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Empirical Study on Consumer Perceived On-line Payment Risk[—]

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Abstract: This paper takes the potential release of online transaction market size as the starting point of research, and discusses how Chinese consumer perceived risks influence online payment willingness. This study divides consumer perceived risks of online payment into eight dimensions: Economic risk, Functional risk, Private risk, Security risk, Time risk, Service risk, Psychological risk and Social risk. Furthermore, it explores the influence of multi-dimensional perceived risks on the willingness of consumers' online payment on the basis of 616 samples from Shanghai. The empirical results show that there is a significant negative correlation between perceived economic risks and the willingness to pay online; perceived security risks and some other risks have significant positive effect on payment willingness, which shows that certain perceived risks are becoming systemic risks in accordance with the principle of finance. So, the paper imply that both Private and Government third payment platforms shall take certain measures to reduce consumers' specific perceived risk for promoting the development of online transaction market in China.

Keywords: Online-payment; Consumer Perceived Risks; Perceived Economic Risk; Intention of Online Payment

1. INTRODUCTION

With the advent of big data, the fast development of information technology and the maturity of intelligent terminal applications, China's e-commerce industry has achieved rapid development. According to a report of iResearch's (www.iresearch.cn), in 2012, more than 350 million people have become users of intelligent terminal applications, and online payment has attracted 2.2 trillion users. E-commerce has reached 3.5 trillion RMB, up 60% compared with the former year, and is still growing rapidly.

The high growth in China's online payment should be contributed to the rapid growth of e-commerce consumer market and the promising prospect of mobile payment; meanwhile, it benefits from the potential threat of distrust in online payment and various perceived risks, including Economic risk, Security risk and so on. Researches on consumer online behavior, especially those on perceived risks, could contribute to offer advice on the development of the coexisted market including online payment of e-bank, China's "super online bank", payment on online platforms and third-part payment platforms. Exploring the relationship between perceived risks and consumers' willingness to use online payment has great significance in reducing certain risks.

Recently, researches on China mainly focus on common perceived risk behaviors in e-commerce market. Yifeng Wei and Liang Zhang (2007), Guocai Wang etc. (2010) ^[1] discussed consumer perceive risks on online market with theoretical models. Dahai Dong etc. (2005) ^[2] demonstrated that consumers' perceived risks in e-commerce action is a critical factor in online trading. Jing Miao etc. (2005, 2006, 2007) ^[3], and Qingwen Li (2007) ^[4] and Bo Xu etc. (2010), through empirical researches and simulated experiments on perceived risks, dimensions and their mutual relationship, discovered that perceived risks are one of the most important factors that influence online payment. Liye Zhu etc. (2007) ^[5] took students for example to study the relationship between perceived risks and total risk. Yu Wang etc. (2009) considered perceived risks an essential factor

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influencing online payment. Recently, risks in online payment attract broad attention; Qing Yang etc. (2011), for example, have examined the positive influence of perceived risks on online payment. In his master's degree paper, Shengnan Guo (2012), taking Alipay for example, systematically analyzed the diffusion of innovation impact factors in China online payment. Yingjun Sun and Xi Zhao analyzed the risks existing in third-part payment operation in a monitor aspect. Xie Na (2013) further investigated the influence of private risk, legal risk, operational risk and time risk. However, as for the perceived risks and measure issue in the innovation of online finance, there still lack regional researches on consumer perceived risks². To further examine the influence of perceived risks on e-commerce activities and intention for consumer to pay online, this paper starts from the perspective of consumers and categorizes consumer perceived risks in online payment into economic, security, private, time, etc., uses statistics collected in Shanghai and studies the influence of perceived risks in various dimensions on consumers' willingness to use online payment, and offers advices on the rapid growth of online trade in China.

2. A REVIEW ON RESEARCHES ON CONSUMER PERCEIVED RISKS

2.1 Definition of perceived risks

There has been years of researches on consumers' perceived risks in accepting and using products. Bauer (1960)^[7] pointed out that risks can hardly been measured as an objective and introduced the concept of perceived risks. Perceived risk is defined as the subjective information that consumers feel they will bear loss when purchasing certain product. Dowling and Staelin (1994)^[8] stated that consumers form individual opinions on risks during the transaction based on limited information they obtained. Koller (1988)^[9], however, considered that the degree of importance of the situation decided that potential influence of the risks. Perceived risk is commonly considered as the uncertainty and the fear to lose consumers feel when using certain products or enjoying certain service. Peter and Ryan (1976)^[10] defined perceived risk as the expected value of loss consumers have during purchase or other activities. Perceived risk will become one of the decisive factors when making choice when the environment stirs any of those emotions below in consumers: (1) Uncertainty; (2) Disturbance or anxiety^[8]; (3) Conflict with consumer^[11]; (4) Concern; (5) Psychological insecurity^[12]; (6) Pain come from anxiety^[13]; (7) Cognitive dissonance^[14].

In the high development of e-commerce, online payment has become an important part in economic activities. Nonetheless, as the payment is finished without face-to-face meeting, and due to the rapid development and uncertainty of information technology, consumers' perceived risks on e-commerce payment and delivery have changed.

2.2 Classification and influence of perceived risks

In early researches, perceived risk was the only variable in TMA model, but later it was divided into two types: functional and psychological, and then the Functional risk was further categorized into (1) economic, (2) temporary and (3) arduous. Cunningham (2005)^[15] supposed in e-commerce activities that all risks origin from functional risks, and later classified perceived risk into six dimensions: (1) functional; (2) financial; (3) opportunity/time; (4) security; (5) social; (6) psychological loss. Later, Jacoby etc. (1972)^[16] invited 148 students to take the test and examined perceived risks of 12 products. The results showed that 5 dimensions including economic, functional, physiological, psychology and social risks could afford to explain 61.5% variance of total risk. Stone etc. (1993)^[17] verified the existence of economic, functional, physiological, psychology, social and time risk. Jarvenpaa etc. (1996)^[18] confirmed 5 kinds of online payment perceived risks: economic, social, functional, individual, and private risk. It was the first research concerning private risk.

² GaoJian Jin (2010)^[6] investigated third-payment platform influence on consumers' perceived risk attitude based on students group and mainly by interviewing students, however, this research do not identify and analyze perceived risk's influence on online payment intention.

Featheman etc. (2003) ^[19] predicted the acceptance rate of consumers to online payment from the perspective of perceived risks and verified that economic, functional, psychological, social privacy and time risk exist in the Internet. In China, Miao Jing etc.(2006) ^[3] identified 8 risk dimensions. They held that, except for economic, functional, social, time, physiological and psychological risk, private risk and service risk also influence consumers. Qingwen Li (2007) ^[4] took Guangzhou for example and conducted empirical researches on perceived risks, suggesting service, time and psychological risk are predominant. Recently, Lee (2009) ^[20] classified perceived risks into financial, security/privacy, performance, social and time risk and built model of perceived risk and perceived benefit. Kim etc. (2010) ^[21], using 219 samples from Korea, analyzed the relationship between consumer's perceived risk and perceived trust in e-payment.

Based on above researches, we consider that the popularity of computer makes healthy risk inevitable. Therefore it can no longer be considered as any particular risk during online payment. In addition, service after the sale also attracted wide consumer's attention; thus we add service risk in dimensions and introduce private risk. Although, logically, security risk should be included in private risk, but in fact private risk influences consumers' online shopping decisions in a different way. For instance, Kim (2007) ^[22] found that private and security factors have significant effect on consumer's perceived risk and trust according to the model of consumers' perceived risk based on trust; Ashrafi and Ng (2009) ^[23] also pointed out that privacy and security are critical factors in e-commerce payment system. Hence, we subdivide consumer perceived risks into eight dimensions: Economic risk, Functional risk, Private risk, Security risk, Time risk, Service risk, Psychological risk and Social risk. The definition of each perceived risk is shown in table 1.

At the same time, Kim etc. (2008) ^[24] discovered that perceived risks have a significant influence on consumers' online purchasing decisions and intentions, and that trust propensity, privacy concerns and security awareness of consumer also affect the trust issue. Certainly, this research did not subdivide perceived risk into various dimensions. Further, Lopez-Nicolas and Molina-Castillo (2008) ^[25] considered consumers' perceived risks play a very important role in e-commerce as well as knowledge management and classified the perceived risk. Lee (2009) ^[20], using the data of e-bank, found that the security, private and financial risk have a negative influence on consumers' intention to use online-bank, but consumers' attitude and consciousness have positive effects on the using online-bank. Lin etc. (2010) ^[26] concluded that perceived risk is a critical variable to influence attitude or behavior intention. Hence, we build model contains consumers' multidimensional risk perception in online payment process and measure how factors affect consumers' intention of online payment, and make further investigating to focus on empirical research. This paper takes Shanghai for example, starts from the perspective of consumers, divides perceived risk into Economic risk, Functional risk, Private risk, Security risk, Time risk, Service risk, Psychological risk and Social risk and give specified definition of each risk. Through analyzing the influence of perceived risks on online payment, grabbing the most significant risk factors through empirical analysis, we will give the regulators, stores and online payment platform some corresponding suggestions and thus give a boost to China's e-commerce transaction.

Table 1. Types, contents and questionnaire design of consumers online payment perceived risks

Types of consumers online payment perceived risks	Contents and questionnaire design
1. Economic risk. Economic risk refers to The potential monetary expenditures consisted of the purchasing price and following maintenance cost. We extend this risk to the probability of money losses due to fraud.	1. I concern the exactness of amount of money paid online. 2. I concern each online payment will be charged for additional transaction fee by the service provider 3. I concern the extra fee claimed by online payment tools and the higher expense. 4. I concern property loss due to the account and password thefts. 5. I concern the third party (with secured function) stand by when I ask for refund. 6. I concern the loss of money due to the malpractice of third payment platforms
2. Functional risk Functional risk refers to the probability that consumers cannot gain the expected return when products are out of work or fail to perform the function designed or advertised.	7. I concern that I may fail to buy the goods I need due to the limitation of amount of money paid online. 8. I concern that the online payment tools may fail to satisfy my needs. 9. I concern that I may fail to pay in time due to the speed and the instability of the Internet environment.

<p>3. Security risk Security risk includes online payment systemic problem, the information asymmetry between the consumers and third payment platforms; and information revealed caused by security loophole.</p>	<p>10. I concern that the trading information may be intercept and tampered by hackers 11. I concern the probability that hacking invasion or virus infection due to the security holes of operating system and related payment tool application software. 12. I concern the probability that unknown person carry out transactions with stolen information like username and password. 13. I concern the credit of third payment platforms. 14. I concern the probability that online banking or payment platforms emerges systemic failure and error connection.</p>
<p>4. Time risk Time risk refers to the dissatisfaction due to spending more time than expected</p>	<p>15. I concern that it may spend much time to register for online payment. 16. I concern that it may spend much time to get familiar with the usage of online payment. 17. I concern that it may spend much time to confirm identity and information to complete the payment process when using online payment.</p>
<p>5. Private risk Private risk refers to the release of consumers' personal information during online payment process.</p>	<p>18. I concern the probability of leakage of personal information during the transaction process. 19. I concern that sellers, banks, and service providers will improperly collect my personal information and use it illegally 20. I concern that personal information stored in service provider's database will leak due to hacking action and lead privacy violation.</p>
<p>6. Social risk Social risk refers to the decrease in consumers' social status due to idle or outdated commodities and services.</p>	<p>21. I concern that online payment is considered unwise, for there are some negative voices among relatives or friends. 22. I concern that the online payment may impact my image around people.</p>
<p>7. Service risk Service risk refers to the dissatisfaction due to service breaches or difficulty of finding the appropriate attendants.</p>	<p>23. I concern that some problem will rise and uncouthly negotiate with bank or third payment platforms attendants during opening online payment process. 24. I concern that some problem will rise and uncouthly negotiate with bank or third payment platforms attendants during online payment process.</p>
<p>8. Psychological risk Psychological risk refers to the risk of sellers' service may lead to consumer's negative psychological impact; the frustration of failing to achieve the consumption aim may wound consumers' dignity.</p>	<p>25. I concern it will make me feel pressure for loss may happen during online payment. 26. I concern it will make me feel anxious during waiting period before confirming payment arrival. 27. I concern it will make me feel fretful when payment not arrival timely or fail to arrival.</p>

3. EMPIRICAL ANALYSIS

3.1 Descriptive analysis of statistics

The structural questionnaire of consumers online payment perceived risks is designed according to Likert-5 scale. The subjects of the questionnaire are graduate and MBA students, professors and etc. in Shanghai and Macau. Altogether 890 answers were received online and offline, but 7 of them are exempt because of vast absence of information, leaving 883 valid questionnaire samples. Considering the influence that cultural differences have on consumers perceived risks, this paper only analyze with samples taken in Shanghai, including 616 valid samples, exempt of 2 without enough information.

In chart 2 are the descriptive analytical and statistical results of the basic facts of our volunteers. The chart shows that the ratio of male to female is around 1:1. 71.429% of our volunteers have 5-10 years' experience with the Internet, and 81.656% of them have ever conducted payment online, far exceeding 18.019%, the percentage of volunteers who have never used online payment. Consumers in Shanghai prefer online payment to traditional payments, but the difference between the preferences of each payment mode is not so obvious. The largest amounts of their online payment fall between 200 and 10,000 RMB. Almost a half, 45.089%, of our volunteers are students, and the majority of them held bachelor or higher degrees. Moreover, their ages fall between 18 and 35, and consumers in the age group between 18 and 25 took 43.994% of our samples.

Meanwhile, we added some other factors that consumers may consider in online payment. For example, 52.423% of our volunteers regarded "the worry of Internet security" as the biggest obstacle for them to use online payment. Thus we hypothesized that there is a negative correlation between perceived economic risks and the willingness to pay online. However, 59.612% of our volunteers held that convenience is the main reason for them to use online payment. This showed the significance of the study on consumer perceived risk.

3.2.2 Validity and reliability analysis

Table 4. Convergent validity analysis of measured model

Measure	Factors	Standard Factors	T_value	composite	average variation
security_risk5	perceived Security Risks (PSR)	0.627	16.153	0.882	0.656
security_risk3		0.826	25.096		
security_risk2		0.913	28.166		
security_risk1		0.846			
economics_risk6	Perceived Economic Risk (PER)	0.806	9.912	0.808	0.516
economics_risk5		0.754	9.714		
economics_risk3		0.652	15.142		
economics_risk2		0.647			
function_risk3	Perceived Function Risk (PFR)	0.714	7.651	0.583	0.415
function_risk2		0.565			
time_risk3	Perceived Time Risk(PTR)	0.703	14.402	0.786	0.551
time_risk2		0.817	15.003		
time_risk1		0.701			
private_risk3	Perceived Private Risk (PPR)	0.839	20.024	0.838	0.633
private_risk2		0.771	18.713		
private_risk1		0.774			
service_risk2	Perceived Service (PSER)	0.878	16.533	0.860	0.754
service_risk1		0.859			
psycho_risk3	Perceived Psychological Risk (PPSR)	0.848	17.360	0.824	0.610
psycho_risk2		0.783	16.824		
psycho_risk1		0.706			
Intention3	Internet pay willingness (INTE)	0.708	18.898	0.857	0.669
Intention2		0.825	21.938		
Intention1		0.909			
society_risk2	Perceived Social Risk (PSOR)	0.802	7.313	0.744	0.593
Society_risk1		0.736			

Structural formula model includes two parts: measure model and latent model. Before constructing structural formula model, let's test the convergent validity and discriminant validity of the measure model. As a rule, Convergent validity means that questions testing the same latent state-trait model will fall into the same factor range, and that the results of those questions will show certain persistence. The results of the confirmatory factor analysis of the measure model are shown in table 4. The adaptive rate of measure model satisfies series basic standards, if the loads of standard factors fall between 0.5 and 0.95. The interior quality of the model is desirable if the composite reliability reaches 0.6. The least value for of average variation evaluation (AVE) is 0.5. The convergent validity of the measure model is desirable when loads of all standardized factors reach 0.5, the composite reliability (CR) of all levels, except for perceptive function risk, is above 0.7 and all AVEs are over 0.5.

3.2.3 Correlation analysis

Discriminant validity means that the latent trait of certain question has little correlation or is totally in contrast with that of other questions. Measure model requires that the correlation coefficients of every two factor level lower than the square roots of both AVE (Fornell and Larckers, 1981) [27].

Table 5. Correlation and discriminant validity analysis of measured model

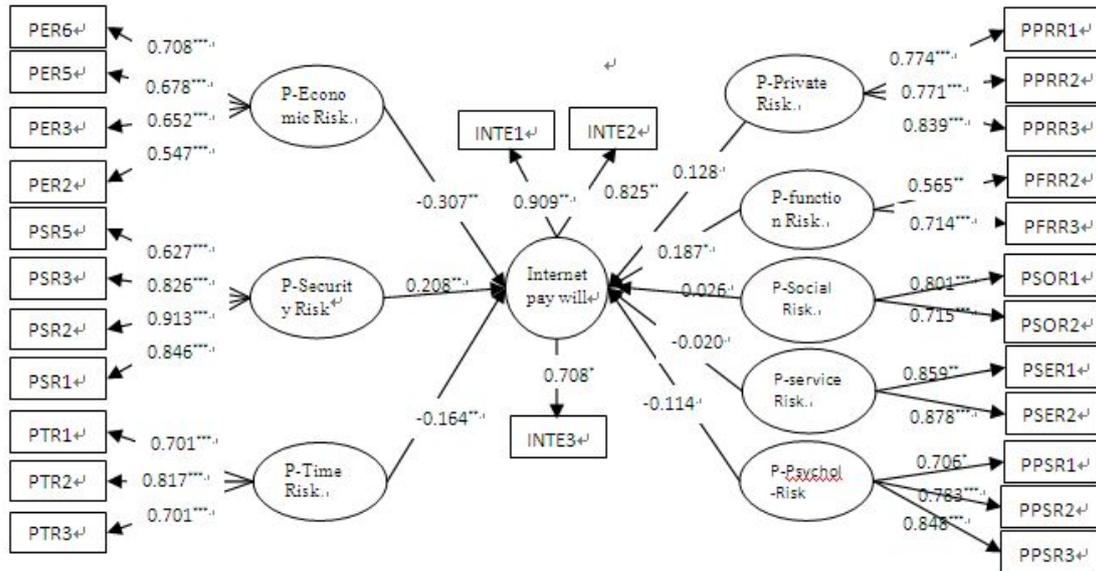
Variables	PSR	PER	PFR	PTR	PPSR	PPRR	PSOR	PSER	INTE
PSR	0.810								
PER	0.414**	0.718							
PFR	0.357**	0.285**	0.644						
PTR	0.160**	0.263**	0.180**	0.742					
PPSR	0.345**	0.386**	0.250**	0.219**	0.781				
PPRR	0.584**	0.397**	0.202**	0.225**	0.297**	0.795			
PSOR	0.091*	0.181**	0.086*	0.263**	0.294**	0.111**	0.770		
PSER	0.263**	0.349**	0.187**	0.246**	0.348**	0.353**	0.286**	0.869	
INTE	0.111**	-0.137**	0.079*	-0.164**	-0.136**	0.046	-0.101*	-0.087*	0.818

Notes: * P<0.05; ** P<0.01。

In table 5, the figures on the diagonal are the square roots of AVE of corresponding factor levels. Other figures in the table are Pearson correlation coefficients of corresponding factor levels. The correlation coefficient of every two figures should be smaller than their respective \sqrt{AVE} to reach the discriminant validity requirements of the measure model. And all perceived risks have close correlativity between each other, for example, the correlation coefficient of Security risk and Private risk is as high as 0.584. The explanation can be that volunteers will expect to face more Security risk once their privacy is intruded. The correlativity between those risk variables indicates that there might be the collinearity problem, which can be effectively solved by structural formula model.

3.3 Model analysis

The structural formula model in figure1 indicates that the perceived Economic risk, Time risk, Service risk and Physiological risk had negative correlations with consumers' willingness to use online payment; however, the perceived Security risk, Private risk, Functional risk and Psychological risk had positive correlations with consumers' willingness to use online payment. This result seemed to contradict the general hypothesis of the correlation between the perceived risks and consumers' willingness to use online payment. It is commonly known that the higher the risk consumers perceive, the less willingly they will use online payment. A possible explanation for this contradiction is that the online payment in Shanghai has passed its primary stage and entered its growing stage and the volunteers in the investigation has already got used to using online payment and developed certain dependency. Thus this group will continue to use online payment even when risks are perceived. This phenomenon changed certain risks to systematic risks.



CMIN/DF=1.894; RMR=0.038; GFI=0.943; AGFI=0.923; NFI=0.933; CFI=0.967; RMSEA=0.038.*P<0.05;**P<0.01;***P<0.001

Figure 1. SEM of consumers perceived risks and online payment intention

Hu and his team held that the global economic crisis in 2008 is a systematic risk in finance industry and offered strategies on the spread of systematic risk on private bank level to slow down the spread speed of contagious bank crisis from an Internet perspective. Taking the example of the systematic risk of private bank, Hu and his team supported that the systematic risk on this level was a catastrophe for the bank and then the whole banking system, and that this kind of systematic risk which influenced the whole banking network is the systematic risk of the Internet. This is the key point for central bank to decide which bank to invest to stop the bank crisis.

In concrete, the higher the risk consumers perceived, the less willingly they use payment online ($\beta_1 = -0.307$, $p < 0.001$), which means that perceived risks have conspicuous negative correlations with online payment willingness. The most significant risk factor that influences mainland consumers is Economic risk, such as loss resulted from the theft of online bank password or the improper capital care of a third party. Since perceived Economic risk will bring about direct loss, customers are most sensitive to them. If proper measures are taken by the sellers or regulators to reduce Economic risk, mainland electronic payment market will experience a vigorous development. Perceived risks also have conspicuous negative correlations with online payment willingness ($\beta_3 = -0.164$, $p < 0.01$), which means that if the time spent on online payment exceeds the anticipation, consumers would be unpleasant. One of the reasons that online payment market has undergone vigorous development is that it is convenient and time-saving, thus consumers have high anticipations on this service. However, the complicated process of payment may weaken the willingness of consumers. Perceived Service risk and perceived Psychological risk also have negative correlations with online payment willingness but are not significant.

Perceived Security risk has a significant positive correlation with the willingness to online payment. The explanation is that the willingness to pay online is not only influenced by perceived risks, but also affected by the perceived practicability and usability. In fact, perceived risks only count for 15.4% of the amount of change of consumers' willingness to pay online. Investment theory can afford to explain such rational behavior and illustrate why perceived risks only counts for less than one fifth of the amount of the change. In general, the risk is in positive correlation with the return. The precondition of the negative correlation between perceived risks and willingness to use online payment is that the return on online payment keeps stable. The individual will pay

online, provided that the ratio between the perceived risks and the return has an obvious positive effect on the willingness to pay online. This indicates that a consumer will use online payment ones the unit perceived risk brings enough usability.

In addition, the influence of the perceived Private risk, Function risk and Social risk is not so significant, but its positive correlation can also be explained by the same theory. This empirical study provides useful suggestions for the further research. Namely, both of risk and return should be considered in studying the willingness to use online payment.

In all, significant probability value of consumers perceived risks model was $p < 0.001$. This value reaches significant levels and rejects the null hypothesis. The ratio chi-square degrees of freedom model (CMIN / DF) was $1.894 < 3.000$. Other indicators such as the degree of fit $RMR = 0.038 < 0.05$, $GFI = 0.943 > 0.9$, $AGIF = 0.923 > 0.9$. The comparative adaptive statistics of the baseline, including $NFI = 0.933$, $RFI = 0.916$, $CFI = 0.967$, are all greater than 0.9, and the square root and gradual residual mean square $RMSEA = 0.038 < 0.05$. These indicators above have reached the standard of the model[≡].

4. CONCLUSION

In China, online payment market has great potential, but it is a potential with certain limitations. This paper took Shanghai for example and divided the perceived risks from the perspective of consumers into eight dimensions: Economic risk, Security risk, Private risk, Time risk, social, Service risk, Functional risk, and Psychological risk, to study the influence of perceived risks on consumers' willingness to use online payment and find the most significant risk. The results showed: (1) For young people, who are getting used to online shopping, the Economic risk influences their willingness to use online payment more than other risks; moreover, both of Security risk and Private risk, especially Security risk, have positive correlations with consumers' willingness to pay online. (2) Not every risk in the eight dimensions has a negative correlation with consumers' willingness to pay online, indicating that online payment is becoming an irreplaceable part of online shopping and closely linked with consuming habits; at present stage, perceived risks in various dimensions have become systemic risks, showing that online payment has achieved steady development in Shanghai. (3) From the perspective of utility function, rational consumers take risk and return into account when deciding whether to use online payment. Perceived risks no longer merely have significant negative influence on consumers' willingness to use online payment as they did at primal stage. Instead, rational and mature, the young generation pays more attention to the return on unit of risk.

Therefore, this study suggests that, on the one hand, provided that perceived Economic risk has a significant negative impact on consumers' willingness to use online payment, as economic losses of consumers are caused by dishonesty of sellers or insecure Internet environment, an honest online shopping environment should be secured, sellers should improve service quality and play fair, and online payment platforms should strive to create a secured payment environment. On the other hand, although the Security risk and Privacy risk and etc have a positive effect on consumers' willingness to use online payment, relevant supervision departments still need to regulate online payment environment, ensure online payment security and especially strengthen the supervision of third-party payment platforms. *Non-financial Institution Payment Service Management Approach* still needs to introduce relevant precipitation rules for funding and other issues. If regulatory measures could improve risk return of online payment platforms, it will be able to drive up the consumers' willingness to pay online.

Undoubtedly, this study also has some deficiencies. For instance, it only considered the risks that influenced online payments, but failed to take return into account, and thus caused that the total risk dimensions

[≡] The fitness shows that theory model of Consumer perceived Risks matches the observed model.

can hardly explain consumers' willingness to pay online. Foreign Im etc (2008) ^[28] suggest that we consider the influence of perceived risks, technology type, user experience, gender and so on, as multidimensional control variables, on perceived usability and availability; Shen and Chiou (2010) ^[29] also held that usability of perception would affect consumers' intention based on Internet use according to the expectation on trade terms and the discrepancy of consumers' security intention. Therefore, we recommend that future research assess the return on online payment from a comprehensive perspective combining availability, usability and perceived risks.

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