global mobile payment market is expected to grow at a Compound Annual Growth rate (CAGR) of 34% from 2017 to 2023 (Indexes, 2018). To predict how the mobile payment industry will shape up in the years to come, we will have to look into the industry's effect on household welfare, the expansion and sophistication of the financial industry, the adoption of Alipay and WeChat overseas, and the revolution of mobile payments through the use of biometrics. Researchers suggest that the aforementioned should serve as points of focus for investors and researchers in the mobile payment field (Pang, 2020).

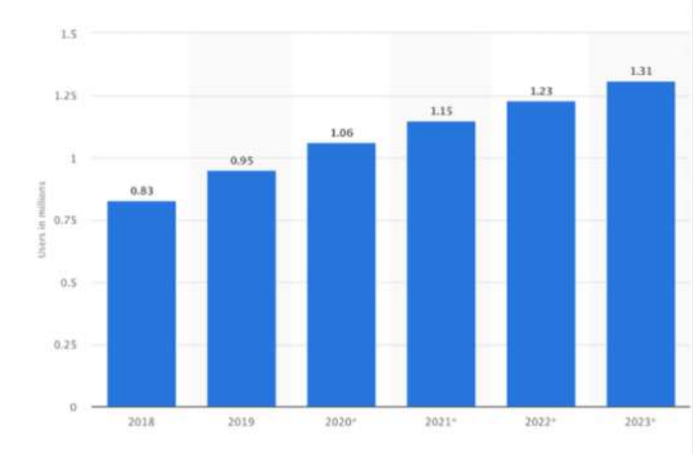


Figure 2.4: Number of proximity mobile payment transaction users worldwide in 2018 and 2019, with forecasts from 2020 to 2023. Reprinted from Statista.com (De Best, 2021).

2.5.1 Household Welfare

Given that mobile payment platforms provide broader access to financial services, this raises the level of involvement family members can have on financial decisions and also raises the level of financial risk sharing among family members. This involvement in financial decision translates into individuals having the chance to make decisions based on careful planning and collaboration with their household members. Even if high-risk financial decisions are made and these decisions proved to be wrong, family members are always there to help through mobile payment. Huang (2020) has found that it is more likely for households in areas with better-developed mobile payment infrastructure to receive transfer from friends or relatives when dealing with a financial risk.

Additionally, mobile payments trigger skills sharing among household members as they adopt new technology practices. When a consumer tries to purchase something through mobile payment a discussion with friends or relatives regarding this payment method is inevitable. The latter would share usage tips, personal experiences or suggestions which raise the level of interaction within the two. The sharing process of such technical and social information between individuals builds a certain level of trust and familiarity, but this social effect is short-lived as it focuses only on the technical side of the issue (Xi, 2021). As average households are still somewhat unfamiliar with the use of mobile payment in their financial endeavors, further research is needed to identify the effects of this industry on household welfare and risk-sharing.

2.5.2 The Future of the Financial Industry

Mobile payments are revolutionizing the financial industry by intriguing banks as financial institutions to get involved in the mobile payment field to provide better service for their customers. Bank customers are leaning towards using digital debit or credit cards instead of physical cards. Indexes argue that "the World Economic Forum forecasts such huge investments will dent credit card volumes in the future as the mobile payment industry starts to offer innovative alternatives to physical cards." The Institute of Electrical and Electronics Engineers (IEEE) predicts that mobile payments could completely replace forms of physical payment by 2030 (Indexes, 2020).

To allow customers to use a credit card or create a direct deposit, businesses would have to connect with financial institutions via phone calls or emails. The use of mobile payment applications makes that process much easier, as these applications have technologies built in them that do the work for you. Additionally, as banks feel the pressure that the booming of e-payments are putting on them, they are becoming more innovative and competitive. They are lowering fees, simplifying payment statements and transactions, and offering more and more digital alternatives to communicate and do business with them. Competition yields advancement, development, and innovation, so the mobile payment industry challenging the financial industry, is nothing but a growth component for both.

2.5.3 Alipay and WeChat in Foreign Countries

Countries worldwide have spotted out the potential that the mobile payment industry has and are turning their eyes towards China and its biggest companies. The two countries who have shown the greatest interest on the possible adoption of Alipay and WeChat are the United States of America and Canada. In 2017, both Alipay and WeChat landed in the U.S. starting a race between each other (Matcheel, 2017). The owners of Alipay and WeChat were interested in expanding their range of influence as Chinese consumers were interested in products that the U.S. market offered. Studies suggested that the U.S. could have passed China in mobile payments usage in 2018, but in 2020 China is still first in the market (Figure 2.5). Alipay and WeChat create tremendous competition for America's own Apple Pay.

At the same time, Canada uses a completely different mobile payment system than China, called the Near Field Communication (NFC) to send card information to facilitate the fund transfer (Nam, 2020). Despite that, AliPay and WeChat Pay presence in over 10 Canadian business ranging from small to multinational businesses in a wide variety of business sectors (Nam, 2020). It looks like Alipay's and WeChat's presence in Canada has led Canadian policymakers and business owners to view mobile payments with greater interest. Even though we used U.S.A and Canada as examples, Alipay's and WeChat's popularity and adoption are spreading around the world at a fast pace.

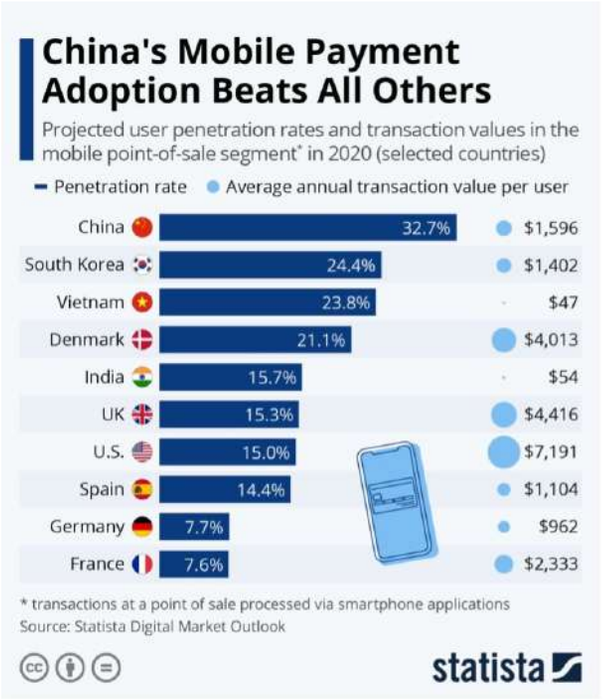


Figure 2.5: Projected user penetrations and transaction values in the mobile point-of-sale segment in 2020. Reprinted from Statista.com. (Buchholz, 2020)

2.5.4 Contactless Mobile Payments

Advancements in technology have introduced and will continue to introduce us to contactless mobile payments that include wearable devices (smartwatches etc.) and also applications that will use fingerprints and face recognition as forms of identification. The way and pace to which these technologies develop, have a great impact on mobile payment industry's future.

We already possess devices with near-field communication (NFC) such as wristbands, smartwatches, and other accessories, which play a key role in the future development of mobile payments (Indexes, 2020). This being said, innovators are not limiting themselves to only wearable devices, but they are also looking for tools we already use in our everyday life with NFC technology.

From the face recognition feature in our smartphones when we attempt to make a mobile payment to the use of our digital fingerprint, biometrics are already revolutionizing the mobile payment industry. The biometric authentication utilizes an individual's face, retina, DNA, and fingerprints to identify a person; company owners are looking to utilize these features in their mobile payment applications. Indexes state that "Acuity Market Intelligence forecasts that, annual revenue from biometrics embedded in mobile devices, biometric app downloads, and biometric transactions authentication are projected to grow from $6.5 billion in 2016 to $50.6 billion in 2022." Many are hesitant about this forecast, as they are worried about privacy protection, social exclusion, and issues with informed consent.

2.6: Gaps in Literature

Throughout our research we ran through numerous sources that studied the mobile payment industry, but there still were some gaps in the studies that suggested that certain components of this industry are yet to be explored. These components include lack of statistical data on the effect of digital financial inclusion to mobile pay users, analysis of failure and merchant adoption. Only 4 % of the total number of studies conducted on mobile payment, have done an analysis on failure of this industry and similarly, only 4% of the sources have studied merchant adoption of the mobile payment applications (de Albuquerque, 2016). We found out that few sources have incorporated the effect of digital financial inclusion into the analysis (Huang, 2020). Given all the information gathered from researchers in the field, local and international news platforms, we still do not have a good description of how mobile payment applications are incorporated into people's lives, how they use them and what these users look like in terms of demographics.

2.7: Background Summary

In conclusion, the e-commerce has experienced a rapid growth in China following the introduction of the Internet. Companies such as Alibaba that were initially found targeting the e-commerce market also started engaging in the mobile payment service. The prosperity of mobile payment service greatly boosts the development of e-commerce. Then, using credit card, buying stock, and visiting online market are generalized and popular in China. More fields, including public transportations and utility bills payments, start to involve mobile payment. Nowadays, daily life has strongly connected with mobile payment. Mobile payment has become a necessity for Chinese citizens. As mentioned above, more technologies are predicted to be applied on mobile payment industry. With existing and predictable investments and development, mobile payment is considered to have a really high growth potential.

METHODS

The goal of this project is to develop an understanding of China's mobile payment industry , to address potential shortcomings and to create recommendations that will transform these shortcomings into short and long-term growth opportunities. In order to achieve this goal, we developed the following research objectives:

1. Identify AliPay's potential shortcomings.
2. Assess key stakeholders' perception of Alipay.
3. Identify mobile pay's growth opportunities.

3.1: Identify Mobile Payment's Potential Shortcomings

Our team had a closer look at the potential problems Chinese citizens have faced when using mobile payment applications. We collected users' opinion and experiences through the design of a web-based survey using Qualtrics. We anticipated reaching a minimum of 100 Chinese citizens of legal age (18+) with the hope and achieved a total of 134 survey participants. Specifically, the survey collected data on user demographics, user experience and ease of use. With Mayring's seven step-method in mind, we determined the research questions and decided to use both open and close-ended questions (Assarroudi et al., 2018). A copy of our draft survey can be found in Appendix A.

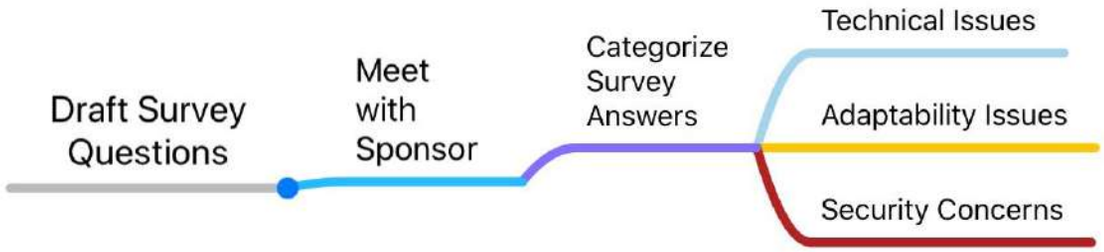


Figure 3.1: Overview of Objective 1

3.1.1 Administering the Survey

To distribute our survey to our target audience (Chinese mobile pay users 18+), we used Qualtrics. Qualtrics enabled us to have a clear data coding strategy that improves the trustworthiness of the study and helps in the distinction of the information collected (Assarroudi et al., 2018). Due to international travel restrictions because of the Covid-19 pandemic, our project was conducted completely virtually. Therefore, the only survey distribution channel we had access to, was internet technology.

The methods we used to reach survey-takers are email survey, QR code integration and social media integration. When emailing our participants, we shared the survey via a Uniform Resource Locator (URL) link and also through a Quick Responding (QR) code. The project advisors assisted us in the distribution of the URL link and the QR code to Chinese citizens of the specifications described above. Additionally, our team members distributed the survey through their personal connections via social media platforms. We translated our survey questions and consent letter from English to Chinese to make it more accessible for our respondents.

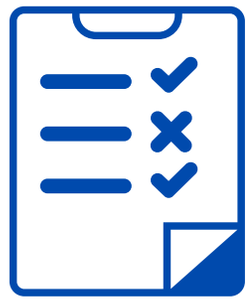
Despite the project's advantages, there were certain limitations to it. First, we were not able to hand out the survey to respondents in-person, which resulted in a lower turnout. Second, members of the aging society in China were less likely to answer the survey because they might lack access to technology, or do not possess the skills needed to access the survey. This narrowed down the range of responses we got and reduce the sample size. These limitations motivated us to work harder on advertising and distributing our survey and led us to consider incentives for the respondents who take the survey, but we ended up not using them.

3.1.2 Data Analysis

After receiving the survey results, we translated all answers from Chinese to English, combining the use of Google Translate with our team members' proficiency in the Chinese language. We coded the survey responses by carefully reading all of them, identifying common themes among the answers and dividing them into three categories: technical issues (usage of Alipay or specific problematic features), adaptability issues (aging society difficulties) and security concerns. First, in terms of close-ended question, focused on descriptive statistics when analyzing responses. Qualtrics provided us with frequency response data (bar charts and percentages), generated from the close-ended questions.

We were able to see the age distribution of our respondents and variance of responses from different age group. Through this information we identified which answers were the most frequent and who the survey respondents were (demographics information). Second, we used content analysis as the primary method to draw inferences about the meaning of the open-ended responses. We read through all open-ended responses and identified the presence of certain words or themes in order to quantify the responses (Fink, 2017). The specific themes were presented in the form of pie charts and infographics.

To present our survey results we created a set of animated infographics. This informational report combined animations with the extremely important and engaging survey data. This infographic consisted of a list of potential issues or shortcomings of mobile payment that were identified by the surveyed Chinese citizens. This summarizing list gave us the opportunity to better understand these underlying issues and provided us with the ability to draft a complete and well-informed set of recommendations for our sponsors.



3.2: Assess Key Stakeholders' Perception of Alipay

We set out to understand what the perception of certain individuals is regarding the use of Alipay in their everyday lives. To identify common themes between our research and the literature review, and to get the perspective of the mobile payment industry's insiders, we decided to conduct semi-structured interviews with the project's key stakeholders. Some examples of key stakeholders are: Alipay users above the age of 18 that are located in China, Chinese mobile payment companies' employees (executives and/or directors) and researchers in the Chinese mobile payment field.

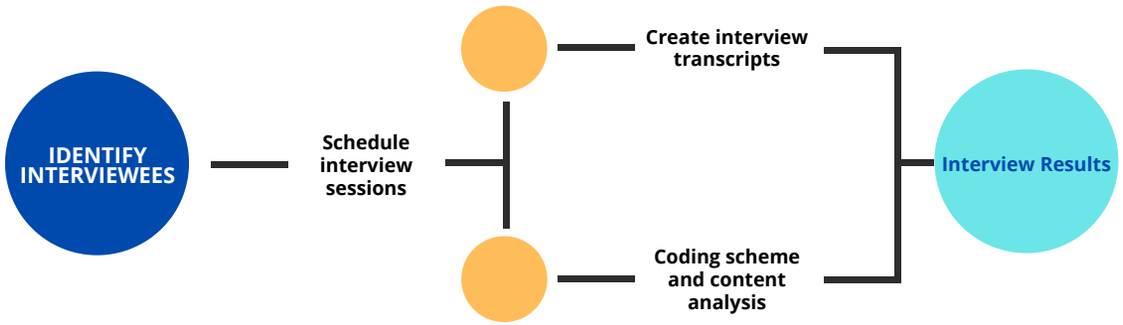


Figure 3.2: Overview of Objective 2

3.2.1 Administering the Interview Sessions

The purpose of these semi-structured interview is to get an insider's opinion on mobile payment in general and Alipay specifically. The interview questions we designed are based on the following research questions:

- What are the effects of mobile payment in the Chinese economy?
- What do you wish, as sponsors, to get out of this project?
- What are some challenges you have faced with mobile payment?
- Is there a specific target group we should focus on when projecting the growth potential of mobile pay?

The aforementioned questions are a summary of the complete interview questionnaire. A copy of the draft interview questionnaire can be found in Appendix B. Interview questions were edited and adapted to each interviewee's professional background and level of expertise in the mobile payment field.

We anticipate conducting at least one key stakeholder interview and ended up reaching five interviews. Two of the interviewees were sponsors and experts in the mobile payment field, respectively. To recruit interviewees, we relied on the project advisors' connections and support. Once the interviewees were identified, we reached out to them via email to introduce ourselves and our project and invited them to virtual interview via Zoom. Interview questions were be sent to stakeholders prior to the interview to provide them with the opportunity to better prepare themselves. Our questions were designed so that the interview would not last more than one hour, but given the interviewees' busy schedules, we are hoped to occupy 30-40 minutes of their time. All interviews were conducted in English, as interviewees were fluent English speakers.

3.2.2 Data Analysis

Before starting the interviews, we obtained verbal consent from the interviewees to record the Zoom meeting. Two team members served as notetakers and one served as an observer to note the interviewee's reaction to questions (facial expressions and body movement). The collection of the aforementioned gave us the opportunity to pay attention to every detail and draw conclusions based on the themes that occurred from the interviews.

We constructed interview transcripts for each of the sessions and numbered and anonymized such transcripts to protect the stakeholders' identities. Regarding the analysis of interview transcripts, we developed a preliminary coding scheme which was defined by a specific set of words and phrases. We first drafted codes by coming up with some certain topics or theme that respondents answered for our questions. We then revised and tested our codes to ensure its reliability. Following the completion of the development for our code dictionary, we then used the content analysis as our primary method to annotate responses. When annotating the transcript for the interview and responses from survey, we were able to categorize the data by our codes so that we could easily identify patterns, themes or trends that occurred in responses. Transcripts and all other interview-related findings are included in this final project report in the form of and appendix.

3.3 :Identify Mobile Payment Industry's Growth Potential

Increase in the use of smartphones across the globe and the rise of the e-commerce, are the major factors pushing forward the growth of the mobile payment industry globally. Our aim is to further identify this growth potential and present our project sponsors with a list of opportunities for them to explore when coming up with their future strategic initiatives and mobile payment products.

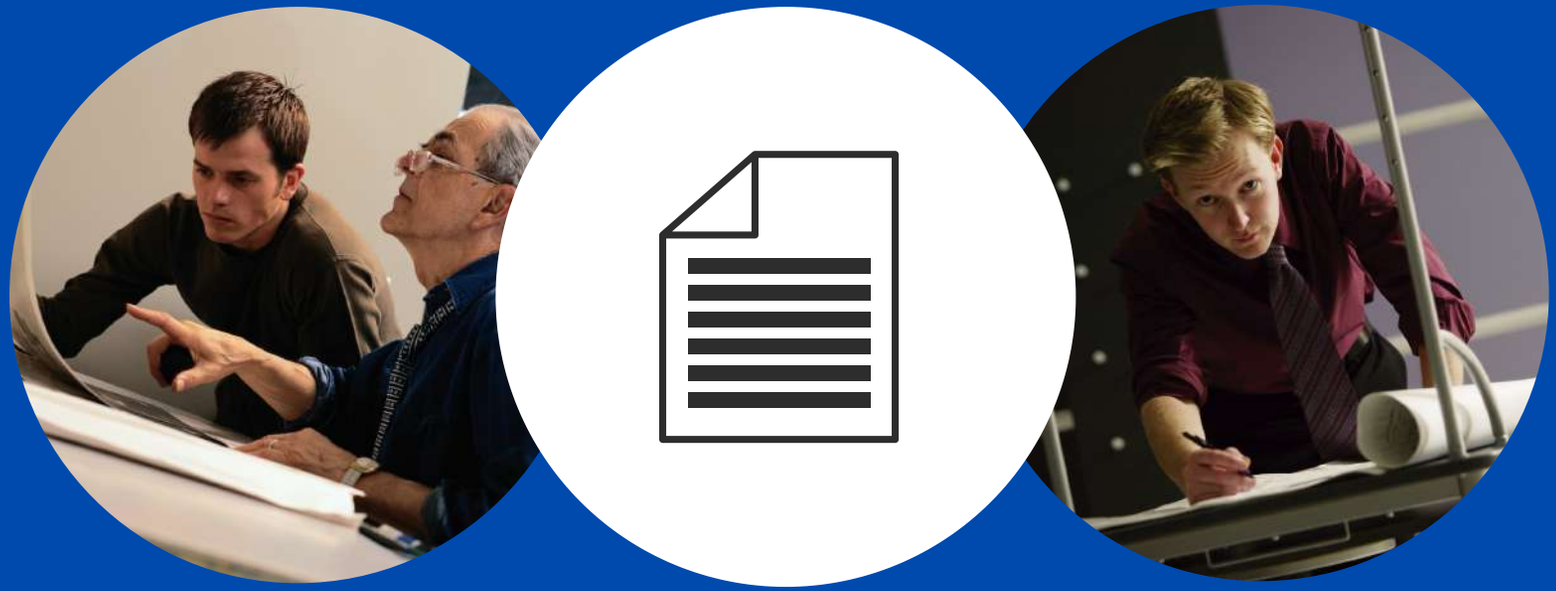
3.3.1 Data Collection

To achieve this objective, we used some of the results generated from the survey and interviews outlined in objectives 1 and 2, and also, we conducted further literature review during the first weeks of our Interactive Qualifying Project. Specifically, from the survey developed in objective 1 we focused on the results of questions 3, 12 and 13, as they are closely related to the growth potential (see Appendix A). From the transcripts constructed during the interviews with our key stakeholders, we extracted only the information that relates to the interviewees' suggestions and/or aspirations for the mobile payment industry. Lastly, we review scholarly sources that focus on the latest trends of the mobile payment industry, the driving factors of such industry and market share categorized by industry.

3.3.2 Data Analysis

To guide our sponsor's market strategy for the years to come, based on the information described in Section 3.3.1, we conducted a SWOT analysis. Essentially, we took a detailed look into the mobile payment industry to determine where this industry is strong (what markets and target groups), where it could strengthen its positions, areas of growth, and outside factors that could alter this industry's outcomes. After the information was placed and divided into each of the four categories, we started looking for connections. We attempted to draw clear lines between strengths and opportunities, as these two factors contribute to the development of mobile payment. Nevertheless, we did not disregard the weaknesses and threats. A final comparison between the strength-opportunities and the weaknesses-threats duo was conducted. Finally, the findings for objective 3 a presented in the form of an animated infographic with an engaging and understandable SWOT table.

4: FINDINGS



We analyzed the results from both the user experience survey and the key stakeholder interviews

4.1: SURVEY RESULTS-DEMOGRAPHICS

Our team collected information about users' experience with mobile payment and user demographics through multiple choice and open ended questions. The survey inquired about 19 questions in total, but given that three questions were open-ended, more than half of the respondents chose not to answer these specific questions. We received **134** responses on our survey, but since most questions were optional, some questions were left unanswered.

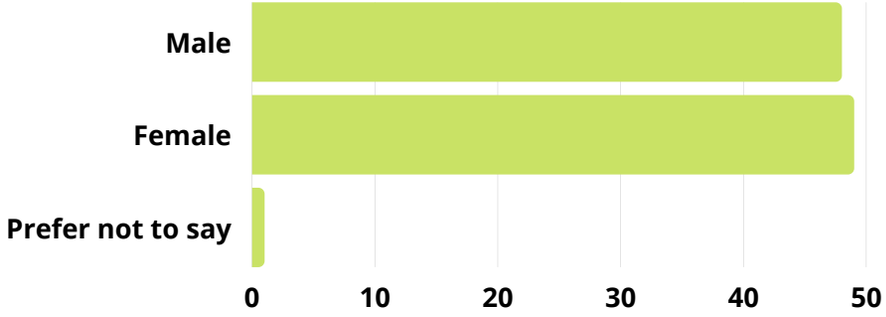


Figure 4.1: Gender demographics of survey takers

Figure 4.1 represents the gender demographics. Out of 98 responses, 48 of the respondents are males, 49 are females and 1 respondent preferred not to say. When converting these numbers into percentages we have 49.98% males, 50.00% females and 1.02% who preferred not to say; these percentages suggests that gender did not play a role in swaying the responses one way or another.

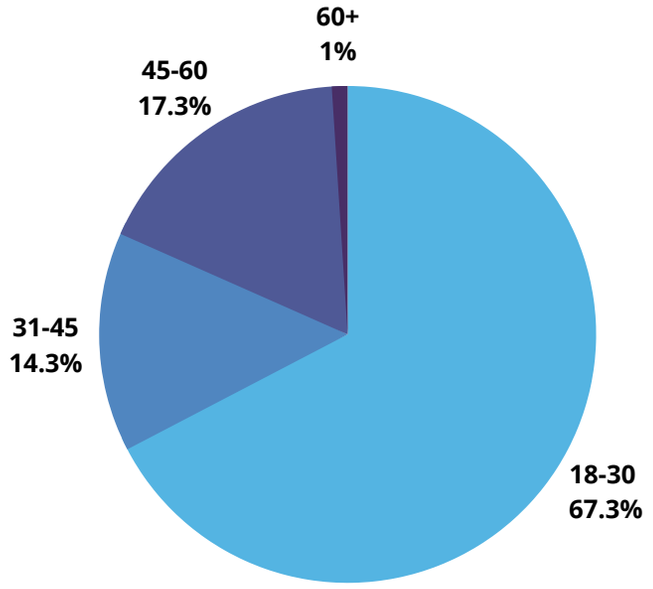


Figure 4.2: Age demographics of survey takers

Figure 4.2 represents the age demographics. Out of 98 responses, 66 or 67.35% of the respondents are between the ages of 18 to 30. 14 or 14.29% of the respondents are between the ages of 31 to 45 and 17 or 17.35% of the respondents are between the ages of 45-60. Only one respondent reported to be over the age of 60, which may lead to an issue of identifying the result, but according to our finding, the impact is relatively small.

The pie chart exemplifies the fact that we received an abundance of from Chinese citizens in the age group 18-30 in comparison to the other age groups. This age distribution was expected, as we discussed in previous sections of this report that younger generations are more prone to using mobile payment applications and are more eager to answer web-based surveys.

4.1: SURVEY RESULTS-DEMOGRAPHICS

Figure 4.3: Map of China with circled provinces in which our respondents reported to be located

Figure 4.4 displays the location demographics of the survey takers. In this map we have circled all provinces from which we received survey responses. From the map we realize that we had an even distribution of the survey taker's location. Even though we did not cover every province of China, the ones already covered will generate sufficient data.

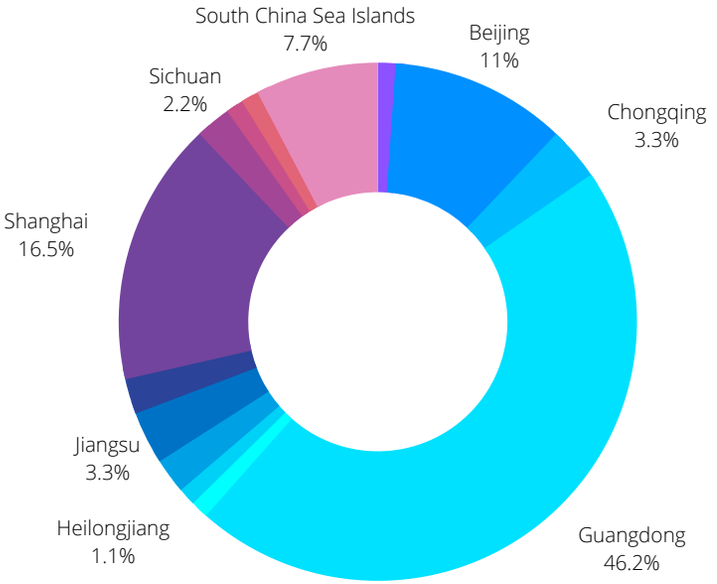


Figure 4.4: Location demographics of survey takers

Based on the percentages presented in the above chart: out of 91 respondents, 45.05% were located in the Guangdong province, 16.48% were located in Shanghai and the rest of the percentages were significantly smaller.

4.1: SURVEY RESULTS-USER EXPERIENCE

	Choice Count	
微信支付 WeChat Pay	44.54 %	**102**
支付宝 ALIPAY	39.47 %	**91**
Pay	11.35 %	**26**

Figure 4.5: Mobile payment applications survey takers have used

Figure 4.5 shows that 44.54 % of respondents have used WeChat Pay in their daily lives, 39.47 % have used Alipay, 11.35 % have used Apple Pay and 4.37 % reported to have used other mobile payment applications such as PayPal. This question was asked to highlight the two most used mobile payment services in China; the results were predictable, WeChat and Alipay hold the first place when it comes to mobile payment.

We then asked our respondents to inform us about the amount of cash they still bring with them in their daily activities. The results in Figure 4.6 show how widespread and important the use of mobile payment is the lives of Chinese citizens. It turns out that close to half, 41 out of 112 respondents, bring no cash with them, as WeChat and Alipay are there to help in any time.

37 or 33.04 % of the survey takers bring about 100 ¥ in cash, 21 or 18.75 % bring about 500 ¥ and a very small percentage (7.14 %) bring about 1000 ¥ with them. These percentages show how dependent and confident to mobile payment applications Chinese citizens are. The more applications like WeChat and Alipay are being used, the less likely are Chinese citizens to bring cash with them.

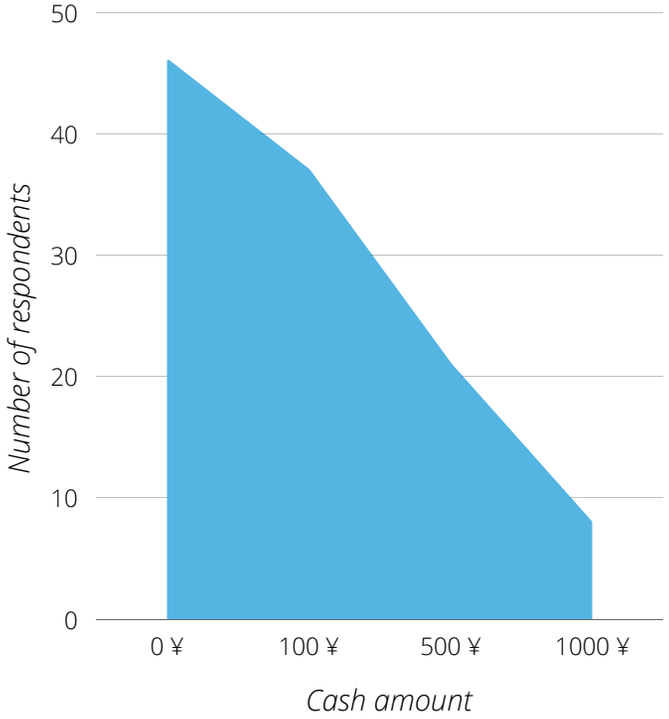


Figure 4.6: Amount of cash survey respondents bring with them

When asked what they use mobile payment applications for, the responses were very diverse. Out of 554 responses, most survey takers selected each of the multiple each of the multiple choice options we provided in the survey. This shows that mobile payment in China is flourishing in all sectors of commerce and service and does not concentrate on one area, but rather a multifaceted one. Figure 4.7 shows the specific findings.

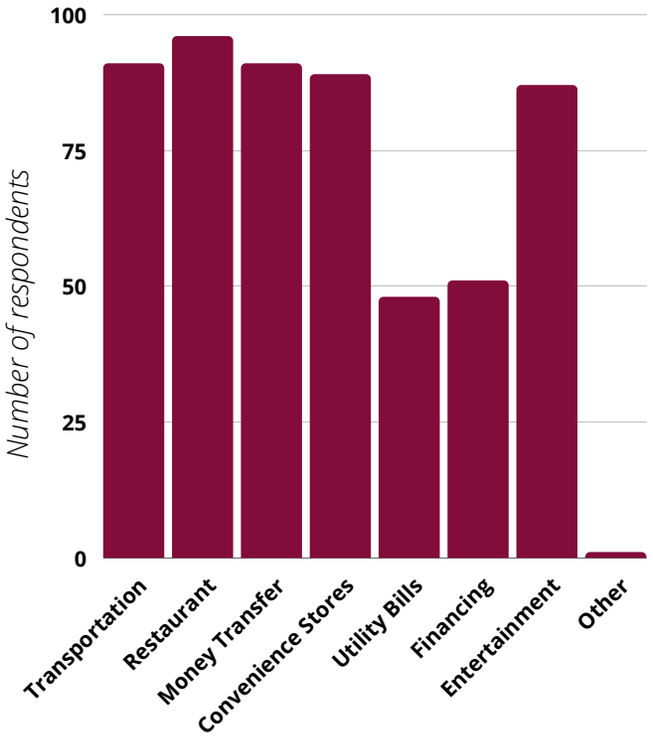


Figure 4.7: Usage of Mobile Payment Applications

4.1: SURVEY RESULTS-USER EXPERIENCE

Our team was also interested in finding out when the booming of mobile payment started in China. That is why we asked our respondents to identify the amount of time they have been using mobile payment applications for. 66 out of 102 respondents or 64.71% reported to have been using mobile payment applications for 3-5 years, 29.41% reported to have been using it for 6 years or more, 4.90% have been using mobile payment for 1-2 years, and only 0.98% have been using it for less than a year. These numbers suggest that Chinese citizens started using massively mobile payment applications about 3-5 years ago. This timeframe also coincides with the rise of mobile payment giants AliPay and WeChat.

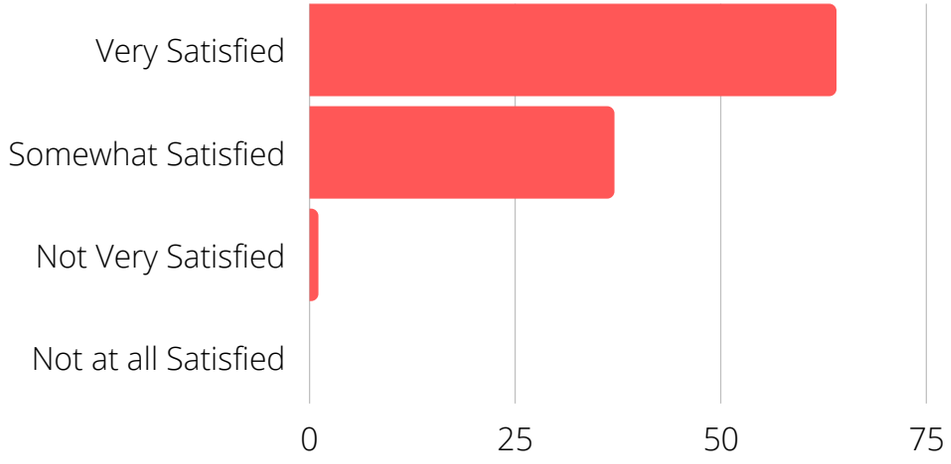


Figure 4.8: User satisfaction regarding mobile payment applications

Our project's first objective focuses on identifying mobile payment's potential shortcomings that is why in our survey we included questions that related to users' experience. When asked how satisfied they are with the overall experience with mobile payment applications, 62.75% of the respondents reported to be very satisfied, 36.27% were somewhat satisfied and only 0.98% were not very satisfied (see Fig. 4.8). The majority of respondents were very satisfied, but still a large percentage were somewhat satisfied, and that is concerning.

We then asked respondents to explain their satisfaction level with an open ended question. After translating and coding the responses, it occurred that the advantages of mobile payment outweighed the disadvantages. The words convenience and efficiency appeared 47 times in the survey takers written responses, not needing to bring cash or a wallet appeared 10 times, the word sanitary appeared 3 times, no need to get change (4 times); discount and coupons (2 times); security(6 times); provide clear a note of receipts(1 time). When it comes to disadvantages, internet dependence appeared 3 times, Security appeared 1 time; Slow when withdrawing money appeared 1 time.

The results suggest that user satisfaction is tied primarily to ease of use, convenience and efficiency. Chinese citizens prefer not to bring cash with them, and the idea of having all their needed payment tools included in the smartphone satisfies them. On the contrary, users being disatisfied is connected to internet dependence and security concerns.

4.1: SURVEY RESULTS - USER EXPERIENCE

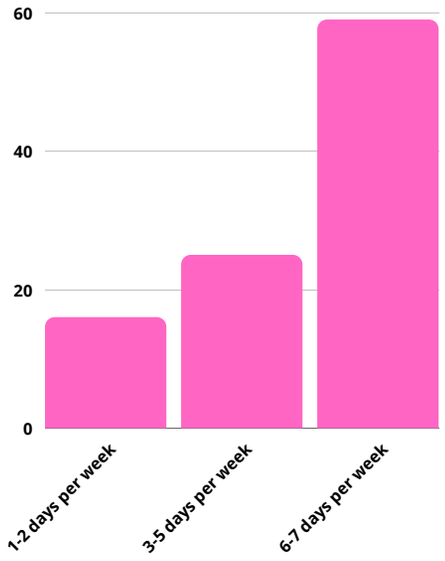


Figure 4.9: Frequency of mobile payment applications usage

Figure 4.9 shows that 16 out of 100 respondents use mobile payment apps 1-2 days per week, 25 respondents use them for 3-5 days per week, whereas the majority, 59 respondents, use mobile payment applications for 6-7 days per week. It looks like the increase in smartphone usage per week has led to an increase in the usage of mobile payment applications as well. This also suggests that users utilize these applications in all of their daily activities, meaning usage of mobile payment applications is essential to their daily lives.

To gain a deeper understanding of how these applications come in handy to Chinese citizens we asked respondents to report what drives them to use such applications. 99 out of 219 respondents reported that convenience was their number one reason for using mobile payment applications, 43 respondents or 19.63% identified safety as a component, 47 respondents or 21.46% were driven to use mobile payment because of its popularity and 30 respondents or 13.70% said they used mobile payment applications because of the discounts and coupons they offer. These findings suggest that the reasons Chinese citizens use mobile payment applications are very diverse, and that these users are also influenced by what fellow citizens are using.

Having asked our respondents about their positive experiences and reasons for using mobile payment, we were way more interested in knowing if these users ever had a negative experience with mobile payment, and if yes what were the reasons for such experiences. Out of 101 respondents, 76 responded to not have had a negative experience and 25 of them reported to have had one.

75.25 % no negative experiences

Through an open ended question, we asked our respondents to explain their answer if they have had negative experiences with mobile payment in the past.

10.2 Payment failed due to Internet issue

10.3 Payment methods are restricted by district or region

10.4 Depend on the internet connection

10.5Steps are far too sophisticated; Payment process is not flexible

10.6 It takes too long to generate the QR code

10.7 You can't pay when you're calling

10.8 The payment went through despite being canceled. It was a lengthy and cumbersome process to get a refund.

10.9 Convenience

10.10 Wechat payment does not support credit card

10.11 Cannot make large amount payment without binding bank account or bank card and there are also lots of other restrictions

10.12 Rely to much on Internet, which means that the payment becomes much less convenient when the signal is bad

10.13 Cannot recover wrong payment

10.14 With poor internet connection, mobile payment is a disaster.

10.15 Internet issue

10.16 Internet issues happens very often in crowded places

10.17 Complicated bank account transformation between different platform

10.18 Cannot make payment without Internet

10.19 Needed handling fee

10.20 Some customer do not aware of repeated payment

Figure 4.10: Sample responses to the open ended question

4.1: SURVEY RESULTS-USER EXPERIENCE

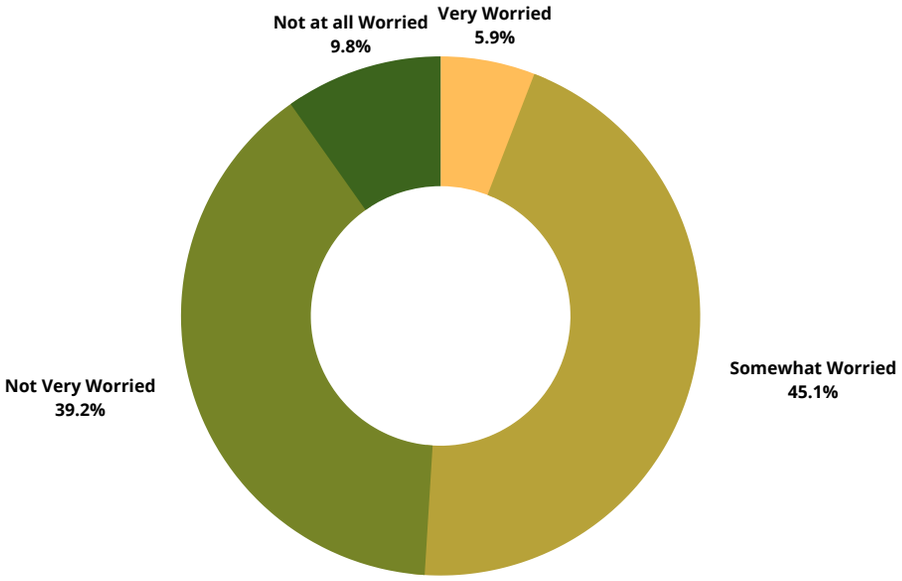


Figure 4.11: How worried users are about information leakage

We asked our survey takers to report how worried they are about information leakage from mobile payment applications and the data generated is quite troubling (see Fig. 4.11). Out of 102 responses, 6 users were very worried about information leakage, 46 were somewhat worried, 40 were not very worried and 10 respondents were not worried at all. We realize that even though these users utilize mobile payment applications in such a large scale in their daily lives, they are still not confident enough that their personal information is safe and well-guarded.

During our research we identified the aging society as a target group of great interest when it comes to mobile payment usage. Elder members of the society tend to struggle the most with usage and adaptability, so we asked our survey takers several questions to confirm our hypothesis. When asked if they have any elder members in their family who use mobile payment applications, 69 out of 102 responded yes and and 33 responded no. We then asked those who responded with a yes, to describe the experience of their elder family members with mobile payment. Out of 67 responses, 20 responded that the experience of their elder family members with mobile payment was very good, 33 answered with "somewhat good", and 14 said their experience was not very good (see Fig. 4.12).

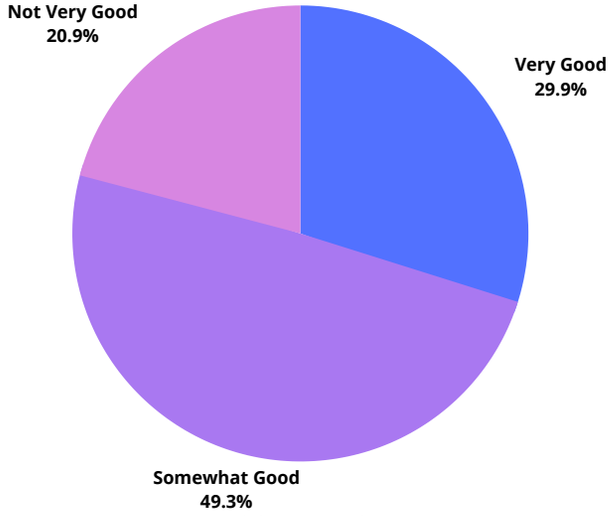


Figure 4.12: Elder members experience with mobile payment

We then asked respondents to identify specific problems that their elder family members have faced with mobile payment applications. Out of 109 responses , 7 respondents connected these problems with manual dexterity, 28 with visual impairment, 53 with understanding how it works, 18 with the internet connection, and 1 other with being tricked by false advertisements (see Fig. 4.13).

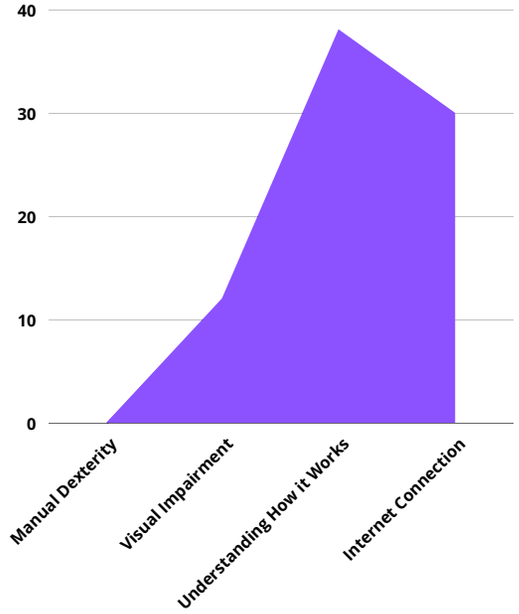


Figure 4.13: Elder members experience with mobile payment

4.1: SURVEY RESULTS-OPEN RESPONSE QUESTIONS

Along with the numerous close-ended questions, our team decided to ask two open response questions in order to give respondents the freedom to express thoughts and/or themes that we had not yet discovered. Given that our project's purpose is to also have a look on mobile payment's growth potential, we asked our respondents to identify what features they would like to see implemented in future mobile payment applications.

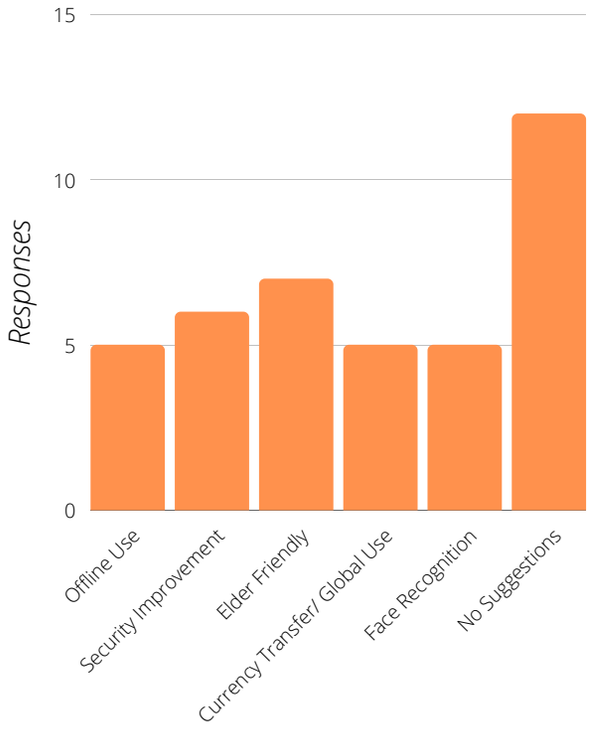


Figure 4.14: Bar chart showing what features mobile payment users would like in the future

As shown in Figure 4.14, we read through the open ended responses and coded the answers in 6 categories. Out of 45 responses, 5 respondents want to see the use of mobile payment applications without the use of internet connection, 6 respondents are concerned about the security of these applications so they would like to see implemented features to increase security. 7 survey takers suggest that mobile payment applications should come up with features that are friendly to senior citizens and that offer trainings for aging populations. 5 of our respondents reported that it would be great for Chinese mobile payment applications to be used globally and also they would like to have the ability to transfer money through a credit card. Additionally, 5 respondents said that face recognition and biometrics use in mobile payment applications would be very convenient. The rest of the respondents had no suggestions to make.

Towards the end, we asked our respondents if there was anything else they wanted to share regarding their experience with mobile payment applications. We received only 11 responses, since open ended questions usually tend to get lower response rates.

Some of the respondents suggested that mobile payments cause impulse purchases, as digital payments do not feel as direct as traditional ones. Others suggest that given the wide spread of mobile payments in China, and the amount of transactions conducted through them, state agencies should control their operation. Additionally, some expressed their concern that mobile payment applications serve only some specific portion of the Chinese population (mostly in better developed regions), leaving those who cannot access to Internet or smart phone behind.
Although, most of the responses were positive, the surveys also show that there are a few concerns yet to be addressed.

4.1: SURVEY RESULTS-CONCLUSION

Our web-based survey mainly targeted Alipay users, but was also open to users of other mobile payment applications. We hoped to collect between 100-150 responses, and we ended up with 134, which was a meets our target. After carefully analyzing the results, we found out that most mobile pay users are satisfied with mobile pay, however, there are still several issues mobile payment users are concerned the most about (listed in Figure 4.15):

The first and biggest concern is, obviously, security. 45.1% of our survey takers worried or even encountered information leakage.
The second issue respondents identified is the week response to mobile payment that aging society encounters. Survey takers pointed out that elder members of their families use mobile payment applications in a large scale, but their experience can switch between two extremes. 49.3% respondents sad that their elder family members are fine with mobile payment while 20.9% hold a different view.
The third concern is internet dependence. When the internet connection is unstable, it is likely to cause payment failure. Also, mobile payment cannot be completed when there is no Internet connection, for instance, in a remote space or rural area.

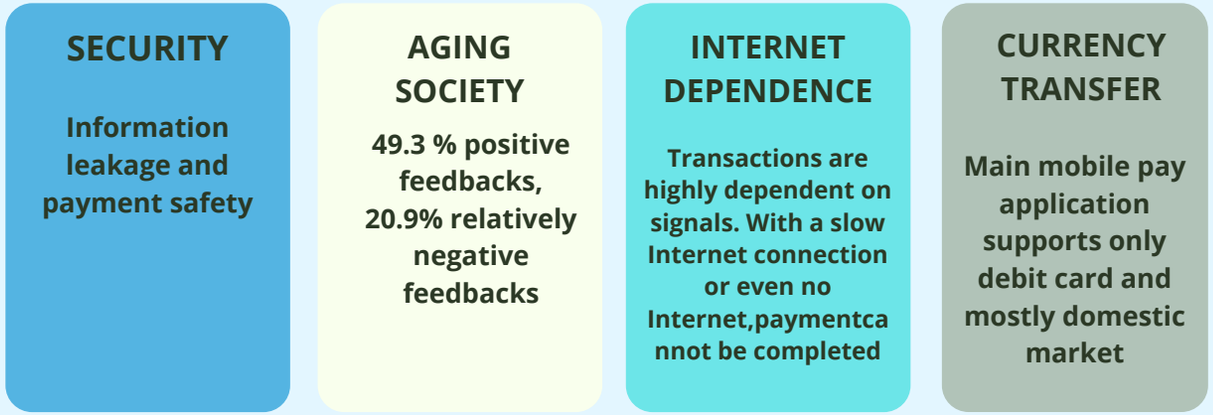


Figure 4.15: Mobile payment applications' shortcomings

The fourth concern is transaction with foreign market. Since neither Alipay or Wechat pay do not hold large share of foreign markets,it is hard to make a transfer between a domestic account and a foreign account. This issue is especially relevant to international students like us, and since we distributed the survey based on our team members' own circles, this issue was somehow amplified.

Overall, we had an even gender and location distribution. Although, age distribution was slightly biased towards younger people, the largest percentage of respondents was between the ages of 18 and 30 and still, a small percentage was from ages of 45 to 60, that is to say, our survey still can be considered as containing all aging groups. As a result, the survey results are abundant and extremely helpful in drawing conclusions, and data analysis was performed accordingly

4.2: STAKEHOLDER INTERVIEW RESULTS

To investigate more on the mobile payment applications in China's market, we conducted in a total of five interviews with different roles of people who have connections to mobile payment: a university professor studying on the information security, a principal staff engineer of our sponsor Alibaba, and three normal users of mobile payment applications. All of them are Chinese and all the interviews obeyed the protocol. We will not identify our interviewees' names, genders, or address information.

Effects on the Chinese Economy

All five interviewees told us that mobile payments are highly accepted in China nowadays, and many people barely bring wallet or use cash for almost all the daily transactions. Professor mentioned that the young generations tend to better accept this payment method, which is in accord with the data we collected from web-based surveys.

Based on the interviews, mobile payments are considered to reduce transaction friction and increase the economic efficiency. Sponsor explained that Alipay can gather data to analyze users' payment behaviors, record payment activities, and construct a trust modal between consumers and merchants so that the money flows more efficiently and easily. For example, if consumers do not feel satisfied on certain products, they can get refund from merchant and return the items without any complicated procedure.

Essential Role during COVID-19

Three interviewees including the professor said that mobile payment is a cleaner payment method because it allows people to finish money exchange without actual touching others. Professor mentioned that some medical reports showed that cash can also carry virus, so scanning the QR code would be safer than using cash or swiping bank cards.

Many Chinese citizens experienced indoor confine in the past two years. And mobile payments became the best way for them to purchase items or order food delivery. Even many elderly people started to learn to use mobile payments. "To a certain degree, COVID-19 promoted the use of smart phones and mobile payment," said professor.

Potential and Existing Problems

a) Elderly people show less interest towards mobile payments. Some of them have more concerns and do not trust mobile payments enough. And some of them are just not familiar with smart phones. As the aging society grows, mobile payments need to be better developed for elderly people to use.

b) Mobile payment companies are now gathering users' payment behaviors and pushing customized advertisements based on users' preference. Such a system requests users to give out their private information to exchange a more convenient recommendation service. To a certain extent, it is a win-win situation. However, most people might not be willing to give out their personal information such as shopping history, locations, etc..

Opportunities and Developments

a) Chinese mobile payment companies are now working on community services. In the past, they only connected mobile payment services to individuals. One of the future development directions in the following years would be connecting services to communities. For example, when a group of people plan to buy a same type of item, merchant will be willing to set a relatively lower price. Community service assisted people to connect with others, even when they do not know each other, to do group purchases. More community services are in the processes.

b) Global market might be a hard but attractive goal. Mobile payments in China have been well developed and highly accepted, so international expansion will be a main goal for the mobile payment giants. Professor mentioned that in the U.S. people are still treating those apps only as a payment tool and many countries are still using cash for most of their transactions, but it is not safe during COVID-19 pandemic. He thus believes that mobile payments have a great global future in terms of community service and disease prevention.

4.3: SWOT ANALYSIS

Strengths

The main strengths of mobile payments are safety, money-saving, health, and convenience. Based on an interviews with a university researcher and our sponsor, the strengths of mobile payment that are more advanced than the traditional ones include better community services, more discounts, and a physically safer payment system during the COVID-19 period. These advantages lead people to get used to using mobile pay more frequently. According to Question 6 from our survey, convenience, privacy security, sanitary, and discounts are the main reasons for people to choose mobile payment instead of cash or bank card. In the future, preserving these identities of mobile payment will be a good plan for companies in this field.

Opportunities

Firstly, based on Question 3 in our survey, industries related to dining, entertainment, convenience store, public transportation, and money transfer have strong potential. Customers have a strong willingness to use a mobile payment application while paying for these products or services because of its convenient built-in functionalities. Compared to other functionalities, fewer survey takers are using the mobile payment to do financial investments or pay for utility bills, so there is huge progress to be made in these fields. Furthermore, from the interview with our sponsor, data analysis are necessary to avoid potential risk, such as overconsuming, so the mobile payment companies may need to keep promoting its investment on data science. Lastly, China's market tends to be saturated, so global expansion should be in their plans.

4.3: SWOT ANALYSIS

Weaknesses

Aging society and internet dependence are two main weaknesses for mobile payment. From the interviews, our interviewees complain about some problems that old generations are facing: (1). lack of experience using smartphones; (2). distrust of mobile payment applications; (3). less interest in new technologies. According to the survey data from Question 12, elderly users are a indispensable part of consumers. Even though their overall attitude towards mobile payment looks good, some potential problems still exist. From Question 14, most elderly users have trouble with how mobile payment works, so companies need more clear and specific guidance. Also, visual problems are waiting to be solved. Today's text adjustment may help, but it is not sufficient. Using not only an internal method but also external assistant devices is a possible solution. Also, based on the data from open-ended Question 6, participants assert that sometimes internet issues worsen their experience using mobile payment. Reducing the dependency on the internet should be a priority of mobile payment applications.

Threats

The crisis of trust is a threat to the whole mobile payment industry. Based on the interviews, collecting private data has issues since some customers do not have enough trust in mobile payment companies. The mobile payment ecosystem is based on the trust and credit system. Thus, here comes a hypothesis: if a more credible organization, like the government, plans to establish its digital wallet system, a lot of original customers might give up the current mobile payment applications controlled by companies and use the new digital wallet instead. Thus, the consequence is that companies should keep the trust between them and their customers.

5: RECOMMENDATIONS

Through detailed literature review, surveys and interviews with our sponsors, mobile payment users and experts in the field, our team better understood the usage of mobile payment in China as well as it's advantages and shortcomings. As a result, our team has curated a set of recommendations aimed to inform our sponsors and others involved in the mobile payment field, regarding the industry's problematics and growth potential.

5.1: Recommendations for Mobile Payment Platforms

The majority of our recommendations are addressed to Alipay as our project sponsor. In our survey and interviews we asked questions specifically relating to Alipay in order to identify what works and what does not. The following recommendations are based on the Findings chapter.

5.1.1: Monitor and Report Security Incidents

As previously stated, 45.1 % of our survey respondents were somewhat worried about information leakage and security. This suggests that Alipay and other mobile payment companies should:

1.Im*plement periodical monitoring and follow-up of security incidents, including reviews and complaints from users.*

2. Have in place an immediate notification protocol for supervisors and local or national authorities to be notified in case of a major security incident when using mobile payment applications.

3. Simplify the process of reporting security issues from users or third party collaborators.

4. Inform users when data breaches occur, so they can be prepared and store personal information more carefully.

5.1.2: Protect Users by Strong Authentication

Alipay and other mobile payment companies in China should ensure that usage of mobile payment applications, completion of transactions and access to sensitive information, is enhanced by stronger user authentication. Alipay should:

1.Have in place authentication requirements for logging into the mobile payment account.

2.Have in place an additional authentication requirement for high-valued transactions.

3.Require users to pass a two-step authentication when it comes to changing personal data, demographics and financial information within the mobile payment app.

4.Inform users when their login information is used to access their mobile payment account from other devices.

5.Require a four digit PIN to access certain pages of the mobile payment app.

5.1.3: Help the Aging Population Adapt to Mobile Payments

Our survey showed that 49.3 % of our respondents reported that elder members of their families had a somewhat good experience with mobile payment and 20.9 % of our respondents did not have a very good experience. Alipay and other mobile payment companies should focus on this vulnerable population, as they find adapting to such payments challenging, primarily due to lack of knowledge regarding technology, or lack of access to a mobile device and internet connection. We, therefore, recommend that Alipay should:

1.Offer trainings for aging society members so they can learn how to use mobile payment applications.

2.Offer services specifically designed for elder members with visual impairment.

5.1.4: Respect Users' Preference on Information Sharing

According to the interviews we conducted with experts, Alipay is recording users' payment activities and gathering related data to study on payment behaviors so that it can customize advertisements based on users' preference. To a certain extent, this system benefits both users and Alipay itself. However, some respondents expressed their unwillingness of information sharing. Thus, we suggest that mobile payment platforms should:

1.Inform users before collecting their data or recording the payment activities with a succinct and clear notification.

2.Allow users to turn on / off the information sharing function and customized advertisements service through an easy procedure.

5.1.5: Expand Oversea Services

Both experts we interviewed with estimated that 90% - 95% of people in China use mobile payments applications. Mobile payments in China gradually tend to be a saturated market. Professor mentioned that most countries are still using cash for most transactions and United States is only treating mobile payment application as a payment tool. Our research is limited, but we still believe the oversea market is full of potential. Combining the opinions of professionals and normal users of mobile payment platforms, our suggestions are:

1.Establish strategic cooperation with foreign mobile payment companies to enter oversea market in an easier way.

2.Start international expansion in countries or regions with similar culture such as Singapore, Hongkong, Japan, etc.

3. Increase more supported languages for Alipay and its connected applications to service foreign users.

5.1.6: Implement Currency Transfer Services

As the development of oversea market strategies, currency exchange and transfer services would be essential and frequently used by users. Several respondents expressed their wish on the implementations of such services. Up to now, Alipay offers currency transfer service only for Chinese citizens over 18 years old with a series of procedures and regulations. And only ten types of currencies are supported. Currency exchange service is only partially supported, which means users can fill out the request form of required information and make an appointment via Alipay application but still have to go to the banks or offices to complete the remaining procedures in person.

To better service users who have needs on international transactions, we suggest that mobile payment platforms should:

1.Simplify the procedures of currency transfer following the local financial regulations

2.Implement the currency exchange service into mobile payment application to boost users' convenience.

3.Increase the supported types of currencies for transfer or exchange services.

4.Inform users the related laws, risks, and regulations before using aforementioned services.

5.Provide a guidance to assist users who are unfamiliar with these services and procedures.

5.1.7: Seek More Collaborations

Although using Alipay or Wechat pay requires a bank account, it does not directly means that both companies have a solid collaboration with banks, because handling fee is still needed when making a transaction. This suggests that Alipay and other mobile payment companies should:

1.Link Alipay or Wechat accounts directly to bank account or simply use online bank account.

2.Enable zero-fee money transferring between a bank account and a mobile pay account.

5.1.8: Simplify Functionalities

Wechat did a good job on simplifying its functionality, but Alipay still has more complicated and dazzling interface. Some of our survey respondents pointed out that sometimes it is hard to find the functionality he / she wanted to use on Alipay App. This suggestes that Alipay should:

1.Simplify the interface by reducing the least used functionality.

2.Combine or abandon useless or similar functionality.

5.1.9: Regulate Online Loan Platforms

This problem is being emphasized greatly in recent years and we are a little surprised that no one mentioned it in our survey. Alipay provides loans to users, which is extremely dangerous for those students who do not have stable financial income. As a result, it indirectly caused some negative consequences. This suggests that Alipay and other mobile payment companies should:

1.Stop giving loan to those who do not have stable financial income.

2.Give only small loan to students or teenagers.

3.Have a more strict standard to assess the qualification of borrowers.

5.2: Recommendations for Researchers

With an only 7 - week project, it is impossible for us to contain all the aspects of the development of Mobile Pay in China. That is to say, there are still a lot of things we may neglect or hardly have time to cover and this leaves to the future researches to accomplish. Here are some possible recommendations for future researchers in this area:

5.2.1: Study Mobile Payments in Other Countries

In our research, we mentioned a few providers of Mobile Pay companies in other countries, such as Paypal and Apple pay, but we mainly focused on Alipay. By directly comparing Alipay or Wechat pay with other countries' Mobile Pay apps, we may have a more clear view on why Alipay and Wechat pay overcame their competitors in such short period of time and their potential drawbacks. Future research tasks may include:

1.List advantages and disadvantages of many other Mobile Pay apps.

2.Instead of only distributing surveys in China, spreading the survey more widely so that they can provide a more thorough view of mobile payment in other countries.

5.2.2: Do More besides Survey, Interview or Online Research

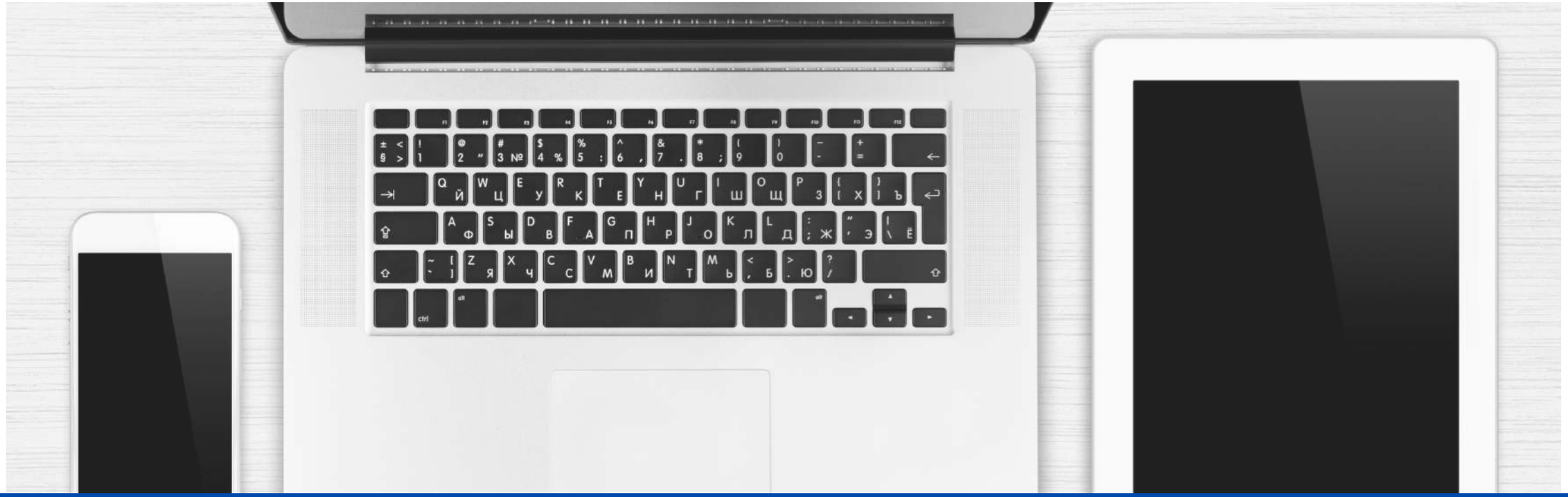
Due to COVID-19, survey and interview are two approaches for us to keep on doing our project, but it is better to find other approaches to the project:

1.Field trips to Mobile Pay companies so that it can provide a totally different view compared to simple online research.

2.Direct interviews with store owners in China. By doing so, we can investigate their selections on Mobile Payment applications and their perspectives on them.

3.In order to learn more about aging society issue, it is reasonable to communicate with some seniors, teaching them how to use those applications to see what exactly their issues are.

6: CONCLUSIONS



Our web-based survey, key stakeholder interviews and SWOT analysis, helped us create more complete understanding of the mobile payment industry in China as a whole. Throughout the duration of our project, we worked on exploring the growth factors behind the booming of mobile payment, identifying its shortcomings and projecting its global growth potential. Reflecting on the lessons we learned from the Chinese case, we discuss our findings and recommendations to mobile payment applications and researchers in the field to better serve users' needs.

Advantages

The data we collected suggest that mobile payment applications are widely spread throughout China. Chinese citizens use at least one of the two dominant mobile payment apps in the market, Alipay and WeChat. Users reported on the web-based survey and during the key stakeholder interviews that mobile payment applications are an essential part of their daily lives and their usage ranges from transportation to all sorts of daily services. Most users described these apps as convenient, easy to use and efficient. The survey results showed that 62.75% of the respondents were very satisfied with the services mobile pay apps offer, which leaves a high percentage of unsatisfied users.

Shortcomings

Along with the numerous advantages mobile payment apps bring, they have several shortcomings that were identified during our project. Based on the findings from our survey and interviews, we divided these shortcomings into four categories: security, aging society, internet dependence and currency transfer. When it comes to security 45.1% of our survey respondents were somewhat worried about information leakage and the security of mobile pay apps.

Survey takers also identified the elderly as an disproportionately affected population by mobile payment. 20.9 % of those who had elder members of their family that used mobile payment apps, gave negative feedback and the rest had somewhat positive feedback. This percentage means mobile pay app developers need to pay special attention to the aging population in terms of adaptability to their apps and ease of use. The third issue has to do with internet dependence. Users clearly expressed that transactions that do not require internet to be completed are much faster and convenient. Additionally, users expressed the need for mobile pay apps to allow currency transfer and the support of international debit and credit cards.

Recommendations

We addressed our recommendations to two key stakeholders: the developers of mobile payment applications and the researchers in the field. The recommendations addressed to app developers focused on strengthening the security of mobile pay apps, protecting users, helping the aging population adapt, oversea expansion of Chinese mobile pay apps and implementation of currency transfer services. The recommendations addressed to researchers, focused on expanding the scope of research to include more innovative tools and areas that have yet to be explored.

Limitations

Due to our focus on users' experience, our results were gathered solely from the end-user's perspective. This means we do not have insights from vendors, developers, managers and administrators. There are opportunities for future researchers to focus on different stakeholders' perspectives and to use different research methods. Additionally, our research was focused to China, so our findings may not be applicable to other countries with different regulatory requirements.

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APPENDIX A: SURVEY QUESTIONS

1. Please select from the list below all the different mobile payment applications you have used in the past two years (Check all that apply)(请选择您近两年来使用过的移动支付软件):

a.Alipay(支付宝)
b.WeChat(微信支付)
c.Apple Pay(苹果支付)
d.Other Pay (Type box: List Other mobile pay apps)(其他支付软件(请输入名字)

2. Do you still bring cash in case the mobile payment application does not work? If so, how much?(请问您还有携带现金以备不时之需的习惯吗？如果有，一般携带多少现金呢？)

a.0¥
b.100¥
c.500¥
d.1000¥

3. What do you use mobile payment apps for: (您通常使用移动支付软件的用途是？)

a.Transportation (公共交通)
b.Restaurant (餐厅)
c.Money Transfer (转账)
d.Convenience Stores (便利店)
e.Utility Bills (水电费)
f.Financing (金融理财)
g.Entertainment (娱乐)
h.Other (其他)

4. How long have you been using mobile pay applications for? (您使用移动支付软件多久了？)

a.less than a year (少于1年)
b.1-2 years （1到2年)
c.3-5 years (2到5年)
d.6 years or more (5年或更多)

5. How satisfied are you with your overall experience with mobile pay applications? (您对移动支付总体的满意度如何？)

6. Please explain your evaluation from above. (您为什么给出这个分数呢?)

APPENDIX A: SURVEY QUESTIONS

7. How often do you use these mobile-pay applications? (您使用移动支付软件的频率大概是？)
a.1-2 days per week (一到两天一周)
b.3-5 days per week (三到五天一周)
c.6-7 days per week (六到七天一周)
d.I don't use mobile pay. (我不使用移动支付)

8. What drives you to use mobile payment applications? Check all that apply. (您选择使用移动支付软件的原因是？可多选)
- Convenience(方便快捷)
- Safety (安全)
- Many People are using mobile payment (很多人都在用)
- Coupons and discount (有很多优惠)
- Other (其他，请说明)

9. Have you had any negative experiences when using mobile payment applications? [Yes/No] (您在使用移动支付时有过不好的体验吗？ (有或者没有))

10. If you chose "Yes" on the previous question, please provide an explanation. (如果有，能详细的说一下具体内容吗？)

11. How worried are you about information leakage from mobile payment applications? (您担心移动支付软件泄露您的数据吗？)
a.Very worried (非常担心)
b.Somewhat worried (有点担心)
c.Not very worried (不是很担心)
d.Not at all worried (完全不担心)

12. Do you have any elder members in your family who use mobile payment? (您家中是否有使用移动支付的老年人) [YES/NO]

13. What is the experience of elder members of your family with mobile payment? (您家中老人使用移动支付的体验是什么样子的？)

14. What are some problems that elder members in your family have encountered when using mobile payment? Check all that apply. (您家中老年人使用移动支付过程中遇到过哪些问题？可多选)
- Manual Dexterity (因身体原因无法正常使用手持设备)
- Visual Impairment (看不清楚操作界面)
- Understanding how it works (不知道如何操作)
- Internet connection issue (因为网络问题无法使用)
- Others (其他原因，请说明)

APPENDIX A: SURVEY QUESTIONS

15. What features would you like to see implemented in future mobile payment applications?(您希望移动支付软件在未来能有什么特征呢？)

16. Is there anything else you would like to share regarding your experience with mobile payment applications?(您有什么其他的关于移动支付的体验想跟我们分享的吗？)

17. What is your age group? （您的年龄段是?）
a.18-30 years old (18到30岁)
b.31-45 years old (31到40岁)
c.46-60 years old (41到60岁)
d.60+ years old (60岁以上)

18. What is your gender identity? (您的性别是？)
a. Male (男性)
b. Female (女性)
c. Prefer not to say (不想回答)
d. Prefer to self-describe below (希望自己解释)

19. What province or city in China are you a resident of? Please choose from the dropdown menu. (您目前居住在哪个省或哪个直辖市？点开目录选择您的省份或城市)

APPENDIX B: INTERVIEW TRANSCRIPT 1

Interviewers: Jorgo Gushi, Haojun Feng
Date of Interview: 06/04/2021

[Begin Transcript]
Gushi: What is your connection to the mobile payment field in China?

1: The connection most of us have with mobile payment is through being users. In the last three years, most people in China do not bring cash anymore, they pay for pretty much everything with their cell phones. I also have a connection with Tencent. Given that they have a lot of data in their possession, we work together for the safety of the city and the community.

Gushi: Do you use any specific mobile payment application?

1: Right now we have two major mobile payment applications in China. One of them is Alipay by Alibaba, and the other one is WeChat by Tencent. I use both of them for payments. Also some people use Apple Pay, but it is not that common in China.

Feng: Do you think Alipay and WeChat target different audiences? If yes, which ones?

1: I think both payments are quite normal in China. We do not only use them for payment but also for the convenience brought by their built-in services. For example, in Alipay if you want to buy something online (e-commerce), you can use mobile payments; if you want to go to restaurants, it will find some restaurants for you; if you want to go to a movie theater (entertainment), it would provide some information. When we use Apple Pay, it would be only for payment itself but not the services. For example, when we go travelling, the Alipay connected to other GPS services will help us get pass (access) to many places, because it helps prove our healthy status (during COVID-19). So the most important thing is not the payment but the built-in services.

Feng: Based on your own experience, how accepting is the Chinese population towards mobile pay?

1: Elderly people might have problems using mobile phones. Most young generations accept this type of payment. For example, when you go to take subways or buses (public transportation), you can use mobile payment for all those services. However if you bring cash, they will not have change for you because most people are using mobile payment. So traditional payments are not convenient enough, and this is why most people have to learn how to use mobile payments. Meanwhile, we also have some social problems especially during the COVID-19. Many elderly people cannot use mobile payment, so a cash service was specially developed for them. In general, in China 90-95% of people are using mobile payment.

APPENDIX B: INTERVIEW TRANSCRIPT 1

Gushi: How convenient is mobile pay, and does it reduce transaction friction?

1: Yes. If we don't use mobile payment, we will need cash exchange. During COVID-19, it is not safe to use cash, because some reports show that cash might also carry and spread viruses. So COVID-19 to a certain degree promoted the use of smartphones and mobile payment so that we can just scan to pay but not actually touch other people.

Gushi: We have realized that mobile payments are often connected to QR codes, so how widespread is the use of QR codes in China?

1: Each individual can generate their own QR code for accepting money. We can accept money by sharing QR code to others, and people can donate or pay money by scanning QR code. Basically, everyone can use QR code to finish payments or transfering.

Feng: Can we consider the widespread use of QR is promoted by Mobile pay?

1: The widespread use of QR code is multi-causal. The main factor that promotes mobile payment is that people are willing to use built-in services.

Feng: What do you personally use mobile payment for in your daily life?

1: Yes, when I go to the shop I can use mobile payment and also to pay telephone, utility or any other bills. To sum it up, we use mobile payment in pretty much every aspect of our life, we don't use cash that much.

Gushi: What are some specific problems that you have encountered with mobile payments? (privacy issue, mistaken transfer, etc.)

1: In the beginning, people had concerns. They might be worried about transfering money to wrong people or being defrauded. Police departments and companies did indeed spend a lot of money and time to guarantee the security of the mobile payment services. For now, we do not have issues regarding fraud. Even if something happens, the mobile payment companies can still help customers to chase their money back in those cases. Secondly, people might have concerns on privacy issues. Sometimes we pay to somebody we don't know, but after many years we found out it is not a big problem now since almost everyone is now using mobile payment.

Gushi: A follow up question on this, do you believe that different generations face different issues when it comes to mobile payment?

1: Elderly people tend to have more concerns and some of them prefer to use cash or credit cards. However, for young generations, they only bring cellphones and do almost all the purchases with mobile payments.

APPENDIX B: INTERVIEW TRANSCRIPT 1

Gushi: Based on your knowledge of the field, what research is being done relating to mobile payment in China? / What areas need more research?

1: Most research is about precise advertisement. After you make the payment, the merchants will actually give you germane recommendations on other products (based on your payment history). Much money is paid to develop better services. It's hard to say it's a good/ bad thing. Users might need to give out their private information to exchange for a more convenient service. For example, when we want to buy some food, then mobile payment applications might get our preference info and give us recommendations. For company-wise, people are doing research on how to advertise their service and attract more people to use it. (Also, we might do more research and try to help elderly people adapt to mobile payment, especially during COVID-19. We can design better apps or get assistance from their neighborhoods.)

Feng: What do you think of Mobile pay development in other countries? Is there any place we can learn from them?

1: Connected services are more important than payment itself. And the security of China's applications is guaranteed by companies, getting refunds even when we make a transfer by mistake. In addition, mobile payment companies need to keep the transaction history (raw data?)

Feng: Is there a specific target group we should focus on when projecting the growth potential of mobile pay (aging population, differently abled populations etc.)?

1: In China, it is not a big problem because almost everyone speaks Chinese. For people speaking Chinese and English, the functionality is good enough. People using other languages might have issues using them. And elderly people might also have issues reading and using mobile payments on cell phones because most of them have bad eyesights. So larger fonts might be needed for elderly people. We need to make some improvements for these two groups of people to have a better experience, but overall it is not a big issue in China.

Gushi: Since we mentioned the growth potential, what is your prediction of mobile payment's growth potential in the next 5-10 years?

1: In the past, mobile payments in China focused on individuals' services. Apps are connected to one person. We are now working on Community Services. For example, when a group of people want to buy the same items, they will get a discount when doing group purchases. Community Services allow people to connect with other people even when they do not know one another (you want to buy the same thing). Community services became very strong, allowing people to buy items at much cheaper prices. Companies would like to promote the connection of the entire community so that more people would like to use their services.

APPENDIX B: INTERVIEW TRANSCRIPT 1

Gushi: Is there anything we are missing, or is there anything you would like to add?

1: I think the use of mobile phones in China is so extensive that many people have two to three cell phones and many elderly people are also learning to use cell phones. These mobile payment apps cannot only share pictures but can also help us communicate with foreigners (build-in translation service). One reason I'm collaborating with mobile payment companies is to develop services for community (so-called community resilience). We would try to guarantee all the customers have access to the services especially during COVID-19. In the U.S, people are still treating those apps as a payment tool. Many countries are still using cash for most of their transactions, but it is not safe at this moment. Mobile payment in my opinion has a pretty good future in terms of community service and disease prevention. I think your team, on this project, should not only focus on the payments but also on how to service people in the future. At the same time, we should also be aware of problems that are facing by elder people. Some potential solutions might be creating better services and finding people in the same community to help older people.

Gushi: Thank you for your time and thoughtful responses!

[End Transcript]

APPENDIX C: INTERVIEW TRANSCRIPT 2

Interviewers: Jorgo Gushi, Haojun Feng
Date of Interview: 06/11/2021

[Begin Transcript]

Gushi: Why is mobile payment research important to you and Alibaba?

2: Alipay has to know very well of user's financial behavior in order to connect them more efficiently. Alibaba has hold many festivals to promote purchases. They also have end users who'd like to loan. So many data (e.g. spending activities) should be involved. The ecosystem has many aspects connected.

Gushi: What is your prediction of mobile payment's growth potential in the next 5-10 years?

2: The users are generating greatly. In the next 5-10 years, the revenue will be doubled in my perspective.

Feng: How accepting is the Chinese population towards mobile pay?

2: People barely use wallet in China and all transactions are made using mobile pay. It's probably one of the most frequently use app in China. Even Alipay sounds like a mobile payment app but there are actually many build-in services there.

Feng: How do you use the data generated from Alipay to transform the Chinese industry?

2: Except elder people, all the younger generation would like to use population. One social problem, older people cannot use mobile people especially during COVID-19 so we developed special surface for them. 90-95% people use mobile pay.

Gushi: How convenient is mobile pay, and does it reduce transaction friction?

2: Alipay can help reduce transaction friction. All transactions are digitally recorded and helps lots of companies to be able to know better about the costumer activities. Alibaba has built a trust modal between merchants and costumer. If consumers not satisfied, then it can return the money to consumers. Alibaba makes the transaction so easily.

APPENDIX C: INTERVIEW TRANSCRIPT 2

Gushi: What are some specific problems that you have encountered with mobile payments?

2: When I travel to China, I cannot link the bank account to the Alipay. Lots of works should be done to make Alipay works globally and when foreign people travel to China they can have a smoother experience.

Feng: What strategies are you using to target the aging population, how easily can they adapt to mobile payments?
Alipay is more user-friendly not only for aging people but also for younger people. Make recommendations based on buying history.

Gushi: How does Alibaba protect users' data? Did any significant security issues happen before?

2: As far as I know, they don't have any security issues related to data.

Feng: What tools have you implemented to prevent fraud?

2: Double check on the cellphone to ensure you are the real one to login and on the website we also ask consumers to do CAPCHA and this help them to block hackers who are engaging illegal activities. Also face recognition is used to protect.

Gushi: What do you think of other competitors in China's market?

2: The largest competitor is Wechat pay and it's found as social app. That's why Wechat pay is a major form in China because it's actually a social app and everyone has an account. For Alipay, it's equally integrated with apps(with Taobao and Tianmao). People use those apps are more likely to use Alipay. That's the advantage against the wechat pay.

Feng: Is there a specific target group we should focus on when projecting the growth potential of mobile pay (aging population, differently abled populations etc.)?

2: In China cities are divided into tiers. and in Tier 4 and 5 cities there are still lots of people using cash so there's still some growth potential regarding those people.

Gushi: Thank you for your time and thoughtful responses!

[End Transcript]

APPENDIX D: INTERVIEW TRANSCRIPT 3 (ALIPAY USER)

[Begin Transcript]

Gushi: Do you use any specific mobile payment application?
3: Yes, I use both WeChat and Alipay.

Gushi: How long have you been using mobile payment for?

3: About four to five years.

Gushi: Do you think Alipay and WeChat target different audiences? If yes, which ones?

3: I think Alipay is more professional on transactions and other built-in services. It allows users to do financial investment in an easy way, and the number of its connected services are more than WeChat's. WeChat is more convenient and has more users. WeChat itself is a social app. Users tend to use a social app more frequently than a payment app, so when we need to scan to pay for something, WeChat is usually the one you already open on the phone.

Gushi: Do any members of your family use mobile payment applications, how accepting are they towards mobile pay?

3: Most of them are using payment apps. I think mobile payment can be accepted by most people. It is already high-developed and convenient enough for normal people to use. Even my grandparents are familiar with it and its connected services like taxi booking or food delivery.

Gushi: How convenient is mobile pay, and does it reduce transaction friction?

3: It did reduce any transaction friction I think. We don't need to use cash, and we don't need to wait for changes. I always believe touchless payment would be much more safe for everyone, especially under a pandemic period. And it is even more convenient than credit card since the application is on the cellphone, and we just need to scan a code to pay. Wallet is not necessary either.

Gushi: How widespread is the use of QR codes in China?

3: QR codes are now used for almost all the public information sharing or collecting in China. For example, when we are in a line waiting to enter a restaurant, we can scan the restaurant QR code to view the menu so that we can decide what to order before we actually sit by the table. Also during pandemic periods, the community can just send out some QR codes for citizens to scan, and they would redirect people to the website in which people can report their healthy status.

APPENDIX D: INTERVIEW TRANSCRIPT 3 (ALIPAY USER)

Gushi: Can we consider the widespread use of QR is promoted by Mobile pay?

3: To a certain extent, yes. QR code is now used for many different aspects. However, at the beginning, it was mainly just used for mobile payment. People were surprised at such a convenient payment method -- scanning. After QR got accepted, it started to appear in different places.

Gushi: What do you personally use mobile payment for in your daily life?

3: I use it for almost all bills payment including online shopping, food delivery, video games charging, stock investments, and credit card repayments.

Gushi: What drives you to use mobile payment?

3: Convenience. I do not like to bring too many things or a big backpack to go out. I downloaded a mobile payment application immediately when I realized that I do not need to bring a wallet with such an application.

Gushi: Have you found yourself to be more eager to buy a product because of mobile payment applications?

3: It somehow influenced me. Mobile payment is a much easier method to send out money, so sometimes I paid without deep consideration. But I think it won't affect too much for most people.

Gushi: What are some specific problems that you have encountered with mobile payments? (privacy issue, mistaken transfer, etc.)

3: Personally speaking, I have not encountered any related problems. It might cause some privacy issues since those e-commerce apps seem to know what kinds of items I would like to buy, but I don't care about this too much.

Gushi: What features would you like to see implemented in the future?

3: I think mobile payment is well-developed enough for most people. I do have an expectation. We can now transfer money via mobile payment apps, and we can also top up money from or withdraw money to our bank cards. If the mobile payment can directly transfer money to other people's bank accounts (since sometimes people or companies only accept money via cash or bank accounts), then we do not need to do a withdrawal process.

[End Transcript]

APPENDIX E: INTERVIEW TRANSCRIPT 4 (ALIPAY USER)

[Begin Transcript]

Feng: Do you use any specific mobile payment application?

4: Yes, I use Alipay, Wechat Pay, Paypal, and sometimes Apple Pay.

Feng: How long have you been using mobile payment for?

4: More than 5 years

Feng: Do you think Alipay and WeChat target different audiences? If yes, which ones?

4: I think Wechat is more like a social app so most of the transactions are between acquaintances. Additionally, it is more casual than Alipay I think. I know many people would send Red Envelope to their friends and family members during festivals or important days (and Red Envelope is actually the function that captivates most of its users). For Alipay, I know there are lots of individually-owned business would use Alipay as their primary transaction tool. Also the largest online shopping platform, Taobao and Tianmao only support payment by Alipay. So I do believe Alipay also mainly targets users of those online shopping platforms as well.

Feng: Do any members of your family use mobile payment applications, how accepting are they towards mobile pay?
4: Almost everyone in my family uses the mobile payment app as long as they have a smartphone. Even my grandparents have learned how to use them since in China mobile payment literally penetrates everywhere.

Feng: How convenient is mobile pay, and does it reduce transaction friction?
4: I do think it's very convenient and it actually reduces the transaction friction. In the past, we always had concerns about receiving forged cash and sometimes exchanging money can be very troublesome as well. But for now, with mobile payment, I don't see anyone around me have those concerns anymore.

Feng: How widespread is the use of QR codes in China?

4: From my understanding, QR code is like the ID of your wallet, no matter it's for an individual or small business. Every user can generate a QR code used for receiving money, and they need to scan other people's QR codes to transfer money. During the Covid-19 pandemic, China also developed the Health Code, which is also a form of QR code that can help dictate whether the individual should be quarantined or allowed into other public places.

APPENDIX E: INTERVIEW TRANSCRIPT 4 (ALIPAY USER)

Feng: Can we consider the widespread use of QR is promoted by Mobile pay?

4: I would say yes.

Feng: What do you personally use mobile payment for in your daily life?

4: Since I'm in the U.S now so I mainly use it for online shopping, for example purchasing some e-books or video games. When I was in China I would use it for my every single daily spent.

Feng: What drives you to use mobile payment?

4: It's very convenient! Especially during some special festival, my family members can easily transfer some money to me and I can easily spend them on things I like, especially for some big spendings (in the past I need to save them to my debit card and then I can do the purchase).

Feng: Have you found yourself to be more eager to buy a product because of mobile payment applications?

4: I do agree with this. For now, if I want to buy something I only need to scan the QR code and enter the PIN to place the order. The procedure is so simple that sometimes I made irrational decisions.....

Feng: What are some specific problems that you have encountered with mobile payments? (privacy issue, mistaken transfer, etc.)

4: For me, I don't really have too many problems associated with mobile payment except one. Since I don't carry my wallet with me anymore, so it is very important to keep my phone connected to the Internet and fully charged when I go out. Things become quite troublesome when I'm far away from my home and I cannot even Uber back or take any public transportation if my phone is out of power or Internet connection.

Feng: What features would you like to see implemented in the future?

4: I think the current features are good enough for me and I don't expect too many functions in the future. I just hope it keeps simple as it is now.

[End Transcript]

APPENDIX F: INTERVIEW TRANSCRIPT 5 (ALIPAY USER)

[Begin Transcript]

Gushi: Do you use any specific mobile payment application?

5: Yes, I use both of them.

Gushi: How long have you been using mobile payment for?

5: About five years.

Gushi: Do you think Alipay and WeChat target different audiences? If yes, which ones?

5: I think they target people with different ages. Wechat targets older people while Alipay targets younger people, because Wechat pay is more like an affiliated function in an app that is used by both young and old people and it combines the payment function with chatting really well.

Gushi: Do any members of your family use mobile payment applications, how accepting are they towards mobile pay?

5: My parents use both Wechat and Alipay, but some of my older relatives do not use Mobile payments, because they barely use smart phones. However, mobile pay is a relatively acceptable new thing to them, because it is convenient to use.

Gushi: How convenient is mobile pay, and does it reduce transaction friction?

5: It did reduce transaction friction to me. Although cash payment is more safe to some extent, it requires a large storage space, which is a wallet, but now with our phone, we can easily pay with a few taps. It not only saves time, but is cleaner, especially during this situation (COVID-19).

Gushi: How widespread is the use of QR codes in China?

5: I'd say it is really wide-spread. It works as an information storage or serves as a link. For instance, when I am in a gallery, I can scan the QR code and get further information about a piece, while in the old days, I probably needed to bend over and read a long and small sentence.

APPENDIX F: INTERVIEW TRANSCRIPT 5 (ALIPAY USER)

Gushi: Can we consider the widespread use of QR is promoted by Mobile pay?

5: Kind of, but I think it is more relate to the development of smart phone and 4G technology.

Gushi: What do you personally use mobile payment for in your daily life?

5: Basically online shopping and sometimes I use Alipay to buy funds.

Gushi: What drives you to use mobile payment?

5: Convenience of course. I do not need to take my wallet all the time with me, which could be easily lost.

Gushi: Have you found yourself to be more eager to buy a product because of mobile payment applications?

5: Sometimes yes, because long shopping always leads to exhaustion while online shopping does not have that problem. Also, online shopping always uses data to recommend products that fit your interests.

Gushi: What are some specific problems that you have encountered with mobile payments? (privacy issue, mistaken transfer, etc.)

5: When the Internet connection is bad, QR code does not generate properly, otherwise it is fine. I transferred wrong one time, but the receiver was nice and he gave me my money back and it was not a huge amount of money.

Gushi: What features would you like to see implemented in the future?

5: I think overall it is good. The only thing it may improve is reducing functions for mobile payment applications. Wechat does a good job on that, but Alipay has so many functions that I had never used and may not be used in the future.

[End Transcript]