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Contents lists available at ScienceDirect

Journal of Retailing and Consumer Services

journal homepage: www.elsevier.com/locate/jretconser

A study on the reciprocal relationship between user perception and retailer perception on platform-based mobile payment service



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ARTICLE INFO

Keywords:

Two-sided market
Platform-based mobile payment service
Fintech
Network externality
Technology acceptance model

ABSTRACT

With the development of the smartphone and mobile Internet, a platform-based mobile payment service has emerged that can handle all banking services with a smartphone alone. In the meantime, many studies have been made on the analysis of new emerging financial technologies. However, most studies have analyzed financial technologies from the consumer perspective, and there has been no analysis of the intention to accept the financial technology in terms of retailers. This study analyzes the factors affecting financial technology adoption from consumer and retailer perspectives respectively, and suggests an integrated model in which each adoption influences each other's demand from the perspective of the two-sided market.

1. Introduction

With the everyday use of smartphones, mobile-based banking and shopping have increased, and financial innovation based on information and communication technology (ICT) has become necessary. Fintech, which is a combination of finance and technology, has emerged in response to this trend (Dahlberg et al., 2015). It is the convergence of ICT and financial services including mobile payment, crowdfunding, remittance, and asset management, and it is expected to meet the demand for various financial services due to the increase in shopping.

The most popular service among the various fintech services is the mobile payment service. Mobile payment is a payment method that uses a mobile device to pay or transfer money, and it has the advantage of being able to use the convenience of wireless infrastructure and can be used anywhere and anytime (Iman, 2018). Mobile payment has been a promising alternative to declining cash use and has been proposed as a solution for the activation of the electronic marketplace (Ondrus and Pigneur, 2006a). Menke and de Lussanet (2006) have argued that mobile payment services have already been successful in the marketplace.

As a result, credit card companies and banks, which had previously been mainly used for payment, are launching mobile payment services. They have the advantage of securing the financial experience and trust of consumers, but they also have the disadvantage of lacking mobile technology or experience and lacking mobile consumers. Non-financial

companies such as electronic / communication companies, ICT / platform companies, hardware / software manufacturers and distributors are also entering the mobile payment service market (Evans and Pirchio, 2015; Iman, 2018). Recently, among these non-financial based mobile services, platform-based mobile payment services using existing subscribers to their advantage have become prominent (Kazan et al., 2018).

First, in the US, Facebook introduced a mobile payment function to Facebook Messenger in 2015, which has brought about a big change in the mobile payment market. Alipay, launched by Alibaba, China's largest online shopping mall, had a market share of 47.5% in China's mobile payment market in 2015 (iResearch, 2016). In South Korea, a portal site with the largest number of subscribers, has launched N pay, and KakaoTalk, the largest mobile messenger platform in South Korea, has launched Kakao pay and secured a large number of subscribers based on existing users. In this study, a mobile payment service based on Internet service platforms such as Facebook and Alibaba is called a platform-based mobile payment service. These platform-based mobile payment service providers do not have financial market experience or the trust of consumers, but they have a strong understanding of the mobile market and already have a lot of mobile users.

Many previous studies investigated mobile payment services have used the technology acceptance model or diffusion of innovation theory. On the whole, these studies either investigate whether the theoretical model of research affects users' intentions or actual use (Dickinger & Kleijnen, 2008) or whether users are ready to accept

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mobile payment services (Zmijewska, 2004). For example, Zmijewska et al. (2004) analyzed the effect of perceived price on users' attitudes toward service and motivation to use. Kleijnen et al. (2004) have shown that perceived cost and social influence are influential on the intention to use mobile payment services. Pousttchi (2003) verified that the concept of convenience, which is a combination of ease of use and transaction time, centered on value-added theory, which influences mobile payment acceptance. Zmijewska et al. (2004) proved that mobility, which is a typical characteristic of mobile devices, is also an important factor in the intention to use a mobile payment service. In addition, Chen and Adams (2005) showed that users should experience the quality of service first without cost, and that observability positively affects the diffusion of service innovation. They used both the technology acceptance model and innovation diffusion theory to determine the variables affecting the actual use of a mobile payment service. In addition, personal information security, which refers to caution around collecting and using personal information, is also an important factor for mobile payment services (Chen, 2006).

The success of Facebook and Alibaba in the mobile payment market was due to their existing mobile customers. Therefore, the meaning of network externality in the mobile payment market is very significant. However, existing mobile payment studies have limitations in that they do not consider network externality. Mallat (2007) added critical externality and critical mass for network externality as new variables for qualitative research using focus group interviews and showed that network externality affects mobile payment services. However, that study was also limited in that it could not complete the analysis from the viewpoint of the two-sided market in which both direct network externalities and indirect external networks exist.

In a platform-based mobile payment service, consumers using mobile payment services and sellers providing products or services form a two-sided market centered on platforms. One of the most important characteristics of the two-sided market is network externality. Network externality means that the user's utility with the same product or service increases with the size of the network to which the product or service belongs. Network externality can be divided into direct network externality and indirect network externality. Direct network externality means that the utility of consumers increases as the number of consumers using the same product or service increases, and indirect network externality refers to a change in consumer utility as the number and variety of complementary products or applications of a product or service increases. That is, as the number of users of a mobile payment service increases, the reliability and usage intention of the service increases (direct network externality), and as the number of retailers available through a mobile payment service increases, consumers will find the platform to be more valuable (indirect network externality). On the contrary, the sellers located on the opposite side of the consumer are also indirectly influenced by the externalities of the network. In other words, secured mobile users attract more mobile consumers and sellers, and more attracted sellers in turn attract even more consumers. Growth is determined by how well iterations of this process occur in the mobile payment service, which is a two-sided market. Therefore, consumer intention to continue to use the mobile payment service and seller intention to continue to use the mobile payment service should be analyzed at the same time.

In this study, a survey was conducted for 304 mobile payment service users and 175 mobile payment service retailers so that the consumer acceptance intention model and the provider acceptance intention model could be linked together through the concept of network externalities. This model has significance in that it can present aspects for the continuous growth of the business, and the hope is that it will be able to suggest ways to revitalize the newly emerging fintech industries. In particular, this study analyzes the factors influencing the acceptance intention of retailer and consumer platform-based mobile payment services through structural equation modeling.

2. Literature review

Mobile payment refers to products, services, and billing based on mobile devices and allows users the convenience of wireless infrastructure and other communication technologies (Dahlberg et al., 2008). In an earlier study on mobile payments, Kreyer et al. (2003) demonstrated that consumers are generally interested in using mobile payment applications. Mobile payment has been proposed as a solution for the activation of the electronic trading market (Ondrus and Pigneur, 2006a). There are also a number of studies showing that mobile payment has successfully settled into the market, including billions of dollars in profitable mobile content, Paypal, and mobile payments for public transit (Menke and de Lussanet, 2006).

A number of studies have applied the technology acceptance model or the diffusion of innovation theory among existing mobile payment services. In general, these are studies that investigate whether the theoretical model of research affects users' intentions or actual use or whether they are ready to accept mobile payment services. Many studies have examined consumer acceptance intentions by adding factors that are considered important in mobile payment services.

The 15 key variables of the typical mobile payment service are: price, convenience, compatibility, self-expression, mobility, network externality, observability, trialability, personal information security, system security, perceived risk, social impact, quality, technical concern, and trust. Kleijnen et al. (2004) have studied mobile payment services based on the perceived price, which is the transaction cost and registration cost of consumers. Their study showed that perceived cost and social influence affect intention to use as a new factor in the technology acceptance model. Zmijewska et al. (2004) have also investigated the effect of perceived price on the attitudes of users and their motivation to use services. Pousttchi (2003) has verified that the concept of convenience—a combination of ease of use and transaction time, centered on the value-added theory—influenced the mobile payment process. In addition, Zmijewska et al. (2004) and others have demonstrated that mobility, a typical feature of mobile devices, is also an important factor in the intention to use mobile payment services. Mallat (2007) added a new criterion: the network mass externality and the critical mass, which is the minimum mass for diffusion, through qualitative research using focus group interviews. Jiajun and Carl (2005) pointed to "trialability"—that users should be able to experience the quality of the service first without cost—and verified its effect on actual mobile payment service use using both the technology acceptance model and innovation diffusion theory. In addition, personal information security—worries about the collecting and use of personal information—has also been proven to be an important factor in mobile payment services (Chen, 2006). Dewan and Chen (2005) investigated information security as an important cross-platform factor in the United States. Dahlberg et al. (2003) demonstrated that trust and security factors have a significant influence on the use of mobile payment services and are important factors for consumers in a payment method.

Despite this high level of growth, however, there is also a belief that mobile payments are not as fast or as prevalent as previously expected (Ondrus and Pigneur, 2006a). The majority of studies have been conducted specifically on consumers in the US and Europe, which have led the proliferation of mobile payment services; there is a lack of research on new services in Asia. In addition, very few research studies have been conducted on network externality, an important factor in mobile services. Also, these studies are limited in that they are only qualitative, and direct and indirect networks are not separately classified. Therefore, this study attempts to overcome these limitations by examining the acceptance of users by setting the externality of direct and indirect networks as important variables in Korean consumers.

3. Research model and hypothesis

For research purposes, structural equation modeling (SEM) was

used in this study. SEM has been used in many studies such as Kim et al. (2018), Shin et al. (2018), Sung et al. (2018), and Kim et al. (forthcoming) to measure the intent to use ICT services.

3.1. Consumer model hypothesis

First, a research model was constructed to investigate the intention of mobile payment service users on the consumer side in the two-sided market. The perceived ease of use, perceived usability, compatibility, accessibility, safety, and attitudes presented in the existing technology acceptance model were used as the factors of intention to continue to use a mobile payment service. Also, this paper tried to verify the effects of direct and indirect network externalities on intention to continue to use.

3.1.1. Compatibility

According to Moore and Benbasat (1991), compatibility indicates how similar the new technology is to the past experience of potential users. Schierz et al. (2010) defined compatibility as a variable that indicates how new information technologies are perceived as harmonious with existing values, behaviors, and existing experiences of users. Chen et al. (2009), Corrocher (2011), Wu and Wang (2005), Mallat (2004), and Schierz et al. (2010) analyzed how compatibility directly or indirectly affects users' attitudes toward or acceptance of information technology in the field of mobile services. Therefore, this study assumes that, if the platform-based mobile payment service is highly compatible, it can lower the switching cost to the new technology and increase the usability.

H1. *Compatibility will have a positive influence on the perceived ease of a platform-based mobile payment service*

3.1.2. Accessibility

According to Moore and Benbasat (1991), accessibility means that a user can access a specific information system through a network or receive information from a user without restriction of time or space. In the case of Lin and Lu (2000) and Lederer et al. (2000), accessibility is important for consumers' intention to use websites. The results are as follows. In this study, a newly introduced mobile payment service eliminated the time and space limitations of electronic commerce settlement by combining with wireless internet. Therefore, this study assumes that accessibility will have a positive effect on users' acceptance of mobile payment services.

H2. *Accessibility will have a positive influence on the perceived usefulness of mobile payment services*

3.1.3. Indirect network externality

According to Katz and Shapiro (1985), network externality is an increase in the utility or value that consumers gain as the number of users using the service increases or more complementary materials are provided to them. Network externality is divided into direct network externality and indirect network externality by Gupta and Mela (2008), Katz and Shapiro (1985), and Lin and Bhattacharjee (2008). Indirect network externality, in particular, is the increase in the number of users and the additional value or utility that users gain when additional complementary products or services are added. Gandal (1994) and Shurmer (1993) examined indirect network externality as a factor influencing consumer acceptance of ICT products. Also, according to Lin and Lu (2011), which considers the characteristics of SNS, it is verified that services with indirect network externality providing various complementary services have high user continuous intention to use. Based on previous studies such as Powell (2009), Tapscott (2008), and Lin and Lu (2011), this study suggests that the indirect network of mobile payment services based on a platform can be used not only for additional services, but also for a variety of applications and merchants. It is

assumed that indirect network externality will have a positive effect on the perceived usefulness of a mobile payment service.

H3. *Indirect network externality will have a positive influence on the perceived usefulness of mobile payment services*

3.1.4. Perceived ease of use

According to Davis (1989), when people are more readily available when using a product or service, the perceived ease of use increases, and the rate of use or acceptance of a product or service positively affects the perceived usefulness and user attitudes. Moore and Benbasat (1991) also demonstrated that perceived ease of use had an effect on perceived usefulness. In this study, we investigated the perceived ease of use of a mobile banking service and of a mobile payment service. It is assumed that perceived ease of use will have a positive effect on users' attitudes.

H4. *Perceived ease of use will have a positive impact on the perceived usefulness of mobile payment services*

H5. *Perceived ease of use will positively affect user attitude toward a mobile payment service*

3.1.5. Perceived usefulness

Davis (1989) has demonstrated that perceived usefulness influences user attitudes and intentions to use and is an important factor in accepting products or services. Jung et al. (2009) suggested that consumers' perceived usefulness of mobile TV has a positive effect on user attitudes. Also, it is verified that the perceived usefulness of consumers in the e-commerce environment has a particularly important effect on satisfaction and persistence intention. Many research studies such as Suhuai and Peter (2010) and Featherman and Pavlou (2003) have shown that the perceived usefulness in environments using information technology, such as online or mobile shopping and the payment environment, is the most important factor. Therefore, in this study, it is assumed that perceived usefulness has a positive effect on user attitudes toward mobile payment services.

H6. *Perceived usefulness will positively affect user attitudes toward mobile payment services*

3.1.6. Direct network externality

In Gupta and Mela (2008), direct network externality means that the total number of users who use a product or service increases, or the value that users feel increases when they believe that there are more users. In previous studies such as Pae and Hyun (2002), Iimi (2005), and Gupta and Mela (2008), it has been verified that direct network externality has a significant effect on user utility. Sledgianowski and Kulviwat (2009) suggested that the total number of users has a significant effect on the intention to use social network services (SNSs). In addition, Baker and White (2010) found that, when the number of Internet users increases, the intention to join an SNS increases. Therefore, this study assumes that direct network externality positively influences user attitudes toward mobile payment services.

H7. *Direct network externality will positively affect user attitudes toward mobile payment services*

3.1.7. Trust

Gefen and Straub (2004) began to include trust in the technology acceptance model in the online shopping environment. Ratnasingham (1998) defined trust as a variable that reduces the fear of another party and reduces the risk cost associated with e-commerce transactions. In particular, trust in virtual environments is the primary means of social control, and the importance of trust in virtual environments is more important than in physical environments. In particular, trust is a very

important factor that enables people to use mobile payment services that are directly related to money. Wang et al. (2003) conducted an empirical analysis by introducing perceived trust as a factor of a new technology acceptance model (TAM) to reflect user security and privacy problems in online banking acceptance research. Luarn and Lin (2005) analyzed the intentions of mobile banking behavior by adding perceived reliability to the technology acceptance model. Therefore, this study assumes that, if reliability increases, it positively affects user attitudes toward the mobile payment service.

H8. Trust will have a positive influence on user attitudes toward mobile payment services

3.1.8. Attitude

Previous research by Davis (1989) concluded that user attitudes toward information systems have an effect on people's behavioral intentions, and many other studies have supported this. In addition, the attitude of the user makes it possible to predict the use of the system, rather than factors such as feasibility, value, user information satisfaction, and user involvement. This study also assumes that user attitudes have a positive effect on the intention to continue to use mobile payment services.

H9. User attitudes will have a positive effect on the intent to use a mobile payment service

Based on the theoretical background, we present the research model shown in Fig. 1 to analyze the influential factors between variables.

3.2. Retailer research model

The purpose of Section 3.2 is to construct a second research model in order to investigate the influence factors of providers' intentions on platform-based mobile payment services. In specific, the purpose of this study is to examine the effect of network externality on intention to continue to use as well as perceived ease of use, trust, brand value, and satisfaction.

3.2.1. Perceived ease of use

According to Mahmood et al. (2000), the perceived ease of use in IT services has a positive effect on end-user satisfaction. Therefore, it is assumed that the perceived ease of use positively affects retailer satisfaction from the viewpoint that suppliers are mobile payment service users as well as consumer models.

H10. Ease of use will positively affect retailer satisfaction of mobile payment services

3.2.2. Network effect

It can be seen from previous research (Zhao and Lu, 2012) that perceived direct and indirect network externality has a significant effect on the user satisfaction of IT services and also has a positive effect on

intention to continue to use. Therefore, in this study, the supplier also assumes that the network effect will have a positive effect on supplier satisfaction in terms of those who use the mobile payment service.

H11. Network externality will positively affect retailer satisfaction of mobile payment services

3.2.3. Trust

According to Kim et al. (2009), trust and satisfaction have traditionally been seen as important measures for the success of e-commerce, and trust has been used as an important variable to measure satisfaction. Therefore, in this study, the retailer also assumes that the trust of mobile payment service users will positively affect the satisfaction of retailers.

H12. Trust will have a positive impact on the satisfaction of retailers of mobile payment services

3.2.4. Brand value

According to Patterson and Spreng (1997), the relationship between perceived brand value and user satisfaction in the B2B environment has been proven to be significant and is positively influenced by repurchase intentions. Therefore, in this study, the retailer assumes that the brand value will have a positive effect on the satisfaction of retailers in terms of users of mobile payment services.

H13. Brand value will positively affect retailer satisfaction of mobile payment services

3.2.5. Satisfaction

As shown in many previous studies, user satisfaction has been used as an important measure for users' intention to use. Specifically, Yi and La (2004) found that it has a positive effect on intention to use and significant influence on repurchase intention. Therefore, it is assumed that satisfaction positively affects intention to continue to use from the viewpoint that retailers are mobile payment service users like consumers.

H14. Retailer satisfaction will positively affect the intention to continue to use of the provider of a mobile payment service

Based on the theoretical background, the research model is presented as shown in Fig. 2.

4. Research methods

4.1. Construct measurement

In this study, the variables that are appropriate for the environment of the study were observed and analyzed, and the validated items were selected in order to secure the content validity of the measurement items of the set variables. All variables were measured using a 5-point

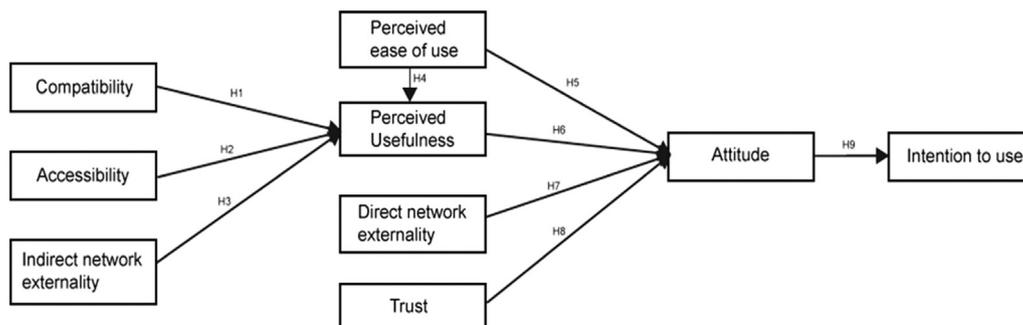


Fig. 1. Consumer research model.



Fig. 2. Retailer research model.

Likert scale. All items used in the study are listed in the Appendix.

4.2. Data collection and demographic analysis

In this study, data were collected by distributing questionnaires through PCs and mobile devices in order to obtain data to test the proposed research models and hypotheses. A total of 313 Korean respondents who used or intended to use the platform-based mobile payment service were asked to complete the questionnaire. The data were used for the analysis of 304 copies of the questionnaire. The demographic characteristics of the sample are shown in Table 1 below.

For the retailer model, the survey was collected from 273 retailers of the platform-based mobile payment service. Among the respondents, the fashion field accounted for the largest number (23.8%), followed by furniture and interior design (13.9%) and food (13.6%) as shown in Table 2. In addition, retailers in various fields, including sports and leisure (6.2%), cosmetics (5.9%), and digital appliances (4.4%), participated in the survey. As for the age of the retailers, most were in their 30s (42.1%), followed by 40s (30.8%), 50 or older (14.7%), and 20s (12.5%). Among the respondents, 175 were used for the analysis after excluding cases with many missing items and insufficient responses.

4.2.1. Verification of reliability and validity of measured variables

In order to determine the degree to which the measurement items

Table 1 Demographic profile of consumer respondents (n = 313).

Division		Frequency	Percent
Gender	Male	153	48.9
	Female	160	51.1
Age	Under 19	68	21.7
	20–29	59	18.9
	30–39	63	20.1
	40–49	61	19.5
	50 or older	62	19.8
Education	Less than high school	13	4.2
	High school student	51	16.3
	High school graduate	37	11.8
	University student	36	11.5
	University graduate	142	45.4
	Master student	4	1.3
Earnings (KRW ^a)	Postgraduate	30	9.6
	Less than 2,000,000	37	11.8
	2,000,001–3,000,000	50	16.0
	3,000,001–4,000,000	52	16.6
	4,000,001–5,000,000	63	20.1
	5,000,001–6,000,000	40	12.8
	6,000,001–7,000,000	25	8.0
	7,000,001–9,000,000	30	9.6
	9,000,001 or more	16	5.1.

^a KRW: the currency of South Korea, 1 USD = 1130.51 KRW as of December 11, 2018.

Table 2 Demographic profile of retailer respondents (n = 273).

Division		Frequency	Percent
Age	20–29	34	12.5
	30–39	115	42.1
	40–49	84	30.8
	50 or older	40	14.7
Business domain	Cosmetics	16	5.9
	Sports and leisure	17	6.2
	Furniture & interior design	38	13.9
	Food	37	13.6
	Fashion	65	23.8
	Digital appliances	12	4.4
Monthly turnover (10 ⁶ KRW)	Life and health	33	12.1
	Etc	55	20.1
	Less than 5	116	42.5
	5–10	41	15.0
	10–20	34	12.5
	20–30	12	4.4
	30–50	20	7.3
	50–80	27	9.9
	80–100	11	4.0
	More than 100	12	4.4

used to measure the research units included in the model were correlated before the research hypothesis was verified, we used the statistical program SPSS Statistics 21 to determine the reliability of the coefficient calculations. As a result, all factors were determined to be over 0.7, which is the general acceptance standard, as shown in Tables 3 and 4. The results of this analysis indicate that all of the latent variables used in this study have statistical internal consistency.

4.2.2. Research model fit

In this study, the independent variables expected to affect consumer perceived usefulness and the attitudes of users were compatibility, safety, accessibility, direct network externality, and indirect network externality. These variables were analyzed using the regression analysis of the structural equation model. The results of the fit of the consumer model are shown in Table 5. The results of the fit exceeded the reference value, so it could be judged to be an appropriate model as a whole.

Also, the independent variables expected to affect retailer perceived satisfaction and intention to continue to use were perceived ease of use, brand value, network externality, and trust. These variables were analyzed using the regression analysis of the structural equation model. The results of the fit of the retailer model are shown in Table 6. The results of the fit exceeded the reference value and could be judged to be an appropriate model as a whole.

Table 3
Results of reliability and validity analysis of consumer side variables.

Items	Cronbach's α	Unstandardized estimates	Standardized estimates	S.E.	C.R.	P
COM1	0.821	1.000	0.519			
COM2		0.998	0.552	0.120	8.294	***
COM3		1.671	0.731	0.200	8.346	***
COM4		1.617	0.703	0.198	8.174	***
COM5		1.153	0.535	0.165	6.992	***
ACC1	0.888	1.000	0.848			
ACC2		1.072	0.831	0.063	16.971	***
ACC3		0.982	0.753	0.066	14.814	***
ACC4		0.851	0.699	0.064	13.299	***
ACC5		0.919	0.740	0.064	14.400	***
PEOU1	0.846	1.000	0.786			
PEOU2		1.016	0.794	0.072	14.183	***
PEOU3		0.897	0.698	0.073	12.215	***
PEOU4		0.833	0.669	0.072	11.622	***
PU1	0.839	1.000	0.717			
PU2		1.023	0.690	0.091	11.192	***
PU3		1.111	0.698	0.098	11.312	***
PU4		1.069	0.732	0.090	11.849	***
ATT1	0.866	1.000	0.778			
ATT2		0.949	0.717	0.073	12.926	***
ATT3		1.025	0.672	0.085	12.017	***
ATT4		1.061	0.779	0.074	14.269	***
IU1	0.894	1.000	0.808			
IU2		0.986	0.793	0.064	15.291	***
IU3		1.042	0.810	0.066	15.723	***
IU4		0.978	0.720	0.073	13.478	***
IU5		0.853	0.639	0.073	11.945	***
DN1	0.825	1.000	0.542			
DN2		1.175	0.645	0.123	9.543	***
DN3		1.177	0.703	0.140	8.382	***
DN4		1.394	0.775	0.159	8.797	***
IDN1	0.830	1.000	0.732			
IDN2		0.956	0.626	0.094	10.176	***
IDN3		1.075	0.736	0.090	11.927	***
IDN4		0.981	0.706	0.086	11.463	***
IDN5		1.019	0.737	0.074	11.945	***
TRU1	0.722	1.000	0.948			
TRU2		0.825	0.779	0.095	8.644	***

Note: COM: Compatibility, AES: Accessibility, PEOU: Perceived ease of use, PU: Perceived usefulness, ATT: Attitude, IU: Intention to continue to use, DN: Direct network externality, IDN: Indirect network externality, TRU: Trust.

*** denotes level of significance at 1%.

Table 4
Results of reliability and validity analysis of retailer side variables.

Items	Cronbach's α	Unstandardized estimates	Standardized estimates	S.E.	C.R.	P
PEOU1	0.844	1.000	1.021			
PEOU2		0.746	0.682	0.810	0.922	***
NE1	0.866	1.000	0.798			
NE2		1.205	0.958	0.092	13.131	***
NE3		0.955	0.752	0.088	10.915	***
TRU1	0.916	1.000	0.834			
TRU2		1.205	0.908	0.065	15.655	***
TRU3		0.955	0.895	0.063	15.269	***
BV1	0.828	1.000	0.796			
BV2		0.794	0.853	0.063	12.602	***
BV3		0.816	0.769	0.074	11.015	***
SAT1	0.861	1.000	0.877			
SAT2		0.856	0.674	0.083	10.357	***
SAT3		0.958	0.882	0.059	16.368	***
IU1	0.706	1.000	0.875			
IU2		1.322	0.885	0.091	14.483	***

Note: PEOU: Perceived ease of use, NE: Network externality, TRU: Trust, BV: Brand value, SAT: Satisfaction, IU: Intention to continue to use.

*** denotes level of significance at 1%.

Table 5
Measures of consumer model fitness.

IFI	0.918
CFI	0.918
TLI	0.910
Chi-square (df)	1221.053(645)
Chi-square /df	1.893

Table 6
Measures of retailer model fitness.

IFI	0.918
CFI	0.917
TLI	0.898
Chi-square (df)	282.001(98)
Chi-square /df	2.878

4.3. Results

4.3.1. Consumer model hypothesis results

As a result of testing the hypothesis using *IBM AMOS 22*, all the hypotheses were supported except that perceived ease of use would affect attitude, as shown in [Table 7](#). The results of this study are as follows. First, trust, direct network externality, perceived ease of use, and perceived usefulness influence the attitude of the users in terms of compatibility, accessibility, indirect network externality, and perceived ease of use. Also, the hypothesis that attitude affects the intention to continue to use persistence was statistically significant and supported.

Direct externality and indirect network externality have a positive effect on intention to continue to use the mobile payment service. In the case of direct network externality, as the number of users of the service increases, the utility as measured by reduction of information acquisition cost, exchange of information, and sharing experience can affect the attitude of users. Especially, the emotional and material support and social exchange received from people in a network in the mobile settlement service with SNS platform characteristics are motivated by the users and influence the acceptance intention. The finding of [Pae and Hyun \(2002\)](#), [Iimi \(2005\)](#), [Kim et al. \(2008\)](#), and [Gupta and Mela \(2008\)](#) that the direct network externality of new technologies has an effect on intention to continue to use is consistent with the results of this study.

In addition, the hypothesis that the indirect network externalities affect perceived usability is also supported, which suggests that the increase of complementary materials for the mobile service can be analyzed as an influencing factor to increase the expected benefit level of users. This supports the results of [Lin and Bhattacharjee \(2008\)](#) and [Lin and Lu \(2011\)](#), which are studies of instant messaging services. The greater is the user perception that complementary resources are highly available, such as franchises or applications that provide mobile payment services, the greater will be their recognition that the mobile payment service is useful. This result shows that, as with the direct network externality mentioned above, more attention is paid to developing and providing enhanced complementary functions or applications and franchises to increase user awareness of the size of the indirect network and to promote more usage.

4.3.2. Retailer model hypothesis analysis result

As a result of verifying hypotheses using *IBM AMOS 22*, all the hypotheses were supported, as shown in [Table 8](#) below. Network externality, network externality, trust, and brand value affect retailer satisfaction. In addition, the hypotheses that the satisfaction affects the intention to continue to use were also supported with a statistically significant value.

Network externality has a positive effect on the intention of the provider of the mobile payment service. This result suggests that providers classified as another user in the platform-based mobile payment

Table 7
Hypothesis consumer side test result.

Attributes	Unstandardized Estimate	Standardized Estimate	S.E.	C.R.	P	Hypothesis status
H1: IDN→PU	0.182 ^{***}	0.199 ^{***}	0.043	4.281	< 0.001	Supported
H2: ACC→PU	0.092 [*]	0.127 [*]	0.054	1.718	0.086	Supported
H3: PEOU→PU	0.247 ^{***}	0.346 ^{***}	0.082	2.996	0.003	Supported
H4: COM→PU	0.577 ^{***}	0.481 ^{***}	0.140	4.125	< 0.001	Supported
H5: PEOU→AT	0.213 ^{**}	0.270 ^{**}	0.093	2.306	0.021	Supported
H6: PU→AT	0.591 ^{***}	0.534 ^{***}	0.141	4.201	< 0.001	Supported
H7: DN→AT	0.316 ^{***}	0.253 ^{***}	0.076	4.172	< 0.001	Supported
H8: TRU→AT	0.140 ^{***}	0.203 ^{***}	0.036	3.921	< 0.001	Supported
H9: AT→IU	1.079 ^{***}	0.920 ^{***}	0.079	13.652	< 0.001	Supported

Note: COM: Compatibility, AES: Accessibility, PEOU: Perceived ease of use, PU: Perceived usefulness, ATT: Attitude, IU: Intention to continue to use, DN: Direct network externality, IDN: Indirect network externality, TRU: Trust.

** indicate a level of significance of 5% respectively.

*** indicate a level of significance of 1%, respectively.

service are also affected by the network externalities. In other words, the greater is the consumer use of a mobile payment service, the greater will be the perceived consumer utility of the service. This paper carries out an empirical verification while concurrently supporting studies (Katz and Shapiro, 1985) that have theoretically verified the characteristics of the duality of the platform.

According to Gefen and Straub (2000), the inconsistency of perceived ease of use is due to the use of information technology. In a study by Gefen and Straub (2000) on e-commerce, the use of websites by users to acquire information is a task related to the inherent characteristics of information technology, and using a website to purchase goods is classified as business related to external characteristics. When a website is used by customers to acquire information, perceived ease of use affects the acceptance of the website. However, perceived ease of use does not affect the acceptance of websites of retailers in this study. From this viewpoint, a mobile payment service can be regarded as being used to purchase information technology. Therefore, it can be explained that perceived ease of use does not directly affect the acceptance of mobile payment services.

User satisfaction is also proven to have a positive effect on user intention in the aspect of a supplier using a mobile payment service. In previous studies, the satisfaction of the service users was examined. However, this study provides implications for the service satisfaction of the suppliers. It also suggests that more attention and efforts are needed to improve the perception of the size of the consumer network in order to encourage more retailers to use the service in the future.

5. Conclusion

This paper is meaningful in that it is the first to present an integrated model from the point of view of the two-sided market, which looks at the rapidly growing platform-based mobile payment industry from the supplier and consumer sides (see Fig. 3). Using a consumer model and a supplier model, this paper has proven the network effect as the most important variable in platform-based service. This study also used an integrated model to show that the two models enhance the network effects of the other. The network effect shows a clear interaction between the provider and consumer in platform-based services.

Table 8
Hypothesis retailer side test result.

Attributes	Unstandardized Estimate	Standardized Estimate	S.E.	C.R.	P	Hypothesis status
H1: PEOU → SAT	0.036	0.036	0.054	0.663	0.507	Not supported
H2: NE → SAT	0.220 ^{***}	0.203 ^{***}	0.049	4.521	< 0.001	Supported
H3: TRU → SAT	0.914 ^{***}	0.855 ^{***}	0.071	12.789	< 0.001	Supported
H4: BV → TRU	0.868 ^{***}	0.947 ^{***}	0.076	11.396	< 0.001	Supported
H5: SAT → IU	0.653 ^{***}	0.870 ^{***}	0.052	12.468	< 0.001	Supported

*** Significant at a 1% level.

In practical terms, it is suggested that maximizing the network effect of platform operators can affect the survival of services. In addition, this research tried to increase the quality of each model by adding frequently mentioned variables to the existing TAM and the mobile payment service user acceptance model.

In addition, the integrated model proposed in this study is meaningful to extend the existing user acceptance model that only verifies one aspect by using the concept of a two-sided market. There are many studies that have proven that only the network effect of the consumer side in the existing literature has been verified, but the interactive network effect between the consumer and the supplier groups has not been studied yet. In this sense, this study proposes the study of consumer and supplier acceptance models in future platform business, and future researchers can refer to the study method and results analysis in their follow-up studies.

In addition, this study has methodological significance in that it examines the network externalities of consumers and suppliers with empirical studies through questionnaires. As mentioned earlier, most of the existing two-sided market studies follow the engineering methodology, and there is little research on the opinions of actual users. Specifically, social science research on the supplier side is scarce, and this study intends to make a methodological contribution to two-sided market research by surveying the opinions of suppliers who are important platform users.

This paper examined the market situation of a mobile payment service based on the network and applied various theoretical implications. Network externality had a important effect on the intention of the users and the consumers in the service operation, and it was revealed that the awareness of the externalities of the network is important for service continuation. For instance, *Kakao Pay*, the largest messaging service in Korea, was the first to launch in the market. In the beginning, it attracted a large number of subscribers and announced a successful start. After one year, transactions failed to increase, and consumers changed to other payment services. In particular, it is likely that early attempts at network externality failed to make good use of the virtuous circle structure. Compared to competitors, there were fewer franchisees available to consumers after the service was first launched. This seems to have had a negative effect on consumer satisfaction due to the lack of

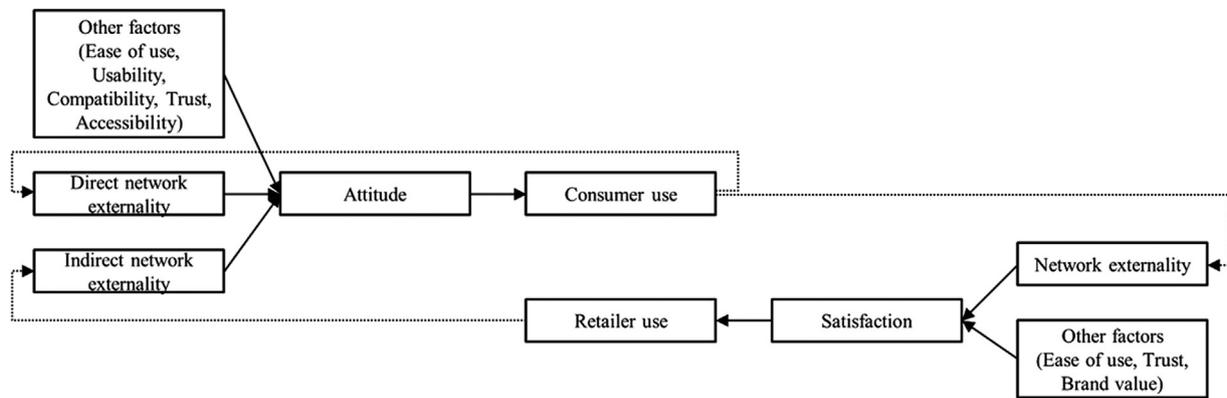


Fig. 3. Integrated model.

indirect network effect. Failure to satisfy consumer satisfaction in a service that regards network externality as important has also led to the dissatisfaction of suppliers and severely hindered the service. As can be seen from the case of Korea, focusing on meeting the network externalities in operating a platform-based service will help sustain the service.

This study has the following limitations. First, even though consumers and retailers were combined through indirect network externality, it was impossible to compare the two models since the remaining variables were different from each other. Second, the number of observed variables used in the retailer model was rather small. Third, although the use of fintech would be influenced by a variety of external factors such as credit card and smart phone usage rates, it was not considered in this study. In the present fintech industry, various types of services are being released as well as platform based services. In the future, we hope that various studies will be conducted in consideration of various fintech services and other external factors.

Acknowledgements

This research was supported by the MIST (Ministry of Science and ICT), Korea, under the National Program for Excellence in SW supervised by the IITP (Institute for Information & communications Technology Promotion) (2015-0-00914), and the Ministry of Education of the Republic of Korea, the National Research Foundation of Korea (NRF-2017R1C1B5017518).

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