A Study on the Influence of Customer Characteristics on Innovation Resistance and Intention to Use in Face Recognition Payment System

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Abstract

The combination of big data and various technologies has caused tremendous changes in the financial industry. Face recognition payment as a new payment method has attracted much attention. China's investment in face recognition technology reached its peak in 2017-2018, and after 2019, it has entered a period of rational development. The reasons include the higher cost caused by higher technical and software and hardware requirements. This paper aims to study the influence of customer characteristics on innovation resistance and to explore the influence of innovation resistance on intention to use, which will help face recognition payment technology and products to better meet the needs of users. This paper chooses the attitude towards existing products, motivation, self-efficacy, innovation, and perceived risk customer characteristics. 123 Chinese users were surveyed by questionnaires, and the collected data were analyzed through Smart PLS 2.0. In the hypothesis about the innovation resistance of customer characteristics to face recognition payment, hypotheses 1-4 that customer innovation has a negative impact on innovation resistance has not been adopted. In addition, all assumptions have been adopted. In other words, customers' attitudes towards previous products and their perceived risks have a positive impact on innovation resistance, while customers' motivation and self-efficacy have a negative impact on innovation resistance. And research shows that customer resistance to innovation will have a negative impact on usage intentions.

Keywords: Face recognition, Customer characteristics, Innovation resistance, Intention to use

1. Introduction

With the application of big data, 5G, artificial intelligence, cloud computing, and other technologies in the economic field, mobile payment can develop rapidly. The convenience and efficiency of mobile payment have gradually replaced cash payment.

When using mobile payment, biometric technology is introduced in the identity verification process to ensure payment security. The introduction of this technology greatly improves the

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convenience of personal identity verification in the mobile payment process [1]. Among them, face recognition technology is one of the issues that deserve attention. According to statistics, from 2019 to 2024, the global facial recognition market will continue to grow at a compound annual growth rate of 16.6% [2].

China's investment in face recognition technology reached its peak in 2017-2018, and after 2019, it has entered a period of rational development. The reasons include the higher cost caused by higher technical and software and hardware requirements [3].

In 2020, a tourist in Hangzhou, China, took the wild animal world for abusing face recognition technology to court and won the case. Other industries use face recognition technology to cause social controversy. This is because the human face has its particularity. It is the exposed part of the human body, which is inconvenient to hide and change. Once the information is leaked, it will face the risk of privacy leakage or economic loss.

Therefore, high cost is not the only reason that slows down the development of the face recognition market. This makes it necessary to pay attention to the influence of customer characteristics on innovation resistance.

When studying innovation resistance, Ram said that not all innovations will be accepted, so it is a normal response of customers to resist changes [4].

Therefore, it is of great significance to study the strength and interrelationship of various factors in customer characteristics on innovation resistance, and the impact of innovation resistance on use intention. It can help face recognition payment technology and products to better meet user needs and achieve proliferation effects.

2. Theoretical background

2.1. Face recognition payment system

Face recognition payment is a combination of simple payment technology and face recognition technology.

The world's first face recognition payment system is a payment platform based on the face recognition system developed in Finland in 2013. When making a payment, you only need to point the camera at the POS machine, and it will be completed within five seconds. The payment process is simple and efficient and does not require cash, cards, or even mobile phones.

Face recognition technology is to collect face images, extract feature points from the face (including ears, nose, mouth, eyes, and other parts), and then compares the recognized data with the stored database to determine whether it is the person [5].

2.2. Customer characteristics

Oreg (2003) pointed out in his research that customers with different personalities will lead to different resistance to change [6]. Therefore, research on customer characteristics has a positive impact on product or service innovation.

When some customers face unfamiliarity and uncertainty in the changes of innovative products and services, they would rather maintain their current stable state and existing habits or customs [6].

And motivation will also affect customers' attitudes towards innovative products. Motivation is divided into intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to customers who voluntarily participate in an action and feel satisfied regardless of the result. Extrinsic motivation refers to customers performing specific actions due to external factors [7].

Because of the difference between internal and external stimuli, everyone has different motivations for innovative products.

The concept of self-efficacy was put forward by Bandura (1977), he believed that self-efficacy refers to the ability to complete a given task or behavior when technology or product innovation occurs [8]. According to Rogers (1983) research, customer innovation refers to the characteristic that they try to accept new technologies or services in preference to others [9].

Sheth (1981) put forward the perceived risk of innovation in the psychological research on innovation resistance. Perceivable risks include psychological risks. Psychological risk refers to the psychological discomfort caused by nervousness or worry after using a new product or new service [10]. Or when users accept innovative products, ideas, and services, they cannot accurately predict the results of such behaviors and there is a risk [11].

2.3. Innovation resistance

Innovation resistance refers to customers trying to maintain their previous state in the face of new changes [12]. In his research, Ram believes that product or service innovation has changed the habits of customers, so it is normal to resist changes. The innovation resistance model points out that three factors can make customers have an impact on innovation: perceived innovation characteristics, customer characteristics, and diffusion mechanisms. The study also pointed out that innovation resistance will vary depending on customer psychology.

2.4. Intention to use

Intention to use is a psychological decision made when an innovative product or service feels convenient, easy to use, and useful [13]. In other words, it can be defined as the possibility of using products or services in the future. In addition, according to previous studies, it was argued that personal characteristics, social characteristics, product characteristics, and corporate characteristics influence the intention to use Fintech services [14].

2.5. Research model and research hypothesis

2.5.1. Research model

From the perspective of customer characteristics, customer characteristics have a significant impact on innovation resistance. Therefore, the attitude toward existing products, motivation, self-efficacy, innovation, and perceived risk were selected as variables. The purpose of this study is to analyze the influence of customer characteristics on innovation resistance and the influence of innovation resistance on intention to use. For this purpose, the design model is shown in [Figure 1].

Figure1. Research model

2.5.2. Research hypothesis

There are many types of research on biometric authentication and simple payment, but not much researches on face recognition payment. In the era of big data, the amount of data has greatly increased, and the risk has also increased. Therefore, customers have different attitudes towards face recognition payment according to their circumstances.

This paper chooses to select customer characteristics as independent variables. Hypothesis as follows:

H1-1: Customer attitudes towards previous products have a positive (+) impact on innovation resistance.

H1-2: Customer motivation has a negative (-) impact on innovation resistance.

H1-3: Customer self-efficacy has a negative (-) impact on innovation resistance.

H1-4: Customer innovation has a negative (-) impact on innovation resistance.

H1-5: Customer perceived risk has a positive (+) impact on innovation resistance.

According to previous research, the higher the customer's innovation resistance, the lower the intention to use, so the hypothesis is:

H2: Customer innovation resistance has a negative (-) impact on intention to use.

3. Research method

Based on previous research, the questionnaire used the Likert scale (5. Fully agree, 4. Agree, 3. Neutral, 2. Disagree, 1. Strongly disagree) to measure various variables to achieve the purpose of the research. The questionnaire contains 7 concepts and 20 questions, including attitudes toward existing products, motivation, self-efficacy, innovation, perceived risk, innovation resistance, and intention to use. The content of the questionnaire is shown in [Table 1].

The basic statistics of this article use SPSS 22.0 and use Smart PLS 2.0 (Partial Least Squares) for analysis using structural equations.

4. Empirical analysis

4.1. Collect data

The demographic data of the sample collected according to the questionnaire show that males account for 21.95% and females account for 78.05%. Among the respondents, 8.94% were under 20 years old, 44.72% were 20-29 years old, 39.02% were 30-39 years old, 5.96% were 40-49 years old, and 1.63% were over 50 years old. In terms of education, 1.01% are those below high school, 7.58% are those who graduated from high school, 82.83% are those who graduated from university, 5.56% are those who graduated from a master's degree, and 3.03% are those with a doctoral degree or above. In terms of jobs, students accounted for 24.39%, public institutions accounted for 9.76%, technical experts accounted for 1.63%, civil servants accounted for 5.69%, and others accounted for 58.54%.

4.2. Data analysis

This article uses Smart PLS 2.0 for analysis. Effective reliability should be Cronbach's Alpha 0.7 or higher. Validity is divided into focusing validity and discriminating validity. Concentration validity tests the factor load value, component reliability (CR), and variance extraction index value (AVE) of each factor. The validity period is divided into focused validity

and differentiated validity. The factor load value, component reliability (CR), and variance extraction index (AVE) of each factor are tested for concentration validity.

In general, the factor loading value is 0.6 or more, the component reliability value is 0.7 or more, and the variance extraction index value is 0.5 or more to be. As a result of comparing the square root of the variance extraction index value with the correlation coefficient, the variance extraction index value is greater than the vertical and horizontal correlation coefficient values, so there is no problem with the discriminant validity. In this study, before proceeding with structural equation analysis for the reliability and validity analysis of the research model, the measurement model analysis was conducted first [Table 1].

Table 1. Reliability and internal consistency

Variable name		Details	Factor Loading	AVE	CR	α	Prior study
Attitude toward existing products	ATE1	-Are you satisfied with fingerprint or password authentication?	0.745	0.734	0.892	0.819	[6], [15]
	ATE2	- You will pay with other authentication methods before you pay with face recognition authentication.	0.918				
	ATE3	- You don't feel the need to pay using face recognition.	0.898				
Motivation	MOT1	- People around you are interested in face recognition payments.	0.887	0.850	0.944	0.912	[16], [17]
	MOT2	-You think it would be fun to pay using face recognition.	0.943				
	MOT3	- You think it's easy and quick to pay using face recognition.	0.934				
Self-efficacy	SEL1	- If you can only use face recognition to pay, you think you have the ability to complete.	0.909	0.811	0.928	0.883	[18]
	SEL2	- If you were told how to use face recognition to pay, do you think you would be able to learn to use it right away.	0.916				
	SEL3	- Do you think you are quicker to accept new products and services than others.	0.876				
Innovation	INO1	- Do you like to try new products or services before anyone else.	0.933	0.835	0.938	0.902	[19]
	INO2	- Do you enjoy challenging innovative products and can handle the good and bad results.	0.926				
	INO3	- Are you interested in innovative products or services.	0.881				
Perceived risk	PER1	- You think face recognition payment is at risk of disclosure of personal information and privacy.	0.928	0.892	0.961	0.940	[19]
	PER2	- You worry that your face information will be tampered with and misused.	0.969				
	PER3	- You worry that face information could be stolen by hackers and cause financial losses.	0.937				
Innovation resistance	INR1	- You refuse to use it because you are worried about the risk of paying for it.	0.951	0.899	0.947	0.888	[11]
	INR2	- You are worried that the online environment is not safe enough to pay for your face.	0.946				

Intention to use	USE1	- You have the intention of using face recognition to pay.	0.929	0.883	0.958	0.934	[13]
	USE2	- You'll continue to pay with face recognition.	0.955				
	USE3	- You'll use it more often	0.934				

As a result of the analysis, the AVE value of all variables is the correlation of each variable. It is larger than the square, so all variables can be considered to have discriminant validity [Table 2].

Table 2. Correlation and discriminant validity

Variable name	AVE	ATE	INO	INR	MOT	PER	SEL	USE
Attitude toward existing products	0.734	0.857						
Innovation	0.835	-0.205	0.914					
Innovation resistance	0.899	0.708	-0.235	0.948				
Motivation	0.850	-0.336	0.595	-0.450	0.922			
Perceived risk	0.892	0.657	-0.097	0.776	-0.293	0.945		
Self-efficacy	0.811	-0.272	0.708	-0.408	0.674	-0.235	0.900	
Intention to use	0.883	-0.410	0.644	-0.459	0.821	-0.285	0.709	0.940

4.3. Verification of the structural model

In this study, Smart PLS was adopted as the data analysis method in consideration of the characteristics of the study such as theoretical robustness, the number of samples, and self-development of the questionnaire. If the R^2 value is 0.26 or more, the degree of fitness is high, and if it is 0.26 to 0.13, the degree of fitness is expressed as a medium, and if it is less than 0.13, the degree of fitness can be expressed as low. Innovative resistance (0.593) of the component value can be evaluated as high, and intention to use (0.287) can be evaluated as high too.

The research result model is shown in [Figure 2].

Figure 2. The results of the research model

The model analysis results are as follows.

Hypothesis H1-1 "Customers' attitudes towards previous products have a positive (+) impact on innovation resistance." The hypothesis was statistically significant at the significance level

of 95% (H1-1; $\beta=0.300$, $t=4.326$, $p<0.05$), so the hypothesis H1-1 was adopted, therefore, the higher the Customers' attitudes towards previous products, the higher the innovation resistance.

Hypothesis H1-2 "Customer motivation has a negative (-) impact on innovation resistance." The hypothesis was statistically significant at the significance level of 95% (H1-2; $\beta=-0.128$, $t=2.140$, $p<0.05$), so hypothesis H1-2 was adopted, therefore, the higher the customer motivation, the lower the innovation resistance.

Hypothesis H1-3 "Customer self-efficacy has a negative (-) impact on innovation resistance." The hypothesis was statistically significant at the significance level of 95% (H1-3; $\beta=-0.174$, $t=2.306$, $p<0.05$), so the hypothesis H1-3 was adopted, therefore, the higher the customer self-efficacy, the lower the innovation resistance.

Hypothesis H1-4 "Customer innovation has a negative (-) impact on innovation resistance." The hypothesis was statistically significant at the significance level of 95% (H1-4; $\beta=0.076$, $t=0.982$, $p<0.05$), so the hypothesis H1-4 was rejected.

Hypothesis H1-5 "Customers' perceived risk will have a positive (+) impact on innovation resistance." Assuming statistical significance at a significance level of 95% (H1-4; $\beta=0.508$, $t=6.248$, $p<0.05$), so the hypothesis H1-5 is adopted. Among the characteristics of customers, the perceived risk of customers is an important factor in determining customer behavior. Therefore, the higher the perceived risk of customers paying for face recognition, the higher the resistance to innovation.

Hypothesis H2 "Customer innovation resistance has a negative (-) impact on intention to use." The hypothesis was statistically significant at the significance level of 95% (H1-4; $\beta=-0.459$, $t=5.935$, $p<0.05$), so hypothesis H2 was adopted. Therefore, the higher the customer innovation resistance, the lower the intention to use.

5. Conclusion

This research is mainly aimed at Chinese users, so a sample study of Chinese users is carried out.

According to the results of this study, its meaning is as follows.

In the hypothesis about the innovation resistance of customer characteristics to face recognition payment, hypotheses 1-4 that customer innovation has a negative impact on innovation resistance has not been adopted. In addition, all assumptions have been adopted. In other words, customers' attitudes towards previous products and their perceived risks have a positive impact on innovation resistance, while customers' motivation and self-efficacy have a negative impact on innovation resistance. And research shows that customer resistance to innovation will have a negative impact on usage intentions.

Based on the results of this research, the following suggestions can be made.

First, the study found that in the process of innovation and diffusion of the face recognition payment system, customer innovation has no significant impact on innovation resistance. This is because the use of facial recognition to verify identity is not the first time to verify identity through biometrics. Customers have become accustomed to using some physical features for identity verification.

Secondly, from the results, the ability of customers to perceive risks has the greatest impact on innovation resistance. In particular, biometrics is related to the customer itself. The massive collection and use of biological data make customers worry about whether privacy and personal information in the era of big data can be effectively protected. Therefore, formulating authoritative big data collection rights, usage rights, and forgetting rights have become a top

priority, which will determine whether the binding of face recognition and simple payment can be used for a long time.

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