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Structural Relationship between Technological Characteristics, Perceived Usefulness, Trust, and Continuous Intention to Use Mobile Payment Services: Sports Consumers in MZ Generations

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Abstract

While the mobile payment service market is expanding, few studies have been conducted on sports consumers to promote the continuous use of mobile payment services. The current study empirically analyzed the structural relationship between technological characteristics, perceived usefulness, trust, and continuous intention to use mobile payments services among sports consumers in millennials and Generation Z (MZ Generations). A questionnaire survey was conducted on students majoring in sports in 4-year universities located in Chungcheong and Gangwon Provinces, Korea. The collected data were examined using frequency analysis, correlation analysis, and structural equation modeling. The key results are as follows. First, the technological characteristics of mobile payment services had a positive effect on perceived usefulness of the services. Second, perceived usefulness had a positive effect on trust in the services. Third, perceived usefulness had a positive effect on continuous intention to use the services. Fourth, trust in mobile payment services had a positive effect on continuous intention to use the services. The results are significant as they provide a reference in establishing marketing strategies required to promote the continuous use of mobile payment services among sports consumers in MZ generations.

Keywords: *technological characteristics of mobile payment services, perceived usefulness, trust*

Introduction

Necessity and purpose of the research

With the increasing dependence on online platforms due to accelerating digital transformation, the growing use of smartphones, and increasingly widespread online shopping, the number of users who buy products and services online through mobile payment has been on the rise. Particularly, contactless payment services based on mobile devices are becoming increasingly common due to social distancing measures put in place because of the prolonged coronavirus (COVID-19) pandemic. Mobile payment service refers to an online payment method that allows users to make a payment after initially registering their card information and then simply verifying their identity with a password or fingerprint (Eun & Kim, 2018). Mobile payment services can lock in consumers once they are successfully attracted to the payment platform by providing basic financial services, including remittance and payment. Further, they can explore new businesses and additional services based on big data related to purchasing patterns among consumers. Given this, it is becoming increasingly competitive to attract loyal customers between mobile payment service providers including banks, fintech firms, and

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retailers (Kim, 2018).

To get ahead in this competitive environment, mobile payment service providers recognize that it is necessary to have a strategy that encourages continuous intention to use, which refers to an individual's intention to continue using the products and services that they are currently using or recommend the products and services to others (Bhattacherjee, 2001). Hence, a user with a high level of continuous intention to use a particular mobile payment service is highly likely to use the service again and communicate its advantages to others through word of mouth (WoM). Thus, it is necessary to examine the factors influencing continuous intention to use mobile payment services to retain the existing user base and attract potential new users (A. Hossain, S. Hossain, & Jahan, 2018).

Trust is a factor that influences mobile payment users' continuous intention to use. Mobile payment refers to a contactless transaction made online. Users may have perceived risk in online transactions due to uncertainty, including personal information leaks or transaction cancellation due to system errors, which have a negative effect on the continuous use of online transactions (Piriyakul et al., 2015). The 2019 Survey on Payment Methods and Mobile Financial Service Use Behaviors conducted by the Payment & Settlement Systems Department, the Bank of Korea (2020) on 2,650 men and women aged 20 or older revealed that lack of trust is the greatest factor discouraging the use of mobile payment services. The survey demonstrated that to expand continuous intention to use, it is necessary to increase the level of trust in such services.

Another predictor variable for continuous intention to use mobile payment services is perceived usefulness, which means how useful it is to use new information technologies as perceived by a user in terms of improving their performance (Lee, Xiong, & Hu, 2012). According to the technology acceptance model (TAM) proposed by Davis (1989), the acceptance of new information technologies is determined by users' attitude, which is affected by perceived usefulness. In other words, when users have a high level of perceived usefulness toward a new information technology, they have a favorable attitude toward the technology, which ultimately leads to their acceptance of it. In this regard, it is necessary to improve users' perceived usefulness for mobile payment to expand their continuous use of such services and the effect of WoM.

Meanwhile, in the TAM, it is important to identify external factors influencing perceived usefulness (Davis, 1989). This is because a certain external factor has an effect on perceived usefulness about a new information technology, which in turn effects the acceptance of the technology (Phonthanukitithaworn, Sellitto, & Fong, 2016). In other words, users who highly perceive the usefulness of a new information technology due to a particular external factor are likely to accept the technology. Research on the acceptance of mobile payment services (Liu & Tai, 2016; Rizkyandy, Setyohadi, & Suyoto, 2018; Schierz, Schilke, & Wirtz, 2010) found that technological characteristics of mobile payment services are one of the determinants affecting the perceived usefulness. In this sense, examining what effect technological characteristics have on perceived usefulness of such services is required to increase the continuous use of mobile payment services.

As seen above, to promote continuous intention to use mobile payment services, it is necessary to examine the causal relationship between the technological characteristics, perceived usefulness, trust, and continuous intention to use. Based on the TAM model, research in the field of sports identified determinants of sports consumers' acceptance of new information technologies. For instance, Hong (2012) found that for college students who purchased sports products online, perceived usefulness had a positive effect on willingness to purchase such products. Kwag, Cho, and Lee (2014) confirmed that perceived ease of use had a positive effect on perceived usefulness, which in turn positively effects college students' attitude toward buying sports products online. Such studies are significant as they identified a causal relationship between sub-factors in the TAM model and proposed how to improve sports consumers' willingness to pay online. However, there are few studies analyzing sports consumers' continuous intention to use mobile payment services. This study, thus, empirically examines the relationship between the technological characteristics of mobile payment services, perceived usefulness, trust, and continuous intention to use for promoting the use of mobile payment among sports consumers.

This study analyzed sports consumers in MZ generations because they are at the center of the growth of mobile payment services. They are exposed to the digital environment growing up, are familiar with economic activities based on digital devices, and use mobile payment services often as they are more likely to have and use smartphones than other generations (Pew Charitable Trusts, 2016). In addition, as MZ generations are emerging as major consumers, replacing baby boomers and Generation X, mobile payment service providers including banks, fintech firms, and retailers are competing fiercely to attract MZ generation consumers.

Research hypothesis

Previous studies on willingness to accept mobile payment services confirmed technological characteristics as a key determinant of perceived usefulness. Schierz et al. (2009) found that ubiquity and compatibility had a positive effect on perceived usefulness. Liu and Tai (2016) demonstrated that compatibility and ease of use had a positive relationship with perceived usefulness, and the effect of compatibility on perceived usefulness was greater than that of ease of use. Furthermore, Rizkyandy et al. (2018) revealed that responsiveness was a key factor that can affect perceived usefulness. Based on these previous studies, the following hypotheses were established:

Hypothesis 1: The technological characteristics of mobile payment services will have a positive effect on perceived usefulness.

Hypothesis 1-1: Ease of use will have a positive effect on perceived usefulness.

Hypothesis 1-2: Responsiveness will have a positive effect on perceived usefulness.

Hypothesis 1-3: Ubiquity will have a positive effect on perceived usefulness.

Hypothesis 1-4: Compatibility will have a positive effect on perceived usefulness.

Among previous studies on the relationship between perceived usefulness and trust, Chinomona (2013) found that users who perceived mobile social software as useful had a high level of trust toward social software. Amin, Rezaei, and Abolghasemi (2014) reported that perceived usefulness played an important role in improving trust among users regarding mobile e-commerce providers. Herzallah and Mukhtar (2016) suggested that perceived usefulness had a positive effect on trust in e-commerce among managers in small and medi-

um-sized enterprises. Based on these previous studies, the following hypothesis was established:

Hypothesis 2: Perceived usefulness of mobile payment services will have a positive effect on trust in the services.

Among previous studies on the relationship between perceived usefulness and continuous intention to use, Jung (2014) investigated continuous intention to use smartphones and reported that users with high perceived usefulness were highly likely to continue using smartphones. Hamid, Razak, Bakar, and Abdullah (2015) examined the acceptance of e-government services and found that perceived ease of use had a positive effect on the continuous use of e-government services. Tsai, Lee, and Ruangkanjanases (2020) confirmed that perceived ease of use had a direct effect on continuous intention to use social media and an indirect effect via satisfaction. The following hypothesis was thus established:

Hypothesis 3: Perceived usefulness of mobile payment services will have a positive effect on continuous intention to use the services.

According to previous studies on the relationship between trust and continuous intention to use, trust is considered a key factor in continuous intention to use information technologies and related services. Ramos, Ferreira, Freitas, and Rodrigues (2018) found that trust positively affected continuous intention to use mobile banking services. Abed (2016) proved a positive relationship between trust and continuous intention to use social networking services. The following hypothesis was thus established:

Hypothesis 4: Trust in mobile payment service will have a positive effect on continuous intention to use the services.

Methods

Participants

A questionnaire survey was conducted on the study population, including students majoring in sports in 4-year universities located in Chungcheong and Gangwon Provinces, who had purchased sports products by using mobile payment services. In total, 320 questionnaires were obtained, and 14 with incomplete responses were excluded. Using convenience sampling, 306 copies were included as effective samples for final analysis. Table 1 presents detailed information on the subjects.

Table 1. Demographic Characteristics of the Subjects (N=306)

		Frequency	Percentage
Gender	Male	195	63.7
	Female	111	36.3
University year	Freshman	77	25.2
	Sophomore	95	31.0
	Junior	80	26.1
	Senior	54	17.6
Age	<21	73	23.9
	21 to 22	94	30.7
	23 to 24	85	27.8
	≥25	54	17.6

Measures

The questionnaire was used to measure technological characteristics of mobile payment services, perceived usefulness, trust, and continuous intention to use. All questions were based on a 5-point Likert scale.

Technological characteristics were measured using a questionnaire in Eun and Kim (2018) based on questions used in previous studies in Korea and abroad. Sub-factors in the tool comprised ease of use (4 questions), responsiveness (4 questions), ubiquity (4 questions), and compatibility (4 questions). This study defined ease of use as a perceived level of easily using mobile payment services and responsiveness as fast processing in mobile payment services and responding quickly to inconveniences during the use of the services (Eun & Kim, 2018). Ubiquity was defined as the degree to which mobile payment services are available anywhere anytime, while compatibility was defined as how compatible mobile payment services are with other payment systems (Eun & Kim, 2018).

Perceived usefulness was measured using a questionnaire in Eun and Kim (2018) based on questions used in Davis (1989). Perceived usefulness comprised four questions as a single factor. It was defined as how useful the use of a mobile payment service is compared to traditional payment methods as perceived by users (Eun & Kim, 2018).

Trust was measured by modifying and adapting a questionnaire in Choi and Choi (2011) based on questions in previous studies. The tool comprised of four questions as a single factor. Trust was defined as the level of trust in mobile payment services and their providers (H. Choi & Y. J. Choi, 2011).

Continuous intention to use was measured using a modified and adapted questionnaire from Eun and Kim (2018) based on questions used in previous studies. Continuous intention to use comprised four questions as a single factor. It was defined as a person's intention to use the mobile payment services they are currently using in the future or recommend the services to others (Eun & Kim, 2018).

Data analysis

SPSS 23.0 and AMOS 23.0 were used to statistically process the data. Confirmatory factor and reliability analyses were conducted to test the validity of the tool and the reliability of measured items. Correlation analysis was conducted to examine the correlation between measured variables, and structural equation modeling analysis was conducted to test study hypotheses.

Validity and reliability

The results of confirmatory factor analysis are reported in

Table 2. Goodness of fit for the measurement model was found satisfactory, with χ^2=576.093(df=329, p<.001), χ^2/df=1.751, TLI=.957, CFI=.963, and RMSEA=.050. In terms of evaluation of the validity of the measurement model, the average variance extracted (AVE) was above .50, and construct reliability was above .70, confirming convergent validity. In addition, AVE values for all variables were larger than the squared value of all correlation coefficients, and hence, discriminant validity was ensured. Reliability analysis revealed Cronbach's α between .831 and .927, suggesting that each factor had internal consistency.

Table 2. Results of Confirmatory Factor Analysis and Reliability Analysis (N=306)

Factor	Estimate	S.E.	C.R.	CR	AVE	α
Ease of use 4	1					
Ease of use 3	.980	.053	18.458	.922	.748	.921
Ease of use 2	.976	.050	19.366			
Ease of use 1	.980	.049	19.923			
Responsiveness 4	1					
Responsiveness 3	1.023	.054	19.032	.922	.746	.912
Responsiveness 2	.946	.052	18.176			
Responsiveness 1	.933	.053	17.605			
Ubiquity 4	1					
Ubiquity 3	.970	.049	19.916	.941	.799	.927
Ubiquity 2	1.035	.050	20.763			
Ubiquity 1	.986	.048	20.447			
Compatibility 4	1					
Compatibility 3	1.260	.074	17.082	.912	.723	.911
Compatibility 2	1.069	.070	15.164			
Compatibility 1	1.231	.072	17.104			
Perceived usefulness 4	1					
Perceived usefulness 3	.935	.059	15.766	.926	.759	.878
Perceived usefulness 2	.907	.057	15.990			
Perceived usefulness 1	.849	.055	15.450			
Trust 4	1					
Trust 3	1.096	.093	11.759	.910	.717	.831
Trust 2	.981	.084	11.667			
Trust 1	1.085	.087	12.467			
Continuous intention to use 4	1					
Continuous intention to use 3	1.034	.064	16.225	.940	.796	.900
Continuous intention to use 2	.979	.057	17.276			
Continuous intention to use 1	.992	.055	17.874			

Results

Correlations results

The results of correlation analysis between technological characteristics of mobile payment services, perceived usefulness, trust, and continuous intention to use are reported in Table 3. A positive correlation between variables was found below the p-value of .01. No multicollinearity was found, as the correlation coefficient between all variables was below .80.

Table 3. Correlation Analysis between Study Variables (N=306)

Variable	1	2	3	4	5	6	7
Ease of use	1 (.748)						
Responsiveness	.603**	1 (.746)					
Ubiquity	.626**	.540**	1 (.799)				
Compatibility	.621**	.536**	.588**	1 (.723)			
Perceived usefulness	.616**	.622**	.597**	.592**	1 (.759)		
Trust	.579**	.600**	.608**	.565**	.763**	1 (.717)	
Continuous intention to use	.659**	.643**	.618**	.681**	.721**	.715**	1 (.796)

Legend: ** - p<.01, ( ) - AVE

Hypothesis testing

The results of a hypothesis test are presented in Table 4. Goodness of fit for the structural model was found to be satisfactory, with χ^2=647.162 (df=337, p<.001), χ^2/df=1.920, TLI=.947, CFI=.953, and RMSEA=.055. As ease of use had a significant positive effect on perceived usefulness (β=.196, p<.01), Hypothesis 1-1 was accepted. As responsiveness had a significant positive effect on perceived usefulness (β=.309, p<.001), Hypothesis 1-2 was accepted. As ubiquity had a significant positive effect on perceived usefulness (β=.226, p<.001), Hypothesis 1-3 was accepted. As compatibility had a significant positive effect on perceived usefulness (β=.228, p<.001), Hypothesis 1-4 was accepted. As perceived usefulness had a significant positive effect on trust (β=.802, p<.001), Hypothesis 2 was accepted. As perceived usefulness had a significant positive effect on continuous intention to use (β=.588, p<.001), Hypothesis 3 was accepted. As trust had a significant positive effect on continuous intention to use (β=.244, p<.05), Hypothesis 4 was accepted.

Table 4. Results of Structural Equation Modeling (N=306)

Hypothesis test	Estimate		S.E.	C.R.
	B	β		
H1-1 Ease of use → Perceived usefulness	.126	.196	.043	2.913**
H1-2 Responsiveness → Perceived usefulness	.210	.309	.042	5.034***
H1-3 Ubiquity → Perceived usefulness	.161	.226	.044	3.626***
H1-4 Compatibility → Perceived usefulness	.171	.228	.047	3.634***
H2 Perceived usefulness → Trust	.781	.802	.067	11.640***
H3 Perceived usefulness → Continuous intention to use	.651	.588	.108	6.056***
H4 Trust → Continuous intention to use	.277	.244	.107	2.590*

Legend: * - p<.05; ** - p<.01; *** - p<.001

Discussion

This study was conducted on university students who purchased sports products with mobile payment services to examine factors influencing continuous intention to use mobile payment services. From previous studies on intention to accept mobile payment services based on the TAM model, this study identified technological characteristics, perceived usefulness, and trust as key factors that may have an effect on continuous intention to use and analyzed the causal relationship between the factors. Key implications from the results of this study are outlined below.

First, there was a positive relationship between ease of use, responsiveness, ubiquity, compatibility; that is, technological characteristics, and perceived usefulness. This finding is consistent with the results of previous studies, which argue that technological characteristics have a positive effect on perceived usefulness (Eun & Kim, 2018; Liu & Tai, 2016; Rizkyandy et al., 2018; Schierz et al., 2009). Based on the results, it is necessary for mobile payment service providers to use technological characteristics in their services and provide usefulness differentiated from traditional payment methods to improve perceived usefulness of their mobile payment services. Particularly, this study found that responsiveness and compatibility among other technological characteristics had a greater effect on university student users' perceived usefulness about the services than ubiquity and ease of use. Hence, to improve perceived usefulness, mobile payment service providers need to consider improving the compatibility of their services with other payment systems, increasing service processing speed, and quickly responding to complaints from users, provide an environment where users can make a payment with their mobile devices anywhere anytime, and improve ease of use of the services (Eun & Kim, 2018).

Second, users' perceived usefulness of mobile payment services had a positive effect on trust in the services. This finding is consistent with the results of previous TAM-related studies by Chinomona (2013) and Amin et al. (2014), who argue that the more useful users perceive new information technologies and related services to be, the more trust they show about such information systems and services. A higher level of trust in mobile payment services and their providers will increase users' continuous intention to use the services. Thus, it is important for mobile payment service providers to make their customers aware that their mobile payment services are more useful than traditional payment methods. As previously mentioned, mobile payment service providers need to consider that users' perceived usefulness may be higher when the ease of use, compatibility, responsiveness, and ubiquity are higher.

Third, perceived usefulness had a positive effect on continuous intention to use the services. The relationship between perceived usefulness and continuous intention to use was reported to be positive by various other studies on the acceptance of information technologies (Hamid et al., 2015; Tsai et al., 2020). Hence, mobile payment service providers need to use the aforementioned technological characteristics in their services and make users aware of the advantages of their services. This would help improve users' continuous intention to use mobile payment services.

Fourth, users' trust in mobile payment services had a positive effect on continuous intention to use. This finding is consistent with the results of previous studies that argue a higher level of trust leads to a higher level of users' continuous intention to use mobile payment services (Cho, 2018; Choi & Choi, 2016). Since mobile payment services provide contactless transactions online, the level of trust that users have built while using the services can potentially have a significant effect on their continuous intention to use (Pal, Funilkul, & Papasratorn, 2019). Trust can play an important role in alleviating perceived risk that may occur during mobile payment (Choi & Choi, 2016). In other words, the more users trust mobile payment services and their providers, the more it alleviates their anxiety about uncertainty, including personal information leaks or abuse that may occur during their use of mobile payment, and it will have a positive effect on continuous intention to use such services (Malaquias & Hwang, 2016).

This study is significant in that it expanded the underlying TAM for sports consumers in MZ generations, identified preceding variables for perceived usefulness, and found the determinants that had a positive effect on continuous intention to use mobile payment services. Furthermore, the results may be used as a reference to establish marketing strategies to promote the use of mobile payment services among sports consumers in MZ generations.

Despite its implications, this study has the following limitations. First, respondents were mostly university students in their 20s. Thus, it is difficult to generalize the results across all age groups. Future research would need to investigate whether a similar significant relationship exists in other age groups as well. Second, only technological characteristics of mobile payment services are selected as variables influencing perceived usefulness. Previous studies on continuous intention to use mobile payment services, which apply the expanded TAM (Schierz et al., 2010), used not only technological characteristics but also personal and social characteristics as preceding variables influencing perceived usefulness. An additional study may be needed to expand these variables and verify the relationship between them.

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Conflict of Interest
The authors declare that there is no conflict of interest

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