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The Effects of Mobile Payment System on Consumer Attitude and Behavioral Intention†

Jaesin Oh* · Wonjong Kim**

··· Abstract ···

The main purpose of this study is to identify major factors affecting users of mobile payment services. Furthermore, it is to confirm the influence of these factors on the perceived value and trust of the user. In addition, this study examines the importance of perceived value and trust as the main influencing factors of users' continuance intention, and suggests theoretical and practical implications. The constructs of this study were incorporated in existing literature. A total of 7 constructs consisted of 21 measurement items. All items were measured on the Likert 7-point scale. We used SPSS 25.0 and AMOS 20.0 for basic analysis and hypothesis testing. The results of analyzing the data of 232 respondents for the hypothesis test are as follows. Perceived usefulness, facilitating conditions, social influence, and perceived security had a positive effect on perceived value. However, these factors did not significantly affect mobile payment trust. On the other hand, it was analyzed that the perceived value, trust, and continuance intention of users for the mobile payment service have a virtuous cycle.

Key Words : m-Payment, Perceived Usefulness, Facilitating Condition, Social Influence, Perceived Security, Perceived Value, m-Payment Trust, Continuous Usage Intention

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* Associate Professor, Department of Industrial Management, Gyeongsang National University, BERI, First Author

** Assistant Professor, Department of Industrial Management, Gyeongsang National University, BERI, Corresponding Author

Ⅰ. Introduction

FinTech industry, including Internet banking and simple payment services, is expanding under the circumstances of development of ICT technology, relaxation of regulations for the emerging online financial services, and the widely spread of smart devices. According to the 'Top 100 Global FinTech Companies in 2016' report, the US and UK are leading the global FinTech industry, while Australia, China and Israel have achieved remarkable results in recent years(Lee et al., 2017).

In Korea, K-bank, the first Internet bank in Korea, was officially launched on April 3, 2017. Kakaobank, as the second Internet bank, was launched on July 27, 2017, based on the dominance of the mobile SNS platform, called KakaoTalk. The wave of FinTech innovation in the financial industry is getting stronger(No, 2017).

Mobile Simple payment service provides different services from existing mobile payment service(micro-payment, mobile credit card, electronic wallet, etc.) based on promptness and convenience of settlement. According to the Korea Internet and Security Agency's 2015 Internet Economic Activity Survey, FinTech services have the highest rate of recognition of simple payments (71.7%) and utilization rate is the highest(59.0%) over other services(Korea Internet and Security Agency, 2015).

According to the Bank of Korea, comparing simple payment usage and amount in the first quarter of 2016 and third quarter of 2017, off-line settlements related to distribution and manufacturers increased by 7 times from 4.8billion KRW to 31.9billion KRW. Online settlement size has increased 10 times from 1.5billion KRW to 22.6billion KRW, and online payment for information and communication technology has tripled from 7.2billion KRW to 21.6billion KRW(Bank of Korea, 2017).

Recently, a number of researches on mobile payment have been actively conducted in various researches(Kim and Oh, 2018). Existing researchers have been studying the user behavior related to the services such as mobile electronic wallets, credit cards, and mobile banking. However, despite the increasing interest in the simple payment service in FinTech field, the research related to it has not been done actively so far.

Most of the existing studies on mobile payment service are mainly focusing on the technical aspects of the simple payment service in the FinTech industry(Jeong, 2015; Cho and Kim, 2015). In addition, empirical studies have been conducted on particular services that affect the behavior of users in simple payment service users(Kim et al., 2016; Oh, 2015; Choi and Kang, 2016).

Therefore, this study focuses on the consumers' perception on the m-payment by empirical study with survey method. The main purpose of this study is to examine the major factors affecting users of mobile payment services and to confirm the influence of these

factors on the perceived value and trust of the users. In addition, this study examines the importance of perceived value and trust as the main influencing factors of users' continuance intention, and suggests theoretical and practical implications to the companies in the field of m-payment sector.

Ⅱ. Literature Review and Hypothesis

1. Mobile Payment Service

1) Concept of m-payment

Mobile payment system is a payment service with wireless electronic devices such as smartphones and tablet PCs. Once entering card information, it allows users to easily pay by ID and PIN code, or SMS verification without entering card information or an authorized certificate verification. The service has been getting convenient since it is compatible regardless of the device, web browser, and OS under any circumstances(No and Kwon, 2014, Kim, 2013).

The mobile payment(m-payment) service allows users to register their payment information and password for payment in advance in the application or server of the smart devices. Whenever a payment is required, the payment can be easily made only by the password for payment without inputting complex payment information or authorized certificate password(Cho and Kim, 2015).

The prior m-payment method had a disadvantage that the payment information had to be input every time the payment is made, and mandatory use of the authorized certificate and Active X is required(Jeong, 2015).

However, the mandatory use of certificates verification and Active X had been abolished in 2015, and by solving the problem of storing card information of PG, m-payment service became a useful tool for electronic commerce.

2) Current Trend of m-Payment

FinTech referring to a new software for financial services, includes all technical processes that may improve performance of financial services. FinTech includes mobile simple payment, remittance, financial management, and investment using wireless ICT technologies(Zhang and Lee, 2016).

According to a study by Kim and Oh(2018), FinTech service types are summarized in <Table 1> below. Among those five categories, the firstly listed simple payment is a service that allows users to settle a payment by using a card or account information entered in advance by a user when purchasing goods or services on the Internet or mobile; for example, Paypal, Alipay, and Kakaopay.

FinTech's payment service consists of online payment services and offline payment services. Online payment services allow users to pay for goods purchased on the Internet through mobile apps(Apple Pay, Kakao Pay, AliPay, etc.),

<Table 1> Classification of Fintech Services

Category	Characteristics
Simple Payment	Electronic Payment Service
Remittance	Mobile and Email Remittance
Financial Management	Online Fund, Internet Banking/Insurance/Securities
Investment	Investment Platform(Social Trading/Crowd-funding)
Data Analysis	Big Data and Business Analysis

while offline payment services allow users to pay for mobile payments in place of cash when the users buy goods at a real store. The number of users is increasing due to its convenience and lower fee for transaction(Lee and Park, 2016).

2. The Influencing Factors on m-Payment

Various research studies are available to determine factors affecting continuous usage intention, including flexibility, effectiveness, ease of use, delights, social influence, convenience and perks for new technology (Dabholkar and Bagozzi, 2002), but there is still a need of in-depth research on consumers to identify factors influencing their perception towards new technology such as m-payment.

Past studies have tried to develop the relationship between consumers' perception towards a new technology(Rust and Kannan, 2003). Several studies confirmed the positive association between consumers' perception and attitude formation toward new technology (Agus et al., 2007; Yang and Lee, 2010).

These studies confirmed that ease of use, security, trust and efficacy are the most influencing variables towards the technology usage.

1) Perceived Usefulness

Perceived usefulness can be defined as a term that include performance expectation and effort expectation. Performance expectation is defined as the degree to which the use of mobile easy payment is believed to provide users with better benefits in terms of usability(Lee, 2017). The feature enables quick and convenient pay due to the nature of mobile.

In addition, effort expectations can be defined as the likelihood of users to use the new technology(Venkatesh et al., 2011). This feature is similar to Perceived Ease of Use in TAM(Davis, 1989). In this study, we try to simplify this construct as easy-to-train, ease-to-understand, and easy-to-use of mobile payment. The previous studies indicated that the degree of ease of use of the system has positively influenced users' attitudes (Venkatesh et al., 2011). Therefore, The higher the perceived usefulness, the more intention to

continue to use m-payment.

2) Facilitation Condition

Facilitation conditions are derived from the perceived behavioral control of the Planned Behavior Theory(TPB), the facilitation condition of the PC use model(MPCU) and the compatibility of the innovation diffusion theory(Venkatesh et al., 2003). In addition, there is a strong belief that there is a systematic and technological infrastructure support the use of technology.

The facilitation condition can be defined as the degree of belief that a systematic and technological environment is available to support users' use of m-payment. Facilitation condition can usually have a greater impact on the users usage intentions when new information technologies are introduced.

3) Social Influence

Social influence is defined as the degree to which users perceive that other people who influence the user believe that they should use the technology(Venkatesh et al. 2003). Social influences are in line with the subjective norm in the attitudinal and normative variables as predictors of specific behaviors(Ajzen and Fishbein, 1973).

Based on this, social influence is defined as the degree to which people around the mobile who consider mobile payment users to be aware of the belief that they should use m-payment. M-payment users use smart devices to communicate with other people in various ways and form relationship in society.

4) Perceived Security

Yang et al.(2015) suggested most consumers' behavior might be risky because the behavior might lead to unpredictable or unfavorable consequences. Therefore, the users are not always free from the security matters and private concern.

Forsythe and Shi(2003) define perceived security as a buyer's subjective judgement of possible losses when making decisions with uncertainty as in online payment. In this study perceived security refers to the extent secured from possible losses that could be created due to the uncertainties of using m-payment. The losses include any unfavorable consequences to consumer, such as financial loss, the violation of privacy, dissatisfaction, anxiety or discomfort, wasting time.

3. Perceived Value

Zeithaml(1988) define perceived value as "the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given," which is widely accepted in marketing fields. Consumers typically cannot accurately assess the objective value of goods, but make decisions on perceived value; the subjective evaluation of the total benefits and losses of

and for the offering(Zeithaml, 1988).

Dodds and Monroe(1985) first tested the relationships between price, sacrifice, perceived quality, perceived value, and willingness to buy. Thereafter, Wood and Scheer(1996) incorporated perceived risk into that model, forming the perceived value theory model. Based on perceived value theory, Kim et al.(2007) regarded usefulness, enjoyment, technicality, and perceived fee as the antecedents of perceived value in order to explain the adoption of the mobile internet.

Therefore, based on prior researches we hire the hypotheses below to examine the factors affecting perceived value:

H1a: Perceived usefulness is positively related to perceived value.
H1b: Facilitating condition is positively related to perceived value.
H1c: Social influence is positively related to perceived value.
H1d: Perceived security is positively related to perceived value.

4. m-Payment Trust

There are various uncertainties in terms of environmental as well as functional aspects in the process of accepting new technology by users. This uncertainty can have a negative impact on the user's attitude toward the product or services.

M-payment is a service that deals with users' financial information, and the user risks more uncertainty about service. Trust in m-payment can be defined as two dimensions: trust in m-payment technology and trust in m-payment provider(Fan and Shao, 2018).

Sun et al.(2013) found that the m-payment service attributes affect users trust and it accordingly affect continuous usage intention.

Based on the studies, we hire the following hypotheses as below:

H2a: Perceived usefulness is positively related to m-payment trust.
H2b: Facilitating condition is positively related to m-payment trust.
H2c: Social influence is positively related to m-payment trust.
H2d: Perceived security is positively related to m-payment trust.

5. Perceived Value and m-Payment Trust

In the mobile payment service, trusting beliefs refer to users' perceptions of attributes of service providers, including the ability, integrity, and benevolence of providers (McKnight et al., 2002).

When users perceived value is secured, the m-payment service and the provider can be generally trustworthy. And it results in general satisfaction with m-payment by being positively evaluated.

In short, users tend to trust m-payment service when they evaluate high value from the service. The relationship between perceived value and trust is also supported by previous

studies(Elbeltagi and Agag, 2016). Therefore, we propose the following hypothesis:

H3: Perceived value is positively related to m-Payment trust.

6. Perceived value and Continuance Intention

Prospect theory suggests that people make decisions based on subjective value, which is consistent with perceived value theory (Kahneman and Tversky, 1979; Wood and Scheer, 1996; Yang et al., 2015). Perceived value can be defined as a consumer's comprehensive evaluation on m-payment based on the perception of the potential benefits and sacrifices induced by m-payment adoption(Kim et al., 2007).

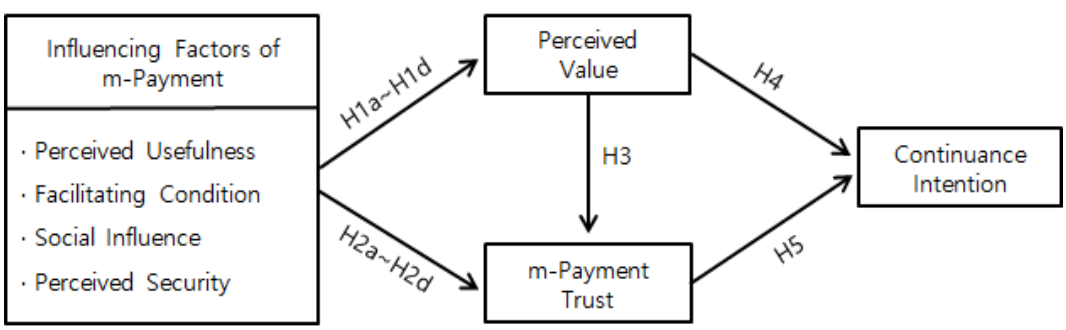
Previous studies reported a strong relationship between perceived value and usage intention in mobile services(Kim et al., 2007; Kleijnen et al., 2007). Thus, based on both prospect theory and perceived value theory, the following hypothesis is proposed:

H4: Perceived value is positively related to continuance intention.

7. M-payment Trust and Continuance Intention

Trust in companies providing m-payment services is deeply related to the reputation of the company. Users who provide personal information and financial information in m-payment may expect service providers to safely handle their information. Prior research findings indicate that trust in the technology acceptance model has a direct positive effect on the users' usage intention in mobile payment system continuously (Pavlou, 2003).

In this study, trust is defined as a single dimension of subjective belief that users recognize new mobile payment service will fulfill original functions and obligations. Other studies investigating the acceptance of mobile payments shows that trust is an important factor influencing the intention to use mobile payment(Lu et al., 2011; Slade, 2015). Therefore, this study suggests the following



<Figure 1> Research model

hypothesis:

H5: M-Payment trust is positively related to continuance intention.

Ⅲ. Methodology

1. Data Collection

In this study, the survey was conducted for users of mobile payment systems. A total of 239 copies of the questionnaire were collected, and the final 232 copies were used for analysis, excluding unfaithful responses. The main profiles of the respondents were 45.3% for men and 54.7% for women, as shown in <Table 2>.

The age was 41.4% in their 20s, 22.8% in their 30s, 22.0% in their 40s, and 13.8% in their 50s and older. The frequency of use was 45.7% less than 2 times a week, 3~4 times(31.5%), 5~6 times(14.2%), and over 7 times(8.6%).

2. Measurement and Method

The constructs of this study were incorporated in existing literature. <Table 3> shows the items for measuring individual constructs. A total of 7 constructs consisted of 21 measurement items. All items were measured on the Likert 7-point scale. We used SPSS 25.0 and AMOS 20.0 for basic analysis and hypothesis testing.

Ⅳ. Data Analysis

1. Reliability and Validity

In this study, confirmatory factor analysis was conducted to evaluate reliability and validity. <Table 4> shows the results. The goodness-of-fit indices of the model are

<Table 2> Profiles of respondents

Variable		Frequency	Ratio	Cumulative Ratio
Gender	Male	105	45.3	45.3
	Female	127	54.7	100.0
Age	20s	96	41.4	41.4
	30s	53	22.8	64.2
	40s	51	22.0	86.2
	Over 50s	32	13.8	100.0
Usage	1-2 times	106	45.7	45.7
	3-4 times	73	31.5	77.2
	5-6 times	33	14.2	91.4
	Over 6 times	20	8.6	100.0
Total		232	100.0	

<Table 3> Measurement Instrument

Variable	Item	Measurement items	Reference
Perceived Usefulness	PU1	I find m-payment easy to use.	Singh et al. (2017) Hussain et al. (2019)
	PU2	M-payment services are easy to understand.	
	PU3	M-payment services are beneficial for me	
Facilitating Condition	FC1	I have the resources necessary to use m-payment.	Hussain et al. (2019)
	FC2	I have the knowledge necessary to use m-payment.	
	FC3	M-payment is compatible with other technologies I use.	
Social Influence	SI1	People who are important to me think that I should use m-payment.	Hussain et al. (2019)
	SI2	People who influence my behaviour think that I should use m-payment.	
	SI3	People whose opinions that I value prefer that I use m-payment.	
Perceived Security	PS1	I think my transaction information is secure in third-party payment platforms.	Rau et al. (2017) Fan and Shao (2018)
	PS2	I think my mobile payment account information and account money are safe in third-party payment platforms.	
	PS3	I think my money transfer process is secure and safe in third-party payment platforms.	
Perceived Value	PV1	Despite the time, effort, and capital involved in m-payment, it is worthwhile to me.	Yang et al. (2015)
	PV2	Considering the cost, risk, and benefits, I think it is valuable.	
	PV3	There are greater benefits than disadvantages of using m-payment.	
m-Payment Trust	PT1	I trust that mobile payment service providers and other stakeholders, such as vendors and banks.	Gefen et al. (2003) Fan and Shao (2018)
	PT2	I trust the security measures or mechanisms of the third-party mobile payment.	
	PT3	I trust that when the payment security problems arise, stakeholders of mobile payment.	
Continuance Intention	CI1	I intend to use m-payment in the future.	Yang et al. (2015)
	CI2	I expect to adopt m-payment soon.	
	CI3	I am willing to use m-payment in the future.	

represented by $\chi 2(98)=201.77$, GFI=0.907($\geq$ 0.8), P-value=0.000($\leq$0.05) AGFI=0.855($\geq$ 0.8), CFI=0.954($\geq$0.9), RMR=0.057($\leq$0.08), RMSEA=0.058($\leq$0.08), etc., and mostly meet ideal standards. The composit reliability of the seven constructs was analyzed from 0.743 to 0.921, and it was found to be higher than the standard value of 0.7, so the reliability of the

<Table 4> The Results of Confirmatory Factor Analysis

Construct	Item	Est.	Std. est.	S.E.	C.R.	Composit Reliability	AVE
Perceived Usefulness	UM1	0.713	0.623	0.157	4.530	0.743	0.599
	UM2a	1.000	0.900	-	-		
Facilitating Condition	FC1a	1.000	0.905	-	-	0.860	0.763
	FC2	0.953	0.841	0.062	15.364		
	FC3	0.815	0.706	0.067	12.175		
Social Influence	SI1	0.838	0.768	0.099	8.474	0.824	0.703
	SI2a	1.000	0.903	-	-		
Perceived Security	PS2	0.852	0.751	0.084	10.169	0.777	0.636
	PS3a	1.000	0.842	-	-		
Perceived Value	PV1	0.915	0.790	0.068	13.361	0.847	0.672
	PV2a	1.000	0.848	-	-		
	PV3	0.927	0.777	0.071	13.072		
m-Payment Trust	PT2a	1.000	0.933	-	-	0.921	0.854
	PT3	0.999	0.915	0.054	18.437		
Continuance Intention	CI1a	1.000	0.863	-	-	0.863	0.697
	CI2	0.930	0.806	0.064	14.577		
	CI3	0.950	0.799	0.066	14.400		

a: reference variable

measurement items can be evaluated as high.

The average variance extracted(AVE) was calculated to evaluate convergent validity. The AVE of all research concepts was found to be above the standard value of 0.5 proposed by Fornell and Lacker(1981). As shown in <Table 5>, the discriminant validity shows that the values of the correlation coefficient are smaller than the square root ave. These results mean that each research concept is mutually distinct.

<Table 5> Discriminant Validity

	PU	FC	SI	PS	PV	PT	CI
PU: Perceived Usefulness	0.774						
FC: Facilitating Condition	0.257	0.874					
SI: Social Influence	0.254	0.379	0.838				
PS: Perceived Security	0.182	0.675	0.484	0.798			
PV: Perceived Value	0.359	0.534	0.498	0.543	0.820		
PT: M-payment Trust	0.158	0.451	0.282	0.450	0.594	0.924	
CI: Continuance Intention	0.353	0.525	0.392	0.586	0.795	0.740	0.835

Note: Diagonal shows the square root of AVE for each construct.

2. Hypothesis Testing

To test the hypothesis established in this study, a covariance structural analysis was conducted and the results are shown in Table 5. The goodness-of-fit indices of the structural model were $\chi^2(102)=201.43$, GFI=0.903($\geq$ 0.9), P-value=0.000($\geq$0.05), AGFI=0.854($\geq$ 0.8), CFI=0.952($\geq$0.9), RMR=0.056($\leq$0.8), RMSEA=0.068($\leq$0.8), etc. The majority of indices show that they are above the baseline. The hypothesis test results are as follows.

First, perceived usefulness was found to have a positive and positive effect on the perceived value, so the H1a was supported. Second, facilitating condition was found to have a positive and positive effect on perceived value, H1b was supported. Third, H1c that social impact will have a positive and significant effect on perceived value was supported. Fourth, the perceived security has been analyzed to have a positive and significant effect on the perceived value, so the H1d was supported.

On the other hand, the four influence factors of mobile payment, namely perceived usefulness, facilitating condition, social influence, and perceived security, were found to have no direct effect on the mobile payment trust. Accordingly, H2a, H2b, H2c, and H2d were not supported. These results do not mean that the four influencing factors are not important for users to build mobile payment trust. This is because the results of the indirect effect analysis conducted in this study were found to have a significant indirect effect on

<Table 6> Hypothesis Testing Results

Hyp.	Path		Std. estimate		S.E.	C.R.	p-value	Result
H1a	PU	PV	Direct	0.224	0.071	2.815	0.005	Supported
H1b	FC	PV	Direct	0.217	0.081	2.253	0.024	Supported
H1c	SI	PV	Direct	0.225	0.064	2.801	0.005	Supported
H1d	PS	PV	Direct	0.265	0.084	2.412	0.016	Supported
H2a	PU	PT	Direct	0.032	0.082	0.413	0.680	Rejected
			Indirect	0.112	0.054	-	0.010	
H2b	FC	PT	Direct	0.134	0.097	1.374	0.169	Rejected
			Indirect	0.108	0.073	-	0.047	
H2c	S	PT	Direct	0.070	0.077	0.878	0.380	Rejected
			Indirect	0.112	0.066	-	0.037	
H2d	PS	PT	Direct	0.127	0.102	1.130	0.258	Rejected
			Indirect	0.132	0.076	-	0.047	
H3	PV	PT	Direct	0.497	0.116	5.097	0.000	Supported
H4	PV	CI	Direct	0.566	0.079	8.000	0.000	Supported
H5	PT	CI	Direct	0.406	0.061	6.277	0.000	Supported

the trust of mobile payments through perceived value.

Finally, this study analyzed the relationship between perceived value, mobile payment trust, and continuance intention, and as a result, these three factors were found to have a virtuous cycle, so H3, H4, and H5 were supported. These results show that perceived value is a major influence on the formation of mobile payment trust, and furthermore, it means that users' trust in mobile payment can increase their intention to use continuously mobile payment.

Ⅴ. Conclusions

1. Theoretical Implications

The purpose of this study is to identify the factors that affect mobile payment users. In addition, it analyzes how these factors affect the perceived value and trust of users, and further analyzes the relationship with the intention to use the mobile payment system continuously.

The theoretical implications are as follows. First, there may be various factors affecting mobile payment users, but in this study, four factors such as perceived usefulness, facilitating condition, social influence, and perceived security were constructed based on previous studies.

Second, in terms of mobile payments, perceived usefulness, facilitating condition, social influence, and perceived security as factors influencing users' perceived value need to be studied more concretely from a theoretical perspective.

Third, the direct relationship between the four influencing factors of mobile payment and the users' trust in the mobile payment system was not confirmed. However, many previous studies have shown that it has a positive effect on justice. As suggested in the analysis of indirect effects in this study, these factors should not be interpreted as a meaningless influence on mobile payment trust.

Fourth, the perceived value of users for products and services has been continuously studied in the marketing field. In this study, it was also confirmed that perceived value is a major prerequisite for the formation of user trust and behavioral intention.

Fifth, the relationship between perceived value, trust, and behavioral intention of users has been conducted in many studies, and this study also showed the same result as the previous study.

2. Practical Implications

The practical implications of this study are as follows. First, perceived usefulness was identified as an important influencing factor for users' values. In other words, users perceive the usefulness of the mobile payment system when it is easy to use and easy to understand the payment method. Therefore, the design of a user-oriented mobile payment system can be

most important.

Second, the facilitating condition means resources, knowledge, and compatibility compared to other technologies required for using mobile payment. In short, mobile payment service companies must not only develop mobile applications that can be conveniently used to increase perceived value of users, but also provide users with appropriate knowledge of how to use them.

Third, social influence have a significant effect on perceived value. These results show that the perceived value of mobile payment users can be influenced by third parties. Many studies in the field of consumer behavior have emphasized the influence of third parties around them on the formation of personal attitudes and decision-making processes. Accordingly, the result of this study can be interpreted that mobile payment service companies must clearly differentiate target groups and execute marketing strategies.

Fourth, perceived security is a concept related to the safety of the account, transaction information, and money transfer process in the payment platform. This security was found to have a significant effect on the perceived value of users. Accordingly, mobile payment service companies will have to make efforts to design more secure payment systems and to secure users' information.

Lastly, it was confirmed that perceived value, trust, and continuance intention regarding mobile payments have a positive virtuous cycle. This suggests that in order to induce the continuous use of the mobile payment system, users must be able to perceive the value and trust regarding mobile payment. In addition, the research results showed that the perceived value of users is very important to trust in mobile payments. Therefore, mobile payment service companies will need to continually monitor the perceived value of users and establish a strategy to increase their value.

3. Limitations

There are several limitations in this study. First, although four influence factors of the mobile payment system have been set, it is difficult to consider these factors as the complete influence factors of perceived value. Therefore, in future studies, the task of identifying the influencing factors through clear review of prior studies is required. Next, although the population of this study can be defined as a person using a mobile payment service, there may be a problem in generalization of results because the actual sample is limited to users living in a specific area. On the other hand, this study did not analyze considering sample characteristics. In future studies, if personal variables such as gender and age of the sample are used, meaningful implications for establishing a target group selection strategy for user diffusion can be drawn.

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