温州肯恩大学
WENZHOU-KEAN UNIVERSITY

The impact of digital payment on China: compared to the United States

In Partial Fulfillment of the Requirements

for the Bachelor of Science in Finance

by

LV Yanan

1025740

May, 2020

The Impact of Digital Payment on China: Compared to the United States

Lv Yanan

1025740

Abstract

Since 2010, with the prevalence of digital payment in china, the internet giants represented by Alipay and WeChat payment have occupied a large number of mobile payment market shares. The digital age has brought great changes in every aspect of Chinese people's life. Actually, the digital payment started earlier in America market, the online payment system represented by PayPal influenced American people's lives for many years. However, digital payment showed different development tendencies and growth rates the among two countries. The research focuses on the changes in the Chinese economy after the rise of digital payment and compares the situation in America. The data used in the study include Chinese and American economic index, consumption pattern, frequency of digital payment and so on, which were selected from the academic journal and the official statistical bureau. The study used the technology acceptance model and consumer behavior theory as the theoretical basis. The research results can provide a border perspective of digital payment development in China and America.

Table of Contents

Introduction

In China, digital payment has become a main payment method. The prevalence of digital payment changed the lifestyle and consumption behavior of Chinese people. The most obvious benefit of digital payment is saving time. People can go to the shopping mall without a physical wallet and cash. The payment process is more efficient without the time used to make a change for the vendor. Meanwhile, it also saves the offline Bank's expenditure on human sources. Chinese digital payment industry has experienced the following three stages:

Stage 1: the era of e-banking. Before 2003, the development of electronic payment in China was relatively slow, which mainly involved major banking institutions. The payment mode was mainly online banking, with relatively slow development speed.

Stage 2: the era of third-party payment institutions. After 2003, the third-party payment organizations represented by Alipay got involved in the payment business, and the electronic payment market began to develop rapidly.

Stage 3: the age of national digital payment. In 2010, with the popularity of mobile smart terminals, major Banks began to launch mobile banking apps. Internet giants represented by Alipay and WeChat pay have played an important role in the mobile payment market and seized market share by virtue of their strong online ecological scene advantages. In 2016, China's electronic payment transaction scale was close to 2,500 trillion yuan, occupying a decisive position in the national financial system. Digital payment is getting rise to a great change in the history of currency-the substitution of e-currency for note.

The promotion of digital payment in china has achieved great success. In fact, the e-payment system started earlier in the United States, but it showed a lower speed of

development. Due to the bank system and people's living habits are different between in America and China, the development of digital payment in two countries follows a different path. The purpose of this study is to find factors that can influence people's acceptance of digital payment, as well as to explore the reasons for the rapid development of electronic payment in China. Through the comparison of the development between China and the United States, this paper tries to find out the reasons for the slow development of electronic payment in the United States

Since digital payment makes trade more effective and expands the scope of the transaction. It is undeniable that digital payment will provide convenience and benefit to people's lives. According to consumer behavior theory, people are perfectly rational and can decide their consumption. Therefore, the hypothesis can be made that digital payment will promote the development of China's economy. Meanwhile, if the factors affecting the development of electronic payments are taken seriously and improved in the United States, it can be predicted that the digital payment will be prevalent in the US and promote economic development.

To thoroughly study the research question, collecting applicable data is necessary. The data will be selected from reliable financial reports. The data will include Chinese and American economic index, consumption pattern, frequency of digital payment and so on. The research uses the statistical method to analyze data and uses the technology acceptance model to deduce the conclusion.

Digital payment could bring huge changes to every industry in China and America. Companies can take strategy in advance to respond to the variation of the financial market in the future. However, there are some dissenting voices. First, the popularity of third-party payment platforms may adversely affect the earnings of offline Banks.

Second, people worry about the safety of digital payment. The digitization of financial services has increased the risk factors. The company needs to put a lot of money and human resources to guarantee the security of users' financial information. The detail information about the influence factors of digital payment development will discuss in the following study.

Literature Review

Since the development of the third-party online payment platform such as Alipay and WeChat payment, China has entered the era of electronic payment. As of March 31, 2018, Alipay had 870 million users worldwide. Meanwhile, as the popularity of E-payment, more and more consumers go shopping online. In 2018 double 11 Day (big promotional activities of Taobao), the total turnover reached 213.5 billion RMB. The digital payment not only brings great convince to people's lives but also changes the industry structure and expands the scope of the transaction. With the success of digital payment in the Chinese market, the research can use several data indicators to show the positive changes in Chinese economy as well as compare the digital promotion in the United States.

This research is inspired by a cross country empirical study between China and Malaysia (Chong Chan & Ooi, 2012). The study expanded the traditional technology acceptance model, which made the social influence, trust, and variety of service become additional variables. Meanwhile, there is another model created by experiments (Özkan, Bindusara & Hackney, 2010), which included three critical factors: security, advantage, web assurance seals, that correlated with consumer's adoption of the digital payment system. The new technology acceptance model can be applied to analyze the influence factors that American consumers acceptance the digital payment system, compared with the current situation of Chinese consumers. If the data can be found to prove that the digital payment system is safe as well as brings economic benefit for the country, the conclusion can be inferred that digital payment will be prevalent in the US.

A study of the consumer's perception of trust and security in the digital payment system found that both the security system and technical protection are important factors for

increasing consumer's perceived safety (Kim et al, 2010). At August 31, 2018, China had passed new E-commerce law strictly regulated the responsibilities of digital payment providers. Meanwhile, many E-payment providers such as Alipay, have a clear security statement before consumers become their users. Besides, employers in the security department developed a risk control system to fight against hackers. As for the voice-authenticated electronic payment which people concerned a lot, it also has systems and methods to ensure security (Schultz, 2015). A large amount of third-party online payment users implied their confidence in the Chinese digital payment system. In America, although the market has an immature digital payment system, the use of credit cards, which is also a kind of cashless payment, has a more complete security system. The digital payment providers in America can get inspiration from these examples.

According to the World Bank national accounts data, China has a higher GDP per person growth rate than America, which can be roughly evidence of Chinese rapid economic development. The economic benefits related to the digital payment system can be divided into several parts. First of all, Chinese finance technology has grown faster than that in America. The number of Alipay users is several times the number of users of PayPal globally. PayPal's annual payment transaction growth rate is only 25 percent, which is also behind the growth rate of third-party online payment providers in China (Chen, 2016). The financial products derived from the digital payment system also promote the development of financial technology. For instance, the Ant Financial Service Group (an affiliate company of Alibaba Group) shows an advantage in financing. One of Chinese online money market products, Yu'E Bao, has total assets more than $100 billion, more than the famous Wealthfront which has US$3 billion assets. The digital payment system helps finance better serve real life, which benefits

all parties. The financial technology is one of the advantages that the E-payment can bring to the American market.

The digital payment not only benefits for the financial field but also contribute to environmental protection. Ant Forest, as a derivative of Ant financial, has already attracted 225 million users (Chen et al, 2017). The user can collect powers from walking, online payment and taking buses, once they have enough power, they could apply for a real tree. According to the data from the related study, the Ant Forest had avoided 150,000 tons of carbon dioxide emissions (Chen et al, 2017). According to the database from the U.S. Department of Energy's carbon dioxide information analysis center (CDIAC), the United States is the second-largest emitter of carbon dioxide. As the prevalence of the digital payment system, its derivatives are more acceptable for the consumer. The valuable derivatives can also attract more users for digital payment providers.

The digital payment has significantly improved the consumption level of Chinese young people. Taking college students as an example. In 2016, the total consumption market of Chinese college students was 685 billion yuan. In 2018, Non-entity shopping channel and non-cash shopping approach tends to mainstream among college students. 94.04 percent of the transaction uses cashless payment. There are around 5300 universities and colleges in America, such a huge number of potential consumers will attract a lot of third-party online payment providers. The related study also showed that trust in E-commerce is adjusted by age factor (Yoon et al, 2015). The age of users makes a significant influence on the ease of use of the third-party online payment system (Liébana-Cabanillas et al, 2014). To increase the number of online users, E-payment providers are supposed to make different strategies based on age.

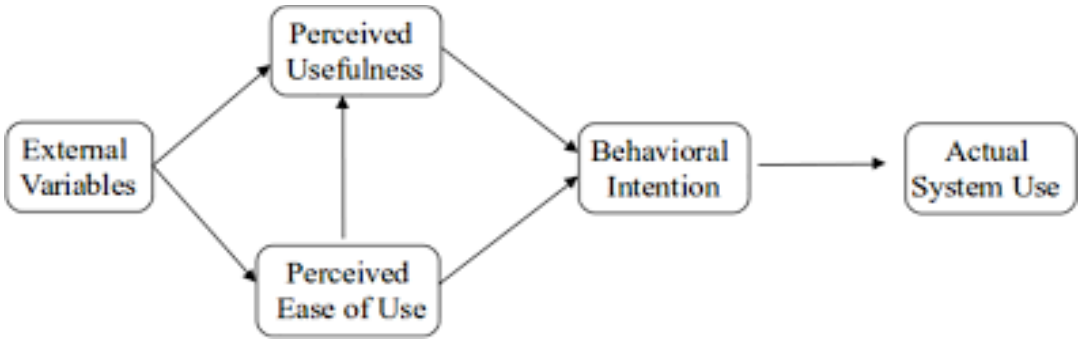
Although the main factors trust and security mentioned in the technology acceptance model were demonstrated by many academic studies, there are other limitations of E-payment development in America. The United States has different bank systems from Chinese, which adds the cost of digital payment prevalence. The digital payment brings benefit to the online financial system but has a negative influence on the profit of tradition bank. Meanwhile, the digital payment provides the transaction without the receipt, which many Americans are reluctant to give up. Besides, the security concern is still a serious problem in America, many people criticized E-payment for revealing personal privacy. In conclusion, the development of digital payment in America involved more potential factors, a systematic model needs to be established by future study.

Research Design

The study uses the Technology Acceptance Model (TAM) as the mathematical model for data analysis. TAM is the application of the Reasoned Action Theory (TRA). TRA mainly used to analyze how attitudes affect individual behaviors consciously. It focuses on the formation process of attitudes based on cognitive information. The basic assumption is that people are rational and will integrate all kinds of information to consider the meaning and consequences of their behaviors before making a certain behavior. The consumption behavior is shown as behavior tendency. The behavior tendency depends on consumers' attitudes, subjective norms, and perceived behavior control. The theory indicated that individual behavior can be reasonably inferred from behavioral intention to some extent, and it is determined by attitude and subjective criteria.

The technology acceptance model presented two main factors that could determine the user's acceptance of new technology on the TRA basis. The first one called perceived usefulness, which means the extent to which a person thinks using a specific system will improve his or her performance. The second one called perceived ease of use, which reflects the degree to which a person finds it easy to use a specific system. By reviewing previous studies, the safety and the variety of service are the additional variables that can influence consumers' acceptance. The research uses this model to analyze and explain the popularity of the digital payment in china. Meanwhile, it can also be used to predict the development of digital payment in America. Specifically, if the data can be analyzed to prove the digital payment can significantly improve the national economy or provide a positive effect on citizens' consumption, at the same time, it is relatively safe, then the conclusion can infer that the digital payment can be

prevalent in the US. Since the two factors are hard to measure directly, this study uses indirect measures: take the economic growth as the indicator of perceived usefulness, take the CCI and other sources from the literature review as the indicator of perceived ease of use.



This research uses correlation analysis to verify the relationship between the GDP per capita from 2007 to 2018 in China and America and their respectively digital payment transaction, as well as the relationship between the CCI (Consumer Confidence Index) and the digital payment transaction. The study uses hypothesis testing to analyze the difference between the speed of digital payment in both countries and the difference of CCI between America and China. In order to figure out the influenced caused by digital payment on Chinese economy, taking 2010 as the watershed, in which year Alipay and WeChat payment were popularized as payment method in china, the study uses Z-test to estimate if there is a significant difference in ten years before and after 2010.

Data and Basic Information

The data used in this study include the Chinese GDP growth rate in the past 20 years and digital payment transactions from 2007 to 2018. The relationship between the digital payment development and Chinese GDP growth rate could be analyzed by the formula of the coefficient of correlation.

	GDP per capita in China 2000-2018 (US$)	growth rate
2000	959.00	0.19
2001	1053.00	0.10
2002	1149.00	0.09
2003	1289.00	0.12
2004	1509.00	0.17
2005	1753.00	0.16
2006	2099.00	0.20
2007	2694.00	0.28
2008	3468.00	0.29
2009	3832.00	0.10
2010	4550.00	0.19
2011	5618.00	0.23
2012	6317.00	0.12
2013	7051.00	0.12
2014	7651.00	0.09
2015	8033.00	0.05
2016	8079.00	0.57
2017	8759.00	0.08
2018	9771.00	0.12

	Non-cash payment transactions in china :100 million	growth rate
2000		
2001		
2002		
2003		
2004		
2005		
2006		
2007	154.51	0.197
2008	183.27	0.186
2009	214.14	0.168
2010	277.04	0.294
2011	338.30	0.221
2012	411.41	0.216
2013	501.58	0.219
2014	627.52	0.251
2015	943.22	0.503
2016	1 251.11	0.326
2017	1 608.78	0.286
2018	2 203.12	0.369

Using the 2000 to 2010 GDP growth rate in China compared with next years' GDP growth rate. Since the Alipay established in 2004 and was prevalence in 2010, the difference between ten years before and after that indicates the influence of digital payment development on economic growth rate (based on the hypothesis the correlation between these two indicators is high). The test results will provide evidence for the perceived usefulness factor.

The study uses the same measure to analyze America's situation. The data included the American GDP per capita growth rate from 2000 to 2018 and the non-bank payment transaction from 2000 to 2017, since the digital payment started early in the US. Using correlation to analyze whether the growth rate of GDP per capita in the United State is related to its non-bank payment transaction. The non-bank payment transactions mainly

refer to the third-party payment platform represented by PayPal.

GDP per capita in America 2000-2018 (US$)		growth rate
2000	36335	5.28%
2001	37133	2.20%
2002	38023	2.40%
2003	39496	3.87%
2004	41713	5.61%
2005	44115	5.76%
2006	46299	4.95%
2007	47975	3.62%
2008	48383	0.85%
2009	47100	-2.65%
2010	48467	2.90%
2011	49883	2.92%
2012	51603	3.45%
2013	53107	2.91%
2014	55033	3.63%
2015	56803	3.22%
2016	57904	1.94%
2017	59928	3.49%
2018	62641	4.53%

	Non-bank payment transactions: United States (1million)	Growth rate
2000	722.09	
2001	745.65	
2002	776.54	
2003	803.08171	
2004	844.92043	
2005	883.20152	
2006	935.60986	
2007	986.21092	0.054084
2008	1023.45306	0.037763
2009	1040.49749	0.016654
2010	1070.20953	0.028556
2011	1138.81918	0.064109
2012	1149.55	0.009423
2013	1216.3	0.058066
2014	1282.37	0.05432
2015	1351.3898	0.053822
2016	1429.6247	0.057892
2017	1544.48	0.080339

The data also include the Consumer Confidence Index between the Chinese and American markets. Using the correlation to prove the relationship between CCI and digital payment development. If the correlation coefficient is large enough, then using hypotheses testing to measure the difference between Chinese and American's CCI. It can refer to the indicator of the degree of trust of the market among the US and China. Additional sources are found from the literature review to support the related view of the research, such as the life changes brought by the third-party payment. All the results will contribute to proving the factors of perceived ease of use.

Years	CCI (China)	Growth rate
2000	111.39	
2001	113.48	0.018762905
2002	113.47	-8.81213E-05
2003	108.63	-0.042654446
2004	108.36	-0.002485501
2005	109.88	0.014027316
2006	110.53	0.005915544
2007	112.60	0.018727947
2008	108.73	-0.034369449
2009	101.94	-0.062448266
2010	105.52	0.035118697
2011	103.30	-0.021038666
2012	102.39	-0.008809293
2013	101.16	-0.012012892
2014	104.35	0.031534203
2015	105.94	0.015237183
2016	104.44	-0.014158958
2017	115.60	0.106855611
2018	121.13	0.04783737

Years	CCI (US)	Growth rate
2000	102.54	
2001	100.40	-0.020869904
2002	100.39	-9.96016E-05
2003	100.23	-0.001593784
2004	101.06	0.008280954
2005	100.29	-0.007619236
2006	100.16	-0.001296241
2007	99.94	-0.002196486
2008	97.31	-0.026315789
2009	97.63	0.00328846
2010	98.30	0.006862645
2011	97.78	-0.005289929
2012	98.81	0.010533852
2013	99.14	0.003339743
2014	99.70	0.005648578
2015	100.69	0.009929789
2016	100.58	-0.001092462
2017	101.15	0.005667131
2018	101.31	0.001581809

Results

According to the correlation analyze, the GDP growth rate in China and digital payment transaction, the correlation of Consumer Confidence Index in China and digital payment transactions showed a significant relevance, with the coefficient of association 0.62 and 0.69.

GDP per capita growth rate (China) and digital payment		
	Column 1	*Column 2*
Column 1	1	
Column 2	0.615131	1

the correlation of CCI (China) and digital payment		
	Column 1	*Column 2*
Column 1	1	
Column 2	0.688234	1

Using hypothesis testing to test whether digital payment improves economy development in China. H0: the GDP per capita from 2010 to 2018 is indifference from that from 2000 to 2009. H1: the GDP per capita from 2010 to 2018 is significantly higher than that from 2000 to 2009.

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	7314.333	1980.5
Variance	2614990	1056798
Observations	9	10
Hypothesized Mean Difference	0	
df	13	
t Stat	8.473512	
P(T<=t) one-tail	5.92E-07	
t Critical one-tail	1.770933	
P(T<=t) two-tail	1.18E-06	
t Critical two-tail	2.160369	

As the form shows that the t Stat is higher than t Critical, which means the probability of making mistakes of denying H0 is low, therefore, H0 should be rejected and H1 is accepted.

As for America, the correlation coefficient between the GDP per capita growth rate and digital payment transaction is negative and lower than that of China. The relationship between the CCI and digital payment transactions reflects the same results.

GDP per capita growth rate (US.) and digital payment transaction		
	Column 1	*Column 2*
Column 1	1	
Column 2	-0.2043	1

the correlation between the digital payment in America and CCI		
	Column 1	*Column 2*
Column 1	1	
Column 2	-0.15133	1

The study uses Z-test to analyze the difference between digital payment in America and China. H0: there is no significant difference between the growth rate of digital payment in China and the US. H1: the growth rate of digital payment in China is faster than that in the US.

z-Test: Two Sample for Means the difference between the digital payment transaction in china and us		
	Variable 1	*Variable 2*
Mean	0.269642	0.04682069
Known Variance	0.009015	0.00046
Observations	12	11
Hypothesized Mean Difference	0	
z	7.912265	
P(Z<=z) one-tail	1.22E-15	
z Critical one-tail	1.644854	
P(Z<=z) two-tail	2.44E-15	
z Critical two-tail	1.959964	

Z is equal to 7.91, which is higher than Z Critical one-tail. Therefore, H0 should be rejected and the study accepts H1. The digital payment developed faster in china during the last 12 years.

Conclusion

The testing results showed that there is a significant correlation between economic growth and digital payment popularization in china. Meanwhile, the hypotheses testing results demonstrated that the development of digital payment promoted China's economic development. According to the Technology Acceptance Model, the promotion effect of electronic payment on economy refers to the perceived usefulness. Also, data displayed that there is a positive correlation between the Consumer Confidence Index and the digital payment transaction in China, which could be an indirect indicator of perceived ease of use in TAM. Combined with other positive influences that digital payment brought to China, such as environmental protection and financial derivatives, it can be predicted that the digital payment will continue to be popularized in china and play a more important role in the China payment system in the future.

On the contrary, in America, data analyzes showed a weak correlation between the digital payment development and economy index. This can be interpreted as the low growth rate of digital payment transactions in the United State. There are many influential factors, such as low trust in digital system. The digital payment system providers in the US are supposed to improve their defense capability to increase people's credibility.

Contributions

The research provides a broader perspective of digital payment development in China, compared with that in America. The company which offers online payment services can get some inspiration from this research. Meanwhile, the analysis of relevant data offers information for future studies.

Limitations

Due to the insufficient of the relevant experience and supporting data, the study has some limitations. Besides, in the situation of the global economy, there is no guarantee that the economic development of China and the United States is not correlated. If the correlation between the economic development of China and the United States is too high, using the hypothesis test to compare the growth rates of the two will occur errors.

Also, recent research expands the Technology Acceptance Model, some new factors are found that can influence the promotion of digital payment in America.

Future Steps

Future studies can explore the relationship between the development of electronic payment and citizens' perceived security. Collecting more information and data to compare the operation mechanism and security system between Chinese and American electronic payment provider companies. Besides, future studies could look for more influencing factors and models to discuss the possibility of the future implementation of electronic payment in both two countries.

References

Chen, L., Zadek, S., & Sun, T. (2017). Scaling Citizen Action on Climate: ANT Financial's Efforts Towards a Digital Finance Solution.

Chen, L. (2016). From fintech to finlife: The case of fintech development in China. China economic journal, 9(3), 225-239.

Chong, A. Y. L., Chan, F. T., & Ooi, K. B. (2012). Predicting consumer decisions to adopt mobile commerce: Cross country empirical examination between China and Malaysia. Decision Support Systems, 53(1), 34-43.

Kim, C., Tao, W., Shin, N., & Kim, K. S. (2010). An empirical study of customers' perceptions of security and trust in e-payment systems. *Electronic commerce research and applications*, *9*(1), 84-95.

Liébana-Cabanillas, F., Sánchez-Fernández, J., & Muñoz-Leiva, F. (2014). Antecedents of the adoption of the new mobile payment systems: The moderating effect of age. *Computers in Human Behavior*, *35*, 464-478.

Özkan, S., Bindusara, G., & Hackney, R. (2010). Facilitating the adoption of e-payment systems: theoretical constructs and empirical analysis. *Journal of enterprise information management*, *23*(3), 305-325.

Schultz, P. T. (2015). *U.S. Patent No. 9,092,781*. Washington, DC: U.S. Patent and Trademark Office.

Yoon, H. S., & Occeña, L. G. (2015). Influencing factors of trust in consumer-to-consumer electronic commerce with gender and age. *International Journal of Information Management*, *35*(3), 352-363.