

The Effect of System and User Characteristics on Intention to Use: An Empirical Study of Face Recognition Payment

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Abstract. The modern society is undergoing tremendous changes due to technological innovation. The birth of new technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), big data, and cloud computing marks the beginning of the fourth industrial revolution. Various new industries are rapidly emerging as Information and Communication Technology (ICT), artificial intelligence, big data, and other new technologies such as the Internet of Things are combined. Fintech is a technology that is attracting attention as new technologies and the financial industry merge. Fintech was formed from the confluence of the financial industry and information and communication technology by governments from all over the world, as well as continual innovation. Fintech is an innovation in the financial industry that uses new technologies such as artificial intelligence, big data, cloud computing, the Internet of Things, and other modern science and technology achievements to reform financial products, business models, and business procedures. One of the most basic tasks in the financial business is payment service. The development and introduction of new technologies have changed the way individuals pay. One of the notable fields in payment service is face recognition payment which is being used in various fields due to its high accuracy and low invasiveness. Facial recognition payment is a technology that uses computer vision to mimic human vision, allowing computers to analyze images. It is a technology that implements identity authentication based on personal facial feature information. The purpose of this study is to analyze the effect relationship between facial recognition payment on usage intention. For basic statistical analysis of the questionnaire, SPSS 22.0, a statistical package, was used. For hypothesis testing, concentrated validity and discriminant validity were verified using the structural equation package Smart PLS 3.0. Information

technology factors that determine face recognition payment were divided into system characteristics and user characteristics. A summary of the result of the study follows. First, the system characteristics of face recognition payment had a significant effect on user resistance. Second, the user characteristics of face recognition payment had a significant effect on user resistance. Third, the user resistance had a significant effect on the intention to use.

Keywords: face recognition payment, system characteristics, user characteristics, user resistance, intention to use

1. Introduction

As payment methods develop, more and more people experience leakage of personal information or privacy, and the higher the user convenience, the greater the user risk. This is because companies that provide easy payment services acquire a lot of personal information from consumers in order to make payment easier and broaden the scope of their operation. Personal information leaks including face information are taking place. When looking at research related to innovation such as Fintech and biometric authentication, it was found that many studies focused only on positive consumer responses such as acceptance, satisfaction, and intention to use.

It is important to maintain the security of information or physical properties in today's networked world. Serious personal information leakage and property damage are occurring due to crimes such as voice phishing and hacking. Because of the advancement of information technology, the most commonly used passwords are readily revealed or modified owing to hacking or malicious code attacks (Musa et al., 2021). Accordingly, biometric technology is being implemented to improve the security of simple payments. Biometrics is a modern technology that verifies identification by using bodily traits such as the iris, face, voice, and fingerprint. It is a technology that converts the extracted individual's body characteristics into data and compares it with pre-stored data to determine whether it is the same person.

One of the notable fields in biometrics is facial recognition which is being used in various fields due to its high accuracy and low invasiveness. Face recognition technology is a type of computer vision technology that mimics human vision by allowing computers to extract, analyze, comprehend, and analyze pictures. It is a technology that can implement identity authentication based on personal facial feature information. The face recognition system performs necessary processing on the collected face images. By extracting the feature data and comparing it with the stored database, it is confirmed that it is the same person. Face recognition technology is widely used in various fields. However, the use of facial recognition technology raises concerns about whether personal information can be properly stored and managed. A person's face is often exposed to public environments and has a unique characteristic that is not easy to hide or fix. As the convenience of use increases, the risk of using face recognition technology also increases.

The specific objectives of this study are as follows. First, it was attempted to uncover specific factors affecting user resistance to face recognition payment depending on system and user characteristics. Second, the purpose of this study was to investigate how user resistance to face recognition payment affects intention to use. In the empirical study, a research model was established based on the review results of literature studies. Hypotheses were presented for the research model, and a survey was conducted.

2. Theoretical Background

2.1. Face recognition payment

Simple payment is one of the industries representing Fintech. With the development of communication and technology, the Fintech industry has also developed rapidly, and there has been a major change in payment methods. Customers initially paid with cash and then started paying with credit cards. Now, with the popularization of smartphones, the era of mobile simple payment has opened. Mobile simple payment entails storing personal information such as a bank card and a credit card in advance on a mobile device and making payments using online identity identification via mobile. It is a payment service that allows one to pay without using cash or a credit card (Murinde et al., 2021; Jin et al., 2020; Vaghela, 2020).

Password authentication is the most widely used authentication method for identity verification, but authentication passwords are easy to leak in a network environment. If the password is leaked, personal information or property loss may occur. Therefore, to increase the safety of identification, a biometric technology that can identify the user's body information (fingerprint, iris, face, vein, etc.) is being introduced. Face recognition payment is a new payment method that is completed by deducting the payment amount from the connected payment account by comparing the consumer's face information with the database through the camera of the POS terminal at the checkout based on facial recognition technology. The whole process takes only about 5 seconds and no other media is required.

2.2. System characteristics

A system is generally an aggregate composed of hardware, software, communication, network, and is combined according to certain laws to realize necessary functions. System Characteristic refers to the quality attribute of the developed information system itself. It refers to the performance of an information system, and it is the degree to which functions are effectively operated. In the quality characteristic factors for information systems, system characteristics include software characteristics and hardware characteristics. Bailey & Pearson (1983) stated that convenience, reliability, security, accessibility, and response speed can be used as measurement tools in the development of computer user satisfaction measurement and analysis tools.

2.2.1. Convenience

According to the study of Bailey & Pearson (1983), convenience means the difficulty of system functions when users use the system. Convenience is the user interface associated with the use of certain technologies and services. It relates to the procedures and methods by which users use information about those technologies and services. In the existing payment method, users had to pay through mobile devices or other media. Face recognition payment is a payment method that allows payments to be made using facial information without media such as cards or smartphones (Teo

et al., 2015) which is more convenient than the existing mobile payment method. Facial recognition technology is different from other biometric technologies. The advantage is that the user can recognize it naturally without requiring a special action or action and without contact. Hence, it is more convenient and unique than other biometric technologies.

2.2.2. Reliability

Trust is defined in numerous academic fields since it is a key aspect in social, economic, and interpersonal settings where uncertainty and reliance occur. To summarize the common characteristics of the various definitions, trust is a positive belief in relative behavior. The anticipation that the other party's promises would aid based on good intentions is referred to as trust. It is a risk-taking relationship since it is formed by interactions between each entity. When users use mobile banking, they must provide not only personal information to the mobile device but also sensitive information such as financial information (Jafari et al., 2020). Reliability is an important factor that can reduce users' perceived risk and induce their intention to use. As new technologies emerge in the fourth industrial revolution, the volume of big data grows exponentially. Therefore, personal information is leaked very easily, so reliability is more important. A system's reliability is defined as its exact and accurate capacity to produce correct or agreed-upon outputs under specified conditions.

2.2.3. Safety

Safety has been studied in various ways by many scholars and has various meanings. In general, safety refers to the degree to which users use services accurately without system errors (Han 2017). Approaching the concept of safety, there is no risk to the new system. The risk means the possibility of causing harmful consequences due to the malfunction of the system. The degree of risk associated with new technology may be tackled by splitting it into technical analysis and psychological analysis. Technical risk analysis can be expressed in terms of the likelihood of occurrence and the severity of the expected loss. Whereas, the descriptive analysis presents objective, probabilistic outcomes. The subjective perception of safety from a psychological point of view is the result of the integrated reflection of political, social, and cultural factors in the risk itself. The user of the system may be more effective in diagnosing safety if the user of the system judges the nature and extent of the risk.

2.2.4. Flexibility

Flexibility refers to the degree to which the system responds flexibly to situations or types when users use services (Gorla et al., 2010). It is believed to be the capacity to immediately respond to user anxiety by efficiently responding to user needs or modification requests. It is the degree to which the provided system is improved to meet the needs of users and promptly responds to the anxiety generated by users. Flexibility is the ability to cope with risks and uncertainties induced by internal

change and external constraints without sacrificing time, effort, or cost. The flexibility of a system is the ability to adapt to changes in the external environment and to respond to the environment. Flexibility includes versatility and agility. It is the ability of a new system to quickly adapt to a variety of environments.

2.3. User characteristics

Most of the existing users can be much more rational than the few users who seek change (Gkikas et al., 2022). However, it must respect users who resist change, understand their resistance, and use their knowledge to develop and promote innovation. Psychological factors influencing user characteristics include product attitudes, behavioral habits, adoption of innovations, and associated perceived risks.

2.3.1. Product attitude

According to research on consumer resistance to innovation, Cornescu and Adam (2013) discovered that some consumers are readier to keep their current stability and established routines in response to changes in innovative products and services.

This is because the impact of innovative products or services on customers is unfamiliar and uncertain. Customers are accustomed to and dependable with existing products and services, therefore they have little interest in or willingness to test innovative products. Conversely, if they are dissatisfied with an existing product, users are more likely to try a new product. Facial recognition payment will be compared with existing products along with mobile simple remittance and resistance in the process of users choosing innovative products. In addition, the attitude toward the existing product is defined as the satisfaction or positive attitude that the user feels toward the existing product.

2.3.2. Motivation to use

Motivation is an important field of psychology. A psychological tendency or extrinsic driving force that leads to the realization of behavior toward a specific goal. Motivation to use drives consumers to adopt innovative needs and intentions, and it also influences customer attitudes toward innovative products. Use motivation can be divided into intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to the behavior that the customer tries to try with factors such as curiosity, regardless of the outcome, even if there is no external reward. Extrinsic motivation means that a consumer takes a specific action under the influence of an extrinsic factor such as a discount or material reward. Because internal and external incentives are different, it was verified that different people have different motives for using or not using innovative products. In the motivation model, intrinsic motivation is not a visible benefit, but the perception of wanting to do something for the sake of the process itself of performing the behavior (Davis et al., 1992). From the consumer's point of view, motivation is an important factor influencing technology acceptance. The

hedonistic motive is the consumer's use of technology for fun or enjoyment. According to the relationship between user attitude and word of mouth intention based on Fintech use motivation, the Fintech service user's purpose for using Fintech service is the pleasure and interest that people experience while using Fintech. The use of certain technologies or systems can improve individual performance.

2.3.3. Perceived risk

Perceived risks include financial risks, psychological risks, physical risks, functional risks, and social risks (Ram 1987). The financial risk is the risk of wasting money because the product is not as satisfying as expected, (i.e. investing more than the benefits from the product). A Psychological risk is the risk that consumers will have a negative impact by choosing a product they do not like. Physical hazard is the risk of harming others while using the product. Functional risk is the risk that a product will not perform as expected by consumers. Social risk is the risk that the consumer's status changes among the important people around him by choosing a product. In consumer behavior analysis, customers cannot forecast the effects of their purchase behavior with precision; hence there is a perceived risk in their purchasing decisions. Perceived risks related to innovation are mainly derived from material risks, risks of social or economic outcomes, and adverse effects related to uncertainty in performance.

2.4. User resistance

Innovation is defined as the user's perception of a new product. Innovation refers to a phenomenon in which existing production systems can create new markets or cause significant changes through completely new ideas or unprecedented services (Cornescu et al., 2013). Innovations are new technologies, processes, and products that have the potential to create new markets or change existing competitive conditions or consumer behavior. The concept of resistance is used in many fields.

The concept of user resistance is defined as human nature's tendency to seek consistency and maintain the status quo. Habit formation and maintenance are much more common in humans than in innovation. Those who choose user resistance are more rational than those who change for the sake of freshness.

Therefore, people tend to maintain the status quo when faced with uncertain innovation. The psychological component of user resistance mainly includes the perceived risks associated with adopting the habits and innovations of existing practices and behaviors.

User resistance is not the opposite of acceptance, but rather a process before the adoption of new technology. It is true that many new products and services have a high failure rate. Because, by definition, innovation involves customers accepting price, performance, or design changes, modifying habits and practices or violating deeply ingrained conventions and traditions (Chuttur 2009).

2.5. Intention to use

The intention to use is the user's acceptance of the technology on the premise of continued use. Behavioral intention refers to an individual's intention prior to actual behavior. It can be defined as a measure of an individual's intention to perform a behavior (Chuttur 2009). In other words, intention to use is the degree of intention to perform a specific action.

It is a major factor influencing actual behavior, and whether or not behavior can be measured through intention. Behavioral intention can be determined according to an individual's attitude toward actual behavior and subjective norms related to that behavior. Intention to use is an individual's intention or willingness to use new technology. The intention of use relates to how frequently the smart device-based in-house information system is utilized, as well as the intention to voluntarily use it and promote it to others.

3. Research Design

3.1. Research model

User resistance and intention to use are essential variables in face recognition payment. In order to increase the intention to use, user resistance should be reduced. The proposed research model focused on analyzing the relationship between system characteristics and user characteristics, user resistance, and intention to use in face recognition payment.

For face recognition payment, system characteristics (convenience, reliability, safety, flexibility) and user characteristics (product attitude, motivation to use, perceived risk) were selected as determinants. The research model based on previous studies is shown in Figure 1.

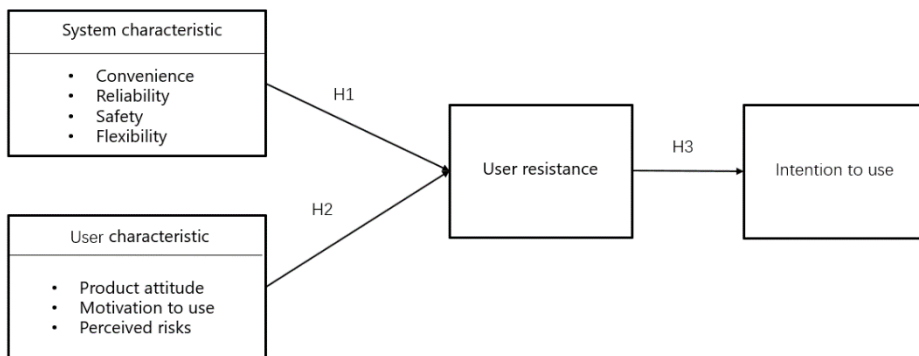


Fig. 1: Research model.

3.2. Research hypothesis

The system characteristics of facial recognition payment were composed of convenience, reliability, safety, and flexibility. According to a related study on user resistance, system characteristics have been shown to have a negative effect on user

resistance (Murinde et al., 2021). Based on previous studies, the following research hypotheses were presented.

Hypothesis 1: System characteristics will have a significant impact on user resistance.

Hypothesis 1-1: Convenience will have a significant impact on user resistance.

Hypothesis 1-2: Reliability will have a significant impact on user resistance.

Hypothesis 1-3: Safety will have a significant impact on user resistance.

Hypothesis 1-3: Flexibility will have a significant impact on user resistance.

The user characteristics of face recognition payment were composed of product attitude, motivation to use, and perceived risk. According to a related study on user resistance, it was found that user characteristics have a negative effect on user resistance (Gkikas et al., 2022). Based on previous studies, the following research hypotheses were presented.

Hypothesis 2: User characteristics will have a significant impact on user resistance.

Hypothesis 2-1: Attitude to existing products will have a significant impact on user resistance.

Hypothesis 2-2: Motivation to use will have a significant impact on user resistance.

Hypothesis 2-3: Perceived risk will have a significant impact on user resistance.

It has been studied that when user resistance to new technology is reduced, it has a positive effect on the living environment and intention to use the product (Cornescu et al., 2013). According to the findings of a study that examined the relationship between user resistance and intention to use digital information level, digital device use motive, and digital device usage attitude, the lower the user's resistance to digital devices, the higher the intention to use it. Based on previous studies, the following research hypotheses were presented.

Hypothesis 3: User resistance is going to impact intention to use.

4. Empirical Analysis and Research Findings

4.1. Operational definition of variables

The study model and accompanying hypotheses were developed using information acquired from a literature survey and examination of different technical systems. Table 1 below states the variables' operational definitions used in this study.

Table 1: Operational definition of variables.

Factors	Operational Definition	Previous Studies
Convenience	The degree to which the user can perceive naturally without requiring any special action or action.	(Bailey et al., 1983; Teo et al., 2015)
Reliability	The degree to which users trust Fintech or related technologies due to high security	(Jafari et al., 2020)
Safety	The degree to which you feel safe by using the device	(Han 2017)
Flexibility	The degree to which you feel that no problem will occur even if you use it in place of another device	(Gorla et al., 2010)
Product attitude	Satisfaction or positive attitude toward existing payment methods by users	(Cornescu et al., 2013)
Motivation to use	It is the degree to which people find fun and interest when using new technologies and services.	(Davis et al., 1992)
Perceived risk	Consumers are worried or anxious about unknown results after using a new product.	(Ram 1987)
User resistance	Human nature is the tendency or degree to seek consistency and maintain habit formation.	(Cornescu et al., 2013; Chuttur 2009)
Intention to use	It refers to the individual's intention before actual action as the individual's behavioral intention, and is a measure of the individual's intention to execute the behavior.	(Chuttur 2009)

4.2. Characteristics of respondents

Recently, several survey tools have been created. In this study, the data was gathered utilizing one of the online survey services which is the Navey service. A total of 799 questionnaires were answered through the Naver survey, and 590 questionnaires were used for analysis, excluding 109 insincere ones.

Table 2: Characteristics of respondents.

Characteristics		Responses	Percentage
Gender	Male	242	41%
	Female	348	59%
Age	20-29 years	183	31%
	30-39 years	189	32%
	40-49 years	130	22%
	50-59 years	59	10%
	60 years or more	39	5%
Education	High School	183	31%
	College / University	260	44%
	Graduate School	100	17%
	Post Graduate	47	8%
Occupation	Student	207	35%
	White-collar	177	30%

	Blue-collar	89	15%
	Professionals	47	8%
	Others	70	12%
Annual Income	0 – \$10,000	47	8%
	\$10,000 – \$20,000	130	22%
	\$20,000 – \$30,000	307	52%
	\$30,000 – \$40,000	59	10%
	\$40,000 or more	47	8%

4.3. Analysis method

In terms of measuring items, prior research questionnaire items were recreated for this study, and each item was measured on a 7-point scale. The statistical package SPSS 22.0 was used for statistical analysis of the questionnaire, and the structural equation package Smart PLS 3.0 was used for hypothesis testing to verify concentration validity and discriminant validity. Factor loading values, Cronbach’s α , composite reliability, and average variance extraction values of each factor were verified. A factor loading value of 0.6 or more, a Cronbach’ α value of 0.7 or more, a construct reliability value of 0.7 or more, and a variance extraction index (AVE) value of 0.5 or more is generally accepted.

4.4. Reliability and internal consistency results

Prior research questionnaire items were reproduced for this study, and each item was assessed on a 7-point scale. The survey takes place over a two-month period, from May 25 to July 25, 2021. A total of 590 copies were used for the analysis for hypothesis testing. The statistical package SPSS 22.0 was used for statistical analysis of the questionnaire, and the structural equation package Smart PLS 3.0 was used for hypothesis testing to verify concentration validity and discriminant validity. The results of the concentrated validity are shown in Table 3 and the results of the discriminant validity are shown in Table 4.

Table 3: Reliability and internal consistency results.

Factors	Items Name	Factor Loadings	AVE	Composite Reliability (CR)	Cronbach’s Alpha
Convenience	Co1	0.876	0.709	0.933	0.873
	Co2	0.920			
	Co3	0.884			
Reliability	Re1	0.879	0.707	0.937	0.891
	Re2	0.921			
	Re3	0.896			
Safety	Sa1	0.713	0.655	0.834	0.737
	Sa2	0.820			
	Sa3	0.868			
	Sa4	0.934			
Flexibility	FI1	0.942	0.738	0.959	0.811
	FI2	0.872			

	F13	0.958			
	F14	0.902			
Product attitude	Pr1	0.713	0.633	0.865	0.752
	Pr2	0.820			
	Pr3	0.868			
	Pr4	0.834			
Motivation to use	Mo1	0.878	0.771	0.913	0.866
	Mo2	0.883			
	Mo3	0.881			
	Mo4	0.906			
Perceived risk	Pe1	0.905	0.743	0.952	0.917
	Pe2	0.936			
	Pe3	0.911			
	Pe4	0.780			
User resistance	Us1	0.867	0.733	0.944	0.892
	Us2	0.947			
	Us3	0.904			
	Us4	0.884			
Intention to use	In1	0.906	0.739	0.935	0.885
	In2	0.922			
	In3	0.901			
	In4	0.809			

Table 4: Pearson correlations and discriminant validity.

Factors	AVE	1	2	3	4	5	6	7	8	9
Co	0.709	0.842								
Re	0.707	0.289**	0.841							
Sa	0.655	0.115**	0.571**	0.809						
Fl	0.728	0.287**	0.662**	0.565**	0.853					
Po	0.633	0.285**	0.638**	0.332**	0.572**	0.795				
Mo	0.771	0.574**	0.617**	0.708	0.689**	0.700**	0.878			
Pe	0.743	0.482**	0.569**	0.275**	0.507**	0.660**	0.630**	0.861		
Us	0.733	0.293	-0.369**	-0.223**	-0.323**	-0.607**	-0.492**	-0.631**	0.856	
In	0.839	0.366**	0.616**	0.691**	0.618**	0.653**	0.658**	0.519**	-0.322**	0.915

**Correlation is significant at 0.01 level (2-tailed).

Diagonal element shows the square root of AVE

4.5. Test hypothesis

Smart PLS 2.0 was utilized for the structural model, and the structural model was used to determine the path coefficient and the coefficient of determination (R^2) between the variables in the research model. If the R^2 value is 0.26 or more, the fit is

high, and if it is 0.25 to 0.13, it is intermediate. A value less than 0.12 can be indicated as a low fit. The coefficient of determination (R^2) for user resistance (0.409) and intention to use (0.512) appeared to be positive.

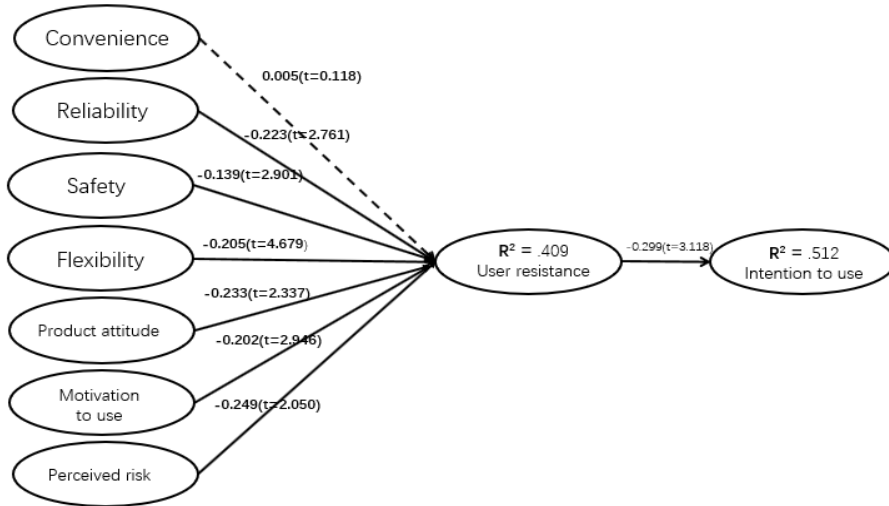


Fig. 2: Path analysis for the research model.

The proposed hypothesis H1 was partially accepted and H2 was accepted. However, the Hypothesis H1-1 was rejected. Convenience and user resistance ($\beta=0.005$, $t=0.118$, $p>0.05$) were found to have no significant effect. Convenience was measured as follows. Learn how to use it easily. The use procedure is simple. It is simpler than the existing payment method. Hypothesis H1-2 was accepted. Reliability and user resistance ($\beta=-0.223$, $t=2.761$, $p<0.05$) were found to have a significant effect. Reliability was measured as follows. No problems with other payment methods. There is reliability in the storage of personal information. Fully trust the security technology. Hypothesis H1-3 was accepted. Safety and user resistance ($\beta=-0.205$, $t=4.659$, $p<0.05$) were found to have a significant effect. Safety was measured as follows. It is more secure than other payment methods. The security of personal information is secure. The new system feels safe. Hypothesis H1-4 was accepted. Flexibility and user resistance ($\beta=-0.205$, $t=4.659$, $p<0.05$) were found to have a significant effect. Flexibility was measured as follows. Existing systems can be easily replaced. It is easy to learn a new system. Everyone can use it. Hypothesis H2-1 was accepted. Product attitude and user resistance ($\beta=-0.233$, $t=2.337$, $p>0.05$) were found to have a significant effect. Product attitude was measured as follows. Facial recognition payment is better than existing cards or mobile. Facial recognition payment is more satisfactory than the existing payment. I want to change the existing payment method to face recognition payment. Hypothesis H2-2 was accepted. Motivation to use and user resistance ($\beta=-0.202$, $t=2.946$, $p<0.05$) were found to have

significant effects. Motivation to use was measured as follows. Authors think facial recognition payment will be interesting. Facial recognition payment is new and interesting. Facial recognition payment will become a trend in the future. Hypothesis H2-3 was accepted. Perceived risk and user resistance ($\beta=-0.205$, $t=4.659$, $p<0.05$) were found to have a significant effect. Perceived risk was measured as follows. If facial recognition payment is used, transaction information and personal information are likely to be leaked. With facial recognition payment, the identity between traders is unlikely to be accurately guaranteed. Hypothesis H3 was accepted. User resistance was found to have a significant effect on the intention to use ($\beta=0.299$, $t=3.118$, $p<0.05$). User resistance is as follows. There is a fear of using facial recognition payments. I have a reluctance to use facial recognition payment. We oppose the use of the facial recognition payment service system. The intention to use is as follows. If possible, facial recognition payments will be used. Face recognition payment will be used more than other payment services. There are plans to use facial recognition payment in the future.

Table 5: Hypothesis testing of model (*Probability level $p<0.001$)

Paths	Estimate	T-statistics	Hypothesis Results
H1-1: Convenience → User resistance	0.005	0.118	Not supported
H1-2: Reliability → User resistance	-0.223	2.761*	Supported
H1-3: Safety → User resistance	-0.139	2.901*	Supported
H1-4: Flexibility → User resistance	-0.205	4.678*	Supported
H2-1: Product attitude → User resistance	-0.223	2.337*	Supported
H2-2: Motivation to use → User resistance	-0.202	2.946*	Supported
H2-3: Perceived risk → User resistance	-0.249	2.050*	Supported
H3: User resistance → Intention to use	-0.229	3.118*	Supported

5. Conclusion

This study is a demonstration to find out how system characteristics (convenience, reliability, safety, flexibility) and user characteristics (product attitude, motivation to use, perceived risk) affect intention to use through user resistance in face recognition payment. With this, the existing literature on system characteristics, user characteristics, user resistance, and intention to adopt facial recognition payment has been assembled. Based on previous studies, research models and hypotheses were developed and empirically validated. The empirical analysis results of this study are summarized below.

First, the results of the study on the relationship between the system characteristics (convenience, reliability, safety, flexibility) of face recognition payment and user resistance are as follows. User resistance was shown to be

significantly affected by system attributes such as reliability, safety, and flexibility. The higher the reliability of the face recognition payment, the lower the user resistance. The safety of acquiring, analyzing, and recognizing face information of a face recognition device has been found to be an important factor that does not cause user resistance. On the other hand, among the system characteristics of face recognition payment, convenience did not appear to affect user resistance.

Second, the results of the study on the relationship between user characteristics (product attitude, motivation to use, perceived risk) and user resistance to face recognition payment are as follows. It was found that user characteristics have a significant effect on user resistance. The product attitude affects user resistance, and the more satisfied with the payment method, the lower the resistance to face recognition payment service. According to the results of the survey on payment methods and mobile financial service usage behavior, credit card showed the highest overall satisfaction among payment methods. It is judged that the development of the face recognition payment market is slow because the satisfaction with the existing credit cards payment is high. Hence, motivation to use face recognition payment has a negative effect on user resistance. The more interesting facial recognition payment is, the more likely it is that they will not refuse to use it. Perceived risk affects user resistance. Face recognition technology is concerned about risks such as invasion of privacy and leaking of personal information, thus, we are concerned about possible threats such as hacking attacks.

According to the findings of an analysis of the effects of system and user characteristics on user resistance and user resistance on user intention for face recognition payment, the following conclusions may be offered.

First, among the system characteristics in face recognition payment, the higher the reliability, safety, and flexibility, the lower the innovation resistance. Therefore, facial recognition payment should allow users to feel unprecedented reliability, safety, and the desire to use can only be raised if resistance is removed.

Second, the convenience of face recognition technology did not have a significant effect on user resistance. However, it can cause various problems. Although the efficiency of identification is high, users are concerned that facial information and personal privacy may be infringed if facial recognition technology is used on a large scale. In particular, the negative impact of this characteristic is more pronounced when facial information is financial-related. Therefore, facial recognition payments must work with other identification technologies to ensure the security of user information and finance.

Third, the higher the product attitude, motivation to use, and perceived risk, the lower the user resistance. Therefore, in order for the facial recognition payment service to become popular, it must first have more attractive features than all existing payment methods. To govern the face recognition market, it is required to enhance knowledge of face recognition payment through education and publicity, as well as

to develop and restructure explicit regulations on the collection, storage, and use of face information.

The limitations of this study and future research directions are as follows.

First, sample analysis for diverse groups was attempted to boost the generalizability of this study, however, the study's drawback is that only 590 valid samples were utilized for the analysis, thus generalizing the point is limited.

Second, in this study, system characteristics (convenience, reliability, safety, flexibility) and user characteristics (product attitude, motivation to use, perceived risk) were limited as exogenous variables affecting endogenous variables. In future research, an in-depth analysis that further expands the exogenous variables is needed.

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