MOBILE PAYMENT ADOPTION IN KOREA: SWITCHING FROM CREDIT CARD

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Abstract

The growing interest in mobile commerce and the high penetration rate of mobile communication service in Korea are expected to provide mobile operators a new and great business opportunity, the mobile payment. This paper empirically investigated what factors make the mobile subscribers reluctant to accept M-payment. For the purpose, we employed the technology acceptance model(TAM), adding the concepts of switching barriers and facilitating condition. Confirmatory factor analysis(CFA) and structural equation modeling(SEM) is used in this study. As a result, we found that "facilitating condition" is positively related to the perceived usefulness as well as the intention to use while "move-in cost" and "attractiveness of alternativeness" are negatively related. However, "interpersonal relationship with credit card service providers", "continuity cost" and "sunk cost" were found to have no significant influence in developing the intention to use M-payment.

Key Words : Mobile Payment, Technology Acceptance Model(TAM), Switching Barrier, Facilitating Condition.

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1. Introduction

Technological innovation has rapidly changed every aspect of our lives and the way of business during last decade. One of the most noteworthy innovative changes is the use of mobile devices that provides an easy and effective way of communicating with each other. The mobile devices, once considered a luxury, have become the conventional communication tools. With the growing penetration of wireless devices and the rapid technological innovation, new business opportunity has been given to mobile operators. One of the most prospective business opportunities is expected to come from the deployment of M-commerce.

M-commerce is electronic commerce over wireless devices and requires a transaction of monetary value through a wireless telecommunication network. Without the transactions of monetary value, M- commerce cannot be realized.

The transaction of monetary value can be made in three ways. First, the transaction can be made by the billing system of a mobile carrier and thus often called carrier-based transaction system. In this particular system, the payment made for any mobile purchase is included in the monthly carrier bill. Second, the transaction itself can be a direct monetary transaction between accounts or bill payment. In this case, most of financial services can be provided through a wireless network using the devices connected to the network. Last, M-commerce transaction may use credit card information stored in a mobile device. This type of transaction considers the mobile device a surrogate credit card.

M-payment can be understood as a point-of-sale payment made through a mobile device, such as cellular phone or personal digital assistant. What makes M-payment particularly interesting is that the payment services for any retail purchases may well be provided by mobile operators and not by the established banking systems. That is, M-payment provides the mobile operators an opportunity to extend their business operation to financial service area.

Traditionally, financial transactions have been made through the networks operated by banks and financial institutions. Especially, banks have played very important role, acting as issuing banks, acquiring banks, and even clearing houses. Even though mobile operators are involved in some financial transactions, it was within the boundary of their own traditional business operation, the telecommunication service.

However, the mobile operators are now able to enter retail payment service market and take some of the shares that could otherwise remain with existing players such as banks and financial institutions. The market share that these mobile operators capture in the retail payment market can be significant if the substantial number of mobile subscribers use M-payment service. The mobile operators also have enormous customer base, established billing system and technical expertise possessed that can be utilized for the successful business operation in the retail payment market.

Nevertheless, it is still obscure whether M-payment can be successfully deployed and practiced in the market. One of the problems of using M-payment is the existence of alternative and the cost of switching from the alternative, especially the credit card. The existence such alternative forms switching barrier that locks customers in, making them difficult to accept M-payment.

Hence, this paper employs the concept of switching barrier to examine the human motivations underlying individual behavioral intention to use M-payment. Throughout the study, we expect to understand the role of switching barrier in predicting the intention to use new technology/services and explore the relationship between the switching barrier and the conventional construct employed in TAM.

2. Literature review

A general purchasing decision-making procedure consists of five major phases [44, 45]. These phases includes (1) need identification, (2) information search, (3) alternatives evaluation, (4) purchase, (5) after purchase evaluation.

The first stage, need identification, begins with the stimulation of a need when a consumer realizes an imbalance between the actual and desired states of a need. In this stage, the efforts of marketers are focused on making consumers recognize such imbalance and convince that the purchase of products/services can balance the gap between two states. In the second stage, information search, consumers searches for information about various alternatives available to satisfy the need. The outcome of this stage is a set of alternatives. Marketing managers' concern in this stage is how to make their product/service information available to consumers. In the third stage, alternatives evaluation, consumers compare and evaluate the alternatives based on the criteria that have been developed from the information stored in memory, or obtained from outside sources, or both. This stage is the most critical to marketers because understanding customers' preference and decision criteria directly influences the next stage, actual purchase. The last stage, after purchase evaluation, is made based on the experience of the product/purchase. This stage has been interests of many researchers and marketers due to its importance in developing customers' loyalty, repurchase intention and retention. Through this simplified procedure, the marketers can effectively understand how consumers respond to marketing strategies and better design marketing plans.

Approaches to the studies of the consumer decision-making procedure and the usage behavior fall into two broad categories: the decision-making before purchasing experience and the decision-making after purchasing experience. The first three phases of the decision-making procedure fall into the category of "before purchasing experience" while the last two phases fall into the category of "after purchasing experience".

The first approach mainly focuses on identifying the determinants that predicts the behavioral intention of adopting new products or services. With the proliferation of the Internet and E-commerce, TAM has earned the attention of many scholars and has been widely accepted as a framework for the studies related to the adoption behavior of emerging information technology [13, 18, 19, 20, 26, 41].

Many researchers have extensively used this framework, and adjusted the model to find the empirical evidences in new WWW context, employing new personal, situational and social beliefs. For example, perceived playfulness was found in many recent studies and showed that this new concept plays a significant role in the development of intention to use IS (Information System) [1, 31, 43].

The second approach focuses on identifying the causality between the constructs such as service quality, switching barrier, satisfaction, loyalty, and repurchase intention. The general agreement of the studies has been "service quality lead to satisfaction" and "satisfaction lead to loyal behavior such as word-of-mouth, repurchase, and retention" [4, 7, 15, 16, 34, 35, 39, 42]. However, some studies demonstrated that customer satisfaction does not always lead to customer retention and unsatisfied customers stay when switching cost is high. These studies insist that the concept of switching barrier needs to be addressed to explain such inconsistency [3, 28, 29].

The switching barrier has been often used as control variable in order to investigate the inter-relationship between satisfaction and retention [28, 29, 30]. That is, the level of customer retention can vary depending on the magnitude of switching barrier when the level of customer satisfaction is identical. In reality, the perception and the switching barrier built from the previous experience in existing service can influence the behavioral intention to accept new service. Technologies are competing and accepting new technology often means switching from the existing one. When a new service emerges in the market, not only the beliefs about the service but also the switching barrier developed from the previous experience in existing service may play a significant role in developing the behavioral intention.

Though many addressed important constructs such as perceived easy of use, perceived usefulness and other variables in predicting individuals' intention to accept IS using TAM, few considered the context of competition and the existence of switching barrier. In addition, despite its potential importance in predicting the usage behavior of new IT services, the role of switching barriers has received little attention in marketing.

In addition to switching barrier, pre-matured facilitating service network can influence the usage behavior of people [2, 14, 41]. The perceived facilitating condition refers to the belief about the accessibility to resources necessary to facilitate any service. The lack of relevant resource is evidently a barrier to system usage. The resource can be time, money or any transformed type of these.

Findings related to facilitating condition are often shown in the studies regarding TPB (Theory of Planned Behavior). These studies demonstrate that the facilitating condition is positively related to behavioral control that is important predictor of intention to adopt IT related services [2, 12, 27, 41]. Obviously, the lack of facilitating resource builds negative perception toward a service and makes people reluctant to adopt it. This concept is especially important in IS context where service network is crucial in meeting customer demand.

In sum, this study employs basic framework of TAM and investigate how the pre-matured facilitating condition and switching barrier built from the previous experience influences the acceptance of new IT service.

3. Research model and Hypotheses

3.1 TAM (technology acceptance model)

Original TAM was proposed by Davis [19]. This model adopts well established causal chain of “beliefs → attitude → intention → actual behavior”, which was developed from the theory of reasoned action by social psychologists, Fishbein and Ajzen [22].

In Davis’s study [19], TAM introduces two important constructs, perceived usefulness and perceived ease of use. The perceived usefulness (PU) is defined as “the degree to which an individual believes that using a particular system would enhance his/her job performance”. The perceived ease of use (PEU) is defined as “the degree to which an individual believes that using a particular system would be free of physical and mental efforts”. These perceptions predict attitudes toward the system. Then the attitude develops the intentions to use and the intentions cause actual system usage. In many recent studies regarding IS acceptance TAM is adopted extensively. TAM was adopted and showed that it contributes to the prediction of individual usage of software in WWW context [32]. Thus, we adopt the conventional TAM construct in our model.

H1 : Attitude toward M-payment service usefulness is positively related to intention to use M-payment service
H2 : Perceived usefulness is positively related to attitude toward M-payment service
H3 : Perceived usefulness is positively related to intention to use M-payment service
H4 : Perceived easy of use is positively related to attitude toward M-payment service
H5 : Perceived easy of use is positively related to Perceived usefulness

3.2 Facilitating Condition

The concept of facilitating condition is adopted from resource-based facilitating condition [2]. Resource-based facilitating condition refers to the beliefs about accessibility to resources necessary to facilitate a service. In the context of M-payment, the resources can be classified into two distinct concepts: external resource and internal resource. The external resource is a service network (retail stores that provide M-payment service) provided by service operators whereas the internal resource is a mobile device directly accessed by individuals and connect them to the service network.

The concept of internal resource is strongly associated with switching cost, especially move-in cost because the absence of mobile device incurs the extra cost that makes individuals difficult to adopt M-payment service. Thus, facilitating condition in this study only concerns the external resource, the perceived accessibility to the service network where M-payment service is available.

In M-payment context, several standards have been competing to be a market de-facto and no interoperability has been achieved between the different standards. This caused an extra burden to retail stores because they are to prepare several devices for the different standards. This extra burden also made the retail stores reluctant to join the service network and, in turn, caused the lack of retail stores where M-payment service is available. Obviously, the lack of service network is likely to develop negative perception on usefulness, attitude toward the system and even intention to use.

H6 : Facilitating condition is positively related to perceived usefulness
H7 : Facilitating condition is positively related to attitude toward M-payment service
H8 : Facilitating condition is positively related to intention to use M-payment service

3.3 Switching Barrier

Switching barriers has been spotlighted in recent marketing researches due to its importance in customer retention and profits to service providers [4, 5, 23, 28, 29, 36]. In more recent studies, Kim et al. [30] identified the positive role of switching barrier in customer retention in Korean mobile telecommunication industry. Patterson and Smith [36] also witnessed that switching barriers capture a substantial amount of the explained variance in “propensity to stay with focal service provider”. It is logically understood that the switching barrier makes individuals difficult to switch service provider.

The same logic can be applied to “between services”. In the process of technological development, the adoption of new system/service means switching from existing one. Individuals are less likely to adopt new system/service if they perceive high switching cost. This problem becomes even more critical if attractive alternative is available in the market. In retail payment market, credit card has been widely used. If individuals perceive high switching cost when switching from credit card to M-payment, the use of M-payment will be limited.

Switching barrier has been explained in many ways. Jones et al. [28] explained the switching barrier as economical, social and psychological cost that make customers' defection difficult [23] and classified the switching barrier into three groups: attractiveness of alternatives, Interpersonal relationship, and perceived switching cost.

Attractiveness of alternative

Attractiveness of alternative refers to the reputation, image and service quality of viable competing alternative available in the market place [8, 28]. Attractiveness of alternative increases when service provider does not offer differentiated services that are difficult for competitors to imitate. In the contrary, when there is few viable alternatives or perceived benefit of switching service provider is low, attractiveness of alternative reduces and customers are likely to stay in service [37]. Hence, we can expect that the attractiveness of alternative to M-payment, the credit card in this study, may have negative impact on the attitude toward M-payment as well as the intention to accept M-payment service because individuals who are attracted to the credit card may have negative attitude toward M-payment, and thus, result in negative willingness to adopt M-payment.

H9 : Attractiveness of alternative(credit card) is negatively related to attitude toward M-payment service
H10 : Attractiveness of alternative(credit card) is negatively related to intention to use M-payment service

Interpersonal relationship with alternative

Interpersonal relationship refers to the strength of personal bonds that develop between customers and their service provider [11, 28]. This relationship can be developed through recurring interactions with care, trust, intimacy and communications between a service provider and a customer [17]. People are likely to remain in service where this relationship is strong [11, 28]. In the study of Kim et al. [30], the interpersonal relationship with mobile operators in Korea contributed significantly to the formation of switching barrier that makes customers defection difficult and costly. Applying this conceptualization into M-payment context in contrary setting, we can predict that an individual may have negative impact on the intention to use M-payment if customers have strong interpersonal relationship with credit card companies

H11 : Interpersonal relationship between customer and credit card company is negatively associated with the intention to use M-payment.

Perceived Switching Cost

Perceived switching cost is the degree to which an individual believes that switching a service provider would incur certain cost to him/her. The cost can be time, money, effort, and any form of psychological cost associated with the change of service provider [21, 24, 28, 30]. It is often grouped into three categories: continuity cost, sunk cost, and learning cost [24, 29].

Continuity cost refers to the cost of losing special treatment and the cost of perceived risk or uncertainty that a new supplier might not perform the core services at a level equal to, or better than the current supplier [36]. It is also referred to the lost performance. We can expect that a customer who believes that he/she receives special care or benefits from the credit card companies would not have willingness to use M-payment service.

Sunk cost refers to the perceived cost of investments in terms of time and emotional effort, already incurred in establishing and maintaining a relationship with current service provider [29, 36]. Especially, if a customer believes that a great amount of time and cost has been incurred to obtain the special care and trust and these time and cost would be lost if stop using service offered by credit card company, he/she would be reluctant to use M-payment service.

Move-in, often called set-up cost or learning cost, refers to the time, effort, and money required not only for searching and evaluating acceptable, alternative service provider but also for learning a new service routine subsequent to switching [29]. However, especially in M-payment context, move-in cost can be referred to as any financial and psychological burdens incurred when switching to M-payment. The financial cost is the cost incurred when purchasing a mobile device that allows individuals to use M-payment. The psychological cost refers to any distress that individuals may feel about the procedures of joining M-payment network and the burdens of getting accustomed to M-payment. It is logically understood that a customer who feels burden for the time and cost needed to use M-payment may become reluctant to use M-payment service.

In sum, we can expect that the perceived level of switching cost incurred when considering switching from credit card to M-payment would negatively influence the intention to use M-payment service.

H12: Switching cost from credit card service is negatively related to intention to use M-payment service

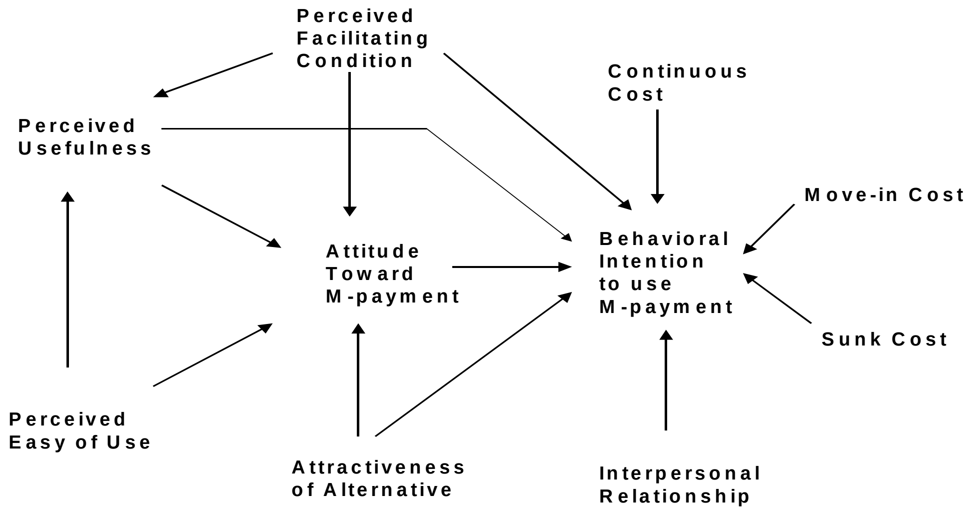
H12-1: Continuity cost is negatively related to intention to use M-payment service

H12-2: Sunk cost is negatively related to intention to use M-payment service

H12-3: Move-in cost is negatively related to intention to use M-payment service

Our model to predict the behavioral intention to use M-payment is shown in Fig. 1. We excluded intention- actual behavior link from original TAM since it is strongly supported by many researches [13, 18, 20, 26, 41] that intention is strongly correlated with actual usage. Thus test of the relation between intention and behavior will do nothing but validating the obvious.

Figure 1. Research model for mobile payment acceptance



4. Research Methodology

In order to test the proposed research model, a field survey was carried out. We first describe the data collection process and discuss the assessment of construct used in the model.

4.1 Subjects

Online survey was performed by a market research company. The data were collected for four days after the announcement of the survey start. The population of interest is the individuals who hold both credit cards and any mobile devices. In total, 1069 replies were collected and 35 replies were discarded due to incomplete or insincere responses. Finally, total of 1034 replies were obtained and used for the study.

Among 1034 respondents, 264 were female and 770 were male. The distributions of age group of 20~29, 30~39, 40~49, 50~59, 60~69 showed 229(22.1%), 602(58.2%), 169 (16.3%), 26 (2.5%) and 9(0.9%) respectively. In terms of education level, 10 had no high-school diploma, 311 had high-school diploma, 193 had college diploma, 463 had bachelor degree, and 57 had higher than bachelor degree. The descriptive data of the variables in our stud is provided in Table 1.

Table 1. Selected demographic attributes of the respondents

Demographic Attributes		Frequency	Percent(%)	Cumulative
Gender				
	Male	770	74.5	74.5
	Female	264	25.5	100.0
Age				
	20-29	229	22.1	22.1
	30-39	602	58.2	80.3
	40-49	169	16.3	96.6
	50-59	26	2.5	99.1
	over 60	9	0.9	100.0
Education				
	No high-school diploma	10	1.0	1.0
	High-school diploma	311	30.0	31.0
	College diploma	193	18.7	49.7
	Bachelor degree	463	44.8	94.5
	More than bachelor degree	57	5.5	100.0

4.2 Instrument Development and Measurement

In this model, total of ten constructs were employed and measured using multiple items with 7 point Likert scales ranging from “Strongly disagree” to “Strongly agree”.

One advantage of using the TAM is that it has well validated measurement inventory. The scale items were taken from previously suggested and validated measures in many researches and restated with care to reflect the characteristics of current context. The measure of behavioral intention to use, attitude towards using, perceived usefulness and perceived ease of use were adapted from previous studies related to the TAM, mainly from the study of Davis et al. [20]. The measures of facilitating condition were adapted from the study of Taylor and Todd [42]. The measure of switching barriers, including attractiveness of alternative, interpersonal relationship and switching cost (continuity cost, sunk cost, move-in cost), were adapted from the studies related to switching barriers [28, 29, 36]. The items used to measure each variable are listed in Appendix.

Prior to the actual study, pilot test of the measures was conducted against graduate students majoring in IT management. The wording of items was carefully modified based on the pilot test outcomes and reviewed by bilingual students.

5. Result

The SEM(Structural Equation Modeling) approach was used to validate our research model due to its ability to define causal relationship between constructs comprised of multiple measurement items. SEM has been used in almost every conceivable field of study including marketing, psychology, management since it provides the way of testing multiple relationships simultaneously with statistical efficiency and supports a transition from exploratory to confirmatory analysis [25], developing a more systematic and holistic view of problems. For the purpose, AMOS4.0 was used.

Our data analysis proceeded in three stages. First, we tested the reliability and validation of instruments and examined the measurement model for refinement. And then we also analyzed overall and structural equation model fit. Followed by the model fit tests, the hypotheses were tested at last.

5.1 Reliability and Validity of measurement model

Before evaluate the overall model fit, the measurement of each construct need to be assessed. For the purpose, we tested internal consistency (unidimensionality), construct validity, and reliability of the model. In this study, we used CFA(Confirmatory Factor Analysis) and SEM technique to assess the measurement model fit.

The internal consistency was examined by Cronbach’s alpha coefficients, testing the stability of individual measurement items across replications from the same source of information. All of the initial scales in our research model demonstrated the acceptable level of reliability as they show the Cronbach’s alpha coefficients above 0.80, the lowest suggested limit [40].

Followed by the internal consistency test, construct validity was tested. Construct validity is the extent to which the indicators are the true measures of what they are supposed to measure [40]. The construct validity for each scale was examined, assessing the standardized CFA factor loadings of its hypothesized items. The minimum factor loading of 0.6 on its hypothesized constructs is proposed [33]. The factor loadings of five items out of 38 items were below 0.6 and, thus, dropped from the model. In more details, one item was dropped from each of PU, IP and CC, and two items were dropped from AA (PU5, AA4, AA5, IP4, CC4). After this scale refinement, total of 33 items remained in the measurement model and the Cronbash’s alphas coefficients increased. Table 2 summarizes the outcome.

In addition to the internal consistency and validity, reliability and variance extracted for a latent construct was computed separately for each multiple items construct in the model. The outcome demonstrated that all constructs had higher construct reliability than the benchmark of 0.6 recommended by Bagozzi and Yi [6]. Along with the construct reliability, the variance extracted was estimated. This measure reflects the overall amount of variance in the items accounted for by the latent construct. Hence, higher value indicates that the items are more truly representative of the latent variable. In this study, all of constructs found to have the value higher than the bench mark of 0.5 recommended by Hair et al. [25]. The outcomes of the tests are shown in Table 3.

In summary, the statistical results demonstrated that the measurement model has acceptable range of reliability and validity and the retained items can be considered adequate indicators of the corresponding constructs.

Table 2. Construct validity and Internal consistency reliability

Likert-scaled construct	No. of items	Item	Mean	Standard deviation	Cronbach alpha	Factor loadings
Perceived usefulness (PU)	5 [4]	PU1	4.35	1.16	0.9103 [0.9336]	0.875 [0.875]
		PU2	4.42	1.15		0.905 [0.908]
		PU2	4.57	1.22		0.861 [0.863]
		PU4	4.49	1.15		0.856 [0.854]
		PU5	4.05	1.27		0.587 (-)
Perceived ease of use (PEU)	4	PEU1	4.38	1.17	0.9409	0.863
		PEU2	4.26	1.21		0.918
		PEU3	4.28	1.19		0.934
		PEU4	4.40	1.20		0.863
Perceived Facilitating Condition (PFC)	4	FC1	4.28	1.28	0.9336	0.840
		FC2	4.25	1.28		0.881
		FC3	4.17	1.22		0.919
		FC4	4.23	1.19		0.892
Attractiveness of Alternative (AA)	5 [3]	AA1	5.01	1.08	0.8281 [0.9243]	0.861 [0.857]
		AA2	5.08	1.15		0.937 [0.945]
		AA3	5.12	1.16		0.893 [0.888]
		AA4	4.44	1.30		0.361(-)
		AA5	4.73	1.18		0.464 (-)
Interpersonal Relationship with Credit Card Firm (IPR)	4 [3]	IPR1	4.07	1.23	0.8548 [0.8847]	0.809 [0.825]
		IPR2	3.67	1.24		0.885 [0.868]
		IPR3	3.92	1.21		0.847 [0.851]
		IPR4	3.12	1.42		0.595 (-)
Perceived Loss of Continuity Cost (CC)	4 [3]	CC1	3.63	1.31	0.8584 [0.9173]	0.857 [0.850]
		CC2	3.59	1.31		0.958 [0.969]
		CC3	3.58	1.36		0.856 [0.847]
		CC4	3.86	1.24		0.434 (-)
Perceived Sunk Cost (SC)	3	SC1	4.25	1.26	0.8663	0.859
		SC2	3.96	1.16		0.797
		SC3	4.04	1.23		0.826
Perceived Move-In Cost (MC)	3	MC1	4.68	1.32	0.9327	0.883
		MC2	4.56	1.27		0.962
		MC3	4.44	1.22		0.878
Attitude (ATT)	3	ATT1	4.31	1.21	0.9190	0.912
		ATT2	4.32	1.16		0.856
		ATT3	4.28	1.23		0.879
Intention to Use (ITU)	3	ITU1	3.93	1.21	0.9277	0.873
		ITU2	3.78	1.22		0.963
		ITU3	3.63	1.24		0.847

[] indicates parameters after scale revision., (-): These items were dropped from the final scales.

Table 3. Composite reliability and Variance Extracted of Measurement model

Likert-scaled construct	**Composite Reliability**	**Variance Extracted**
Recommended Value	> 0.6	>0.5
Perceived usefulness **(PU)**	0.929	0.766
Perceived ease of use **(PEU)**	0.928	0.801
Perceived Facilitating Condition **(PFC)**	0.918	0.781
Attractiveness of Alternative **(AA)**	0.925	0.805
Interpersonal Relationship **(IP)**	0.893	0.719
Perceived Loss of Continuity Cost**(CC)**	0.920	0.793
Perceived Sunk Cost **(SC)**	0.867	0.685

Perceived Move-In Cost **(MC)**	0.934	0.825
Attitude **(ATT)**	0.914	0.780
Intention to Use **(ITU)**	0.924	0.802

The absolute fit measures test the overall model fit but do not adjust the degree of possible "overfitting". In general, five measures are used for the absolute fit measures; the likelihood ratio Chi-square statistic of estimated model, GFI (Goodness-of-Fit-Index), AGFI (Adjusted GFI), RMSR (Root Mean Square Residual) and RMSEA (Root mean square error of approximation).

The chi-square statistic is found to be significant, indicating that the actual and proposed model differ considerable. However, the Chi-square test tend to be highly sensitive to sample size, increasing the probability of rejecting any model with increased sample size, though the problem of the model is in acceptable range. For this reason, "chi-square/df (degree of freedom)" ratio was suggested as a more appropriate measure of model fit [9, 10]. The measure should not exceed 5 for models with acceptable fits [10] and was estimated as 3.46 in our hypothesized model. RMSR had a value of 0.157, which falls outside the acceptable threshold of 0.08. However, no absolute threshold levels for acceptability have been established [25]. With this in mind, we examined a number of other measures. AGFI and GFI were found to be 0.893 and 0.908 respectively, surpassing the recommended level of 0.8. RMSEA under 0.08 is deemed acceptable [25]. In this study, it was estimated as 0.049, satisfying the suggested level.

In addition to the absolute fit measure, the incremental fit measures were evaluated. NNFI (Non-normed fit index), often called TLI (Tucker-Lewis Index), NFI(Normed fit index) and CFI (Comparative fit index) are used for the measures. In general, recommended values of NNFI, NFI and CFI are 0.9 or greater [25] and were estimated as 0.955, 0.944 and 0.959 respectively. These measures were also found to be acceptable with the observed data.

In sum, comparison of all fit indices with their corresponding recommended values provided evidence of acceptable model fit. Thus, we move to the final step of the study, the test of hypotheses.

5.3 Hypothesis testing

The final step in model estimation is to explore the path significance of each causal relationship for hypotheses and examine the variance explained by each path in the model. The structural parameter estimates and the variance explained are described in Figure 2.

All of the hypothesized causal relationships were significant at p=0.05 except the links for "IP→ ITU" ($\beta = -0.014$, p=0.585), "CC→ITU"($\beta = -0.005$, p=0.840) and "SC→ITU"($\beta = -0.007$, p=0.805).

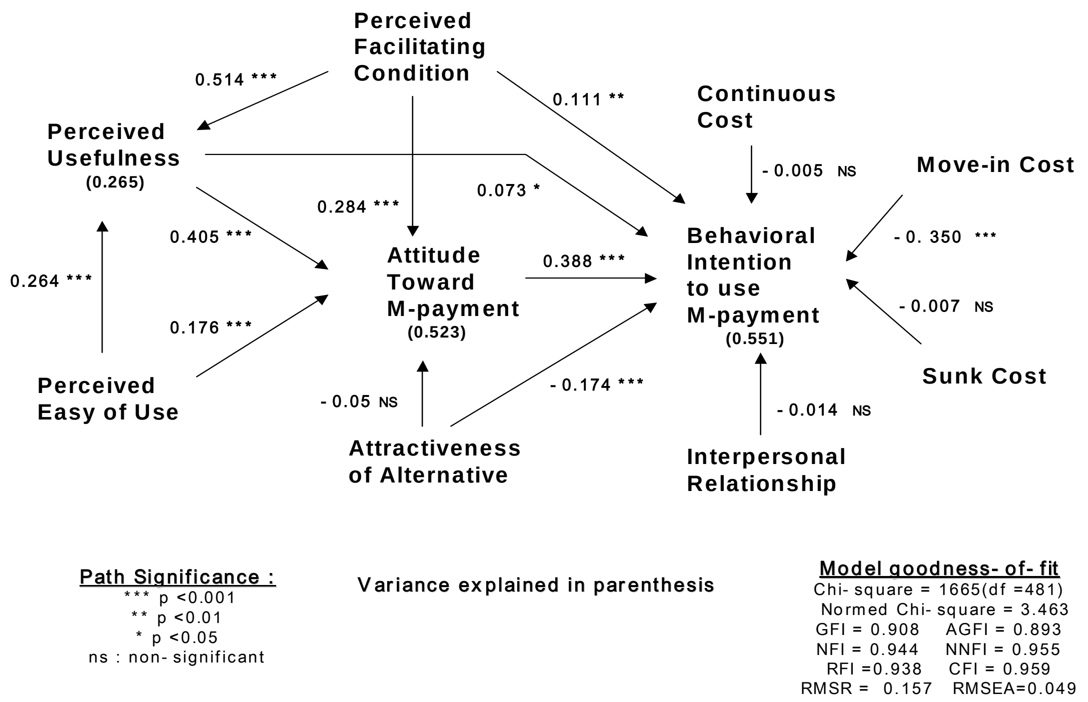
Hypotheses 1 to 5 tested the general causality shown in conventional TAM. As expected, all were supported at p=0.05. Hypotheses 6 to 8 examined the impact of individuals' perceived facilitating condition on their perceived usefulness, attitude and intention to use M-payment. The outcome demonstrated that perceived facilitating condition has significant positive impact on all constructs at p=0.01. The two beliefs (PFC, PEU) explained 26.5% of the variance in perceived usefulness. Moreover, 52.3% of variance in attitude toward M-payment was explained by four beliefs (PU, PEU, PFC and AA)

Hypotheses 9 to 12 investigated the causal role of different type of switching barriers (Attractiveness of alternative, Interpersonal relationship with alternative service provider, Switching cost incurred when switching to M-payment) on perceived usefulness, attitude toward M-payment, and intention to use.

In more details, hypothesis 9 and 10 tested the role of attractiveness of alternative service, the credit card in this study, as a predictor of attitude toward M-payment as well as intention to use. As argued, attractiveness of alternative was found to be a good predictor of intention to use ($\beta = -0.174$, p<0.001). However, its impact on attitude toward M-payment was not significant ($\beta = -0.05$, p=0.058), though it has marginal negative effect at p=0.1. Similarly, hypothesis 11 examined the impact of perceived interpersonal relationship with the alternative service provider (credit card service provider) on intention to use M-payment. The outcome showed that interpersonal relationship does not have significant effect on intention.

At last, hypotheses 12-1 to 12-3 examined how three different switching costs, say continuity cost, sunk cost and move-in cost incurred when switching to M-payment, influence intention to use M-payment. The outcome indicated that move-in cost has significant effect on intention to use M-payment($\beta = -0.350$, p<0.001) while other two costs (continuity cost and sunk cost) do not have significant effect. At last, 55.1% of variance in intention to use(ITU) was explained in this model.

Figure 2. Structural model fit for original research model



6. Conclusion

The primary purpose of this study is to examine what are the human motivations underlying individual behavioral intention to use M-payment and how this intention is influenced by the perception for external conditions such as facilitating condition and switching barrier. Our research started from the doubt that the conventional constructs addressed in TAM may not be good enough to explain the intention to accept M-payment because the conventional TAM does not consider the competition between services and the switching barrier that might keep individuals from joining new service. In this regards, we investigated how the switching barriers and the facilitating condition influence the intention to accept new service, M-payment in this study, and how these constructs fit in the TAM.

As argued, the facilitating condition was found to be a significant predictor of perceived usefulness, attitude toward M-payment and even intention to use. This outcome supports that the conceptualization of the facilitating condition is important and useful predictor of behavioral intention especially in the industry where service network is crucial in delivering the service to customers.

This outcome also delivers the following implications to the mobile operators. First, the study reveals that individuals feel inconvenient to use M-payment due to the lack of retail stores where M-payment service is available. Indeed, no M-payment platform has been settled yet and the mobile operators are competing for the market standard. This is, M-payment service agents, such as retail stores, restaurants and shopping malls, are required to install several M-payment device readers in order to support the different M-payment protocols of different operators, on the top of the already existing credit card readers. This extra burden makes the service agents reluctant to join M-payment service network. Hence, to promote the use of M-payment, mobile operators are suggested to reduce the burden of service agents by compromising for the standard or by, at least, offering interoperability between different standards so that individuals can experience M-payment in various services and places.

The study also reveals that the loyalty of customers toward credit card companies is not high enough to keep people in service. This implies that many credit card users can easily switch to M-payment if necessary. Now, more than 65% of the total population is hooked up to the mobile network and the intense competition among mobile operators has made themselves experience and know how to leverage their understanding about customers, fulfill their demand and eventually earn the loyalty. In this regards, if the mobile operators leverage enormous customer base, they may capture substantial share of payment market and emerge as an influential player.

However, the study tells that procedural and financial costs, called move-in cost, incurred when joining M-payment network and purchasing the mobile device that connects individuals to M-payment network make mobile subscribers difficult to adopt M-payment. Hence we may suggest that simplified process of M-payment registration, and financial subsidy for M-payment device would help the mobile operators to realize the benefit from the increase of M-payment subscribers.

7. Limitation and Further research issues

Like most field surveys, our study has some methodological limitations. For example, our sample subjects consisted solely of credit card holders. This approach may have introduced some sampling bias in our survey because some individuals may use M-payment without issuing the credit cards. However, more than 95 Million cards are issued and this number is more than twice of total Korean population. Hence, our assumption that the potential users of M-payment also hold the credit card wouldn't cause sampling bias.

In addition, security is often referred to one of important factors in realizing M-payment. In our model, no items and factors related to this matter were employed. Similar problem has been raised in the Internet context, and few researches using conventional TAM and TPB model dealt with this issue. Indeed, a model cannot deal with all of important factors. For example, the theories used in this research(TPB and TAM) is focusing on attitude formation of individuals. Hence, these models may not provide satisfactory answers for more specific and business issues such as "how the use of M-payment can be promoted" and "which specific attributes can appeal to customers". To that end, further research may develop a model that provides more comprehensive context of M-payment.

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Appendix

Perceived Usefulness (PU)

M-payment service useful for the purchase of goods/services

M-payment service makes the purchase of goods/services easier

M-payment service makes the purchase of goods/services faster

M-payment service makes the purchase of goods/services convenient.

M-payment service is effective way of making payment.

Perceived Ease of Use (EU)

M-payment service is easy to use.

Learning how to use M-payment service is easy to understand.

Using M-payment service is simple.

Using M-payment service can be easily skillful.

Facilitating Condition(FC)

I think that M-payment system can be used in many places.

I think that M-payment system can be used to purchase of many goods/services.

I think that I have access to the M-payment system in the place where I can purchase goods/services I need.

I think that M-payment system can be used in the place where I often visit.

Attitude (ATT)

I think that using M-payment for any purchase is good idea.

I think that using M-payment system is beneficial to me.

I have positive perception about using M-payment system

Intention to use (ITU)

I intend to use M-payment system.

I intend to use M-payment system as much as possible.

I intend to use M-payment system more than any other payment system.

Switching Barrier from Alternative

Attractiveness of Alternative(AA)

I think that credit card is very convenient to use

I think that credit card can be used in many places

I think I can purchase various goods/services using credit card.

Using credit card brings many benefits to me
Credit card is more useful than mobile payment.

Interpersonal Relationship with credit card company(IP)
I feel close(familiar) to the credit card company.
I think that my credit card company cares for me
I think there is mutual trust between me and my credit card company
I think that my credit card company will help me when I have difficult time.

Continuity Cost(CC)
I have been treated specially by credit card company.
I have been receiving many benefits from credit card company for using credit card
It is important for me to have the care and benefits that I receive from credit card company.
I worry about losing the care and benefits that I receive from credit card company when I do not use the credit card.

Sunk Cost(SC)
It takes much effort to receive the care and benefit that I get now from the credit card company.
It takes long time and cost to build the relationship that I have with the credit card company
If I do not use credit card, the relationship that I have with the credit card will not be same as it used to be.

Move-in Cost(MC)
I need to purchase mobile device to use M-payment service
It is a hassle to initiate M-payment service and takes time and effort to follow up the procedure
It takes a lot of time and effort to use M-payment system