

## Moderating Effects of Personal Innovativeness in Mobile Banking Service\*

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### I. Introduction

With the widening diffusion of the mobile Internet, mobile banking is rapidly becoming an alternative channel for accessing banking services. Mobile banking (banking through a mobile phone) refers to the convergence of mobile technology and financial services that has emerged following the advent of the wireless Internet and smart-chip-embedded handsets.

Mobile banking is used by people who place a

premium on time, who are regularly on the move, and who want to access their bank accounts and transfer funds at any time and any place through their phones without visiting a bank. For example, banking customers in Korea have little time to spend on activities such as banking and demand a higher degree of convenience and accessibility [Lee et al., 2008]. Consequently, Korean banks currently offer many 24-hour-a-day mobile banking services, such as bill payments and financial management services [KIEC, 2004].

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Considering that the number of people who signed up for Internet banking services was 40.11 million at 19 financial institutions as of June 2007 [Bank of Korea, 2008], competition is stiff among Korean mobile phone operators in mobile banking services, and the new application market grew more than 10 times from 2003 until 2005 [Korea Times, 2003].

Because customers in Korea have less time to spend on activities such banking, and so desire a higher degree of convenience and accessibility. In Korea, the number of people who signed up for the Internet banking service was found to be 40.11 million in 19 financial organs as of late June, 2007 [Bank of Korea, 2008]. Korean banks offer a number of mobile banking services, such as bill payment and financial management services 24 hours a day [KIEC, 2004]. The stiff competition among Korean mobile phone operators is spreading to mobile banking services, and the new application market grew more than ten times from 2003 until 2005 [Korea Times, 2003].

Given that mobile banking offers many benefits for banks and customers, why is it not more widespread? The reasons are the limitations of the system—tiny screens and keypads and slower speeds—compared with Internet banking and uncertainty about the security of wireless transactions [Luarn and Lin, 2004].

At present, mobile banking in Korea is still evolving, thus considerable potential for development and expansion exists. For banks to realize the potential benefits of mobile banking to

stay competitive, they need to understand not only the technological advances but also the personalities of users. The influence of personality in this case is not well understood, having been the subject of very limited academic research.

Some recent studies related to the acceptance of mobile banking suggest several factors affect its acceptance by applying the technology acceptance model (TAM) [Luarn and Lin, 2004]. TAM-based attitude models focused on reasonable behavior explain the acceptance of information technology (IT) but they do not take into account the enjoyment factor that makes banking easy and interesting by using mobile phones anywhere, anytime. According to Gefen and Straub [2000], in accepting e-commerce, usefulness is important because e-commerce is the user's main purpose, but convenience is also important. The perceived usefulness and ease of use can both appear differently, according to the types of IT involved. In mobile banking, perceived enjoyment as a value of amusement as well as the perceived usefulness and convenience presented in TAM should be considered [Hsu and Lu, 2004]. Innovativeness is an important concept in explaining why some people adopt new IT earlier than others, and these early adopters can become opinion leaders for the spreading of new technologies [Rogers, 2003]. In short, personal innovativeness (PI) has a decisive effect on the general acceptance of IT [Agarwal and Prasad, 1998]. Also, for mobile banking, experimental preferences are very important in explaining the

more widespread acceptance of mobile banking. According to this viewpoint, we expect the acceptance and diffusion of mobile banking to expand through innovation and individual preferences. Studies related to the existing mobile banking options are still very basic, however. Therefore, the purposes of study are presented as follows.

First, an expanded model is presented that reflects perceived enjoyment in the TAM model with the judgment that mobile banking has a factor of enjoyment.

Second, the moderating role of how different models of mobile banking are accepted according to PI is also investigated. Through this, the processes of individuals' acceptance of mobile banking are intended to be more precisely reviewed theoretically and practically.

In this paper, Section 2 provides the study's theoretical background and hypotheses. Section 3 describes our research model, and Section 4 presents our experiments and comparisons of the hypotheses. Sections 5 and 6 conclude with a discussion and suggestions for further research.

## II. Theoretical Background and Hypotheses

### 2.1 Technology Acceptance Model

Since user acceptance of Information Systems

(IS) is necessary to obtain productivity data from their implementation [Jonscher, 1983], commentators have advanced a variety of theoretical perspectives to explain usage determinants. One important line of research has utilized intention models to predict usage based on attitudes and social influences. Models from social psychology, such as the theory of reasoned action (TRA) [Ajzen and Fishbein, 1980] and the theory of planned behavior (TPB) [Ajzen, 1985], focus directly on behavior determinants and intentions. Davis et al. [Davis et al., 1989] turned to the social psychology literature in an attempt to provide a theoretical foundation for individual reactions to IS and/or IT. For example, the TAM [Davis, 1989] is an adaptation of TRA specifically tailored to model user acceptance of a particular IS. Davis's [1989] study of perceived usefulness (USF) and perceived ease of use (EOU) is one of the most widely recognized research efforts on user acceptance of a specific form of IS and/or IT. TAM posits that EOU and USF can be used to predict users' attitudes toward (and eventual acceptance of) IS and/or IT. Several researchers have subsequently validated TAM for IT applications such as e-mail, voice mail, word processing, and spreadsheets [Mathieson, 1991; Adams et al., 1992], while others have recommended further investigation into web users' behaviors [Shaw et al., 1997; Lederer et al., 2000].

TAM is currently the most widely accepted theory of technology acceptance in IS research.

Numerous empirical tests have shown TAM to be a parsimonious and robust model of technology acceptance behaviors that crosses both expertise level and country. (For a summary of this literature, see Venkatesh et al. [2003]; otherwise, see Taylor and Todd [1995], Rose and Straub [1998], and Straub et al. [1997]). Even though considerable TAM research has examined IT acceptance in the context of work-related activity, the theory has also been successfully applied to diverse non-organizational settings [Davis et al., 1989; Mathieson, 1991; Sjanzna, 1994; Agarwal and Karahanna, 2000], including e-commerce [Gefen and Straub, 1997; Goodhue and Thompson, 1995].

Studies applying the mobile environment to TAM have recently appeared. Hong and Tam [2006a] saw that mobile data services showed different acceptance patterns because they were non-working settings. Hong and Tam's purpose was similar to that for this study by asserting that, in the environment of mobile data services, usability as a convenience is more important than usefulness. Another study that pointed out that the TAM-related studies did not distinguish between beginning users and regular users, and similarities here exist with that study [Hong et al., 2006]. In addition, the studies on the need for uniqueness in mobile data services have been carried out [Hong et al., 2006b]. According to TAM, the intention to voluntarily accept (i.e., use) a new IT is determined by two beliefs: (1) the USF of the new IT and (2) its EOU. USF is an individual's

subjective assessment of the utility offered by the new IT within a specific, task-related context. EOU is an indicator of the cognitive effort needed to learn and utilize the new IT. This TAM-based study evaluates the following hypotheses:

- Hypothesis 1. USF has a positive relationship on the intention to use mobile banking.
- Hypothesis 2. EOU has a positive relationship on the intention to use mobile banking.
- Hypothesis 3. EOU has a positive relationship on the USF of mobile banking.

## 2.2 TAM and Perceived Enjoyment

Davis's TAM [Davis, 1989; Davis et al., 1989] posits that user acceptance can be explained by two beliefs: USF and EOU. An important addendum to the model is a third variable called perceived enjoyment [Davis et al., 1989]. This concept is defined as "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" [Davis et al., 1989, p. 1,113]. Perceived enjoyment (ENJ) is defined as the state of enjoyment as a situational characteristic of the interaction between an individual and the situation [Van der Heijden, 2004]. Venkatesh [2000] found that ENJ might have an indirect impact on intention via EOU. Atkinson and Kydd [1997] found that ease of use exerted a significant

effect on the use of the Internet for entertainment (ENJ) purposes. The basic assumption is that ENJ will have a positive effect on attitudes toward using mobile services and behavioral intentions to use mobile services. EOU has also been found to influence IT usage indirectly by influencing levels of perceived enjoyment because ITs that are difficult to use are less likely to be considered enjoyable. Also, Csikszentmihalyi [1975] argued that the feasibility of the activity for an individual encourages flow—playfulness. ITs that are easier to use are less threatening to the individual. Past research has related EOU to the enjoyment of interacting with computer systems, and to the flow experience during computer interaction. Therefore, EOU is expected to have a positive influence on users' perceptions of ENJ in their use of mobile banking. Thus, the fourth hypothesis is:

- Hypothesis 4: EOU has a positive relationship with the ENJ of using the mobile banking.

Triandis [1977; 1979] has argued that feelings or emotions associated with a particular act, such as feelings of joy, elation, pleasure, depression, disgust, displeasure, or hate, have an impact on the person's behavior. Previous research has found that attitudinal outcomes, such as positive effects, pleasure, and satisfaction, result from playful experiences [Sandelands et al., 1983]. Several studies suggest the saliency of ENJ in

explaining IT adoption [Davis et al. 1992; Venkatesh 2000; Van der Heijden 2004]. Davis et al. [1992] theorized ENJ to be an intrinsic motivation that directly influences intention to use IT. Hong and Tam [2006] saw that mobile data services showed different acceptance patterns because they were non-working settings. The studies of Webster and Martocchio [Webster and Martocchio, 1992] and Webster et al. [1990] show that playfulness is highly correlated with the user's positive attitudes. Also, studies comparing the user's microcomputers and mainframes have supported such relationships [Katz, 1987]. Therefore, individuals who perceive that using mobile banking is ENJ will have a positive attitude toward using it. The above argument leads to the following hypothesis:

- Hypothesis 5: ENJ has a positive relationship on the intention to use mobile banking.

### 2.3 Personal Innovativeness and Mobile Banking Acceptance

Personal Innovativeness (PI) means the tendency of some individuals to more quickly accept innovation than others [Rogers, 2003]. This innovativeness is open to new experiences and new stimulus because personal characteristics influence consumers' behaviors, such as the adoption of new products [Midgley and Dowing, 1978]. Innovative individuals (innovators or beginning accepters) are relatively more

important because they purchase new products, take risks, and play the role of opinion leaders in spreading new technologies [Rogers, 2003]. The higher the innovativeness, the more consumers will accept new technologies [Venkatesh and Davis, 2000; Rogers, 2003]. The results of practical studies on the acceptance of information systems report that personal innovativeness affects the acceptance of IT, Internet shopping, web broadcasting, etc. [Venkatesh and Davis, 2000]. Pagani [2004] suggests that individuals' perceived innovativeness has a controlling effect on the accepting attitudes of mobile services, and Agarwal and Prasad's [1998] study showed that personal innovativeness has a controlling effect only on compatibility by verifying whether it had a controlling effect on perceived usefulness, perceived convenience, and compatibility.

It is not conclusive, however, that personal innovativeness has no controlling effect on perceived usefulness or perceived convenience and this aspect needs additional review with many samples or other IT innovations [Agarwal and Prasad, 1998, p. 213]. Agarwal et al. [1998] divided groups into early adopters and late adopters according to the levels of innovation acceptance of IT and compared the differences of perceptions of usefulness and convenience between the groups. In their results, early adopters appeared to have more highly recognized perceived usefulness or convenience than did the late adopters. One interesting result of this study is that for early adopters usefulness and

convenience were equal, whereas for late adopters these were two different factors. This means that the group reluctant to accept innovation apparently recognized the perceived convenience by dividing usefulness and convenience unlike the group that readily accepted innovation. Perceived convenience is therefore deemed relatively important. Especially in the case of mobile banking, consumers who have low innovativeness tend to consider convenience more important than usefulness because the technology is inconvenient to use owing to the small screen and keypad. Considering all of this, it is deduced that perceived usefulness in the group of high innovativeness and the perceived convenience in the group of low innovativeness is a more important influence on the acceptance intention toward mobile banking. Thus, the following additional hypotheses are as follows:

- Hypothesis 6. The higher the level of PI, the greater the positive relationship between customers' USF and their intention to use mobile banking.
- Hypothesis 7. The lower the level of PI, the greater the positive relationship between customers' EOU and their intention to use mobile banking.

Starbuck and Webster [1991] suggested that ENJ contributes to extrinsic motivation. ENJ can also be considered more important along with

usefulness in the group with high innovativeness because mobile banking is less convenient to use compared with Internet banking. ENJ is considered relatively less important in the group with low innovativeness. Thus, an additional hypothesis is as follows:

- Hypothesis 8. The higher the level of PI, the greater the positive relationship between customers' ENJ and their intention to use

mobile banking.

The main focus of this study is on the moderator effect of PI. The relationship between a customer's perceptions and usage behavior may vary depending on the specific condition of a customer's internal/external constraints such as PI [Agareal and Prasad, 1998; Leonard-Barton and Deschamps, 1988; Agarwal and Karahanna, 2000; Rogers, 2003]. The general findings of this

Table 1. Demographic characteristics of samples

Characteristics		Full N=336		High PI subgroup N=218		Low PI subgroup N=118	
		Frequency	%	Frequency	%	Frequency	%
Gender	Male	220	65.5	141	64.7	79	66.9
	Female	116	34.5	77	35.3	39	33.1
Age	Below 30	123	36.6	89	40.8	34	28.8
	31~40	156	46.4	99	45.4	57	48.3
	41~50	47	14.0	26	11.9	21	17.8
	Above 51	10	3.0	4	1.8	6	5.1
Main Mobile Banking Usage Place	House	64	19.0	37	17.0	27	22.9
	Office	97	28.9	61	28.0	36	30.5
	School	10	3.0	6	2.8	4	3.4
	Vehicle	33	9.8	20	9.2	13	11.0
	Anytime, Anywhere	132	39.3	94	43.1	38	32.2
Mobile Banking Usage Frequency	Below 1 time a month	53	15.8	35	16.1	18	15.3
	Above 5 times a month	159	47.3	105	48.2	54	45.8
	2~3 times a week	95	28.3	58	26.6	37	31.4
	Above 5 times a week	14	4.2	9	4.1	5	4.2
	Above 1 time a day	6	1.8	5	2.3	1	0.8
Education	Many times a day	9	2.7	6	2.8	3	2.5
	Below High School	60	17.9	37	17.0	23	19.5
	Undergraduate School	266	79.2	174	79.8	92	77.9
Mobile Telecom Company	Above Graduate School	10	3.0	7	3.2	3	2.5
	SK Telecom	182	54.2	119	54.6	63	53.4
	KTF	117	34.8	75	34.4	42	35.6
	LG Telecom	37	11.0	24	11.0	13	11.0
Total		336	100	218	100	118	100

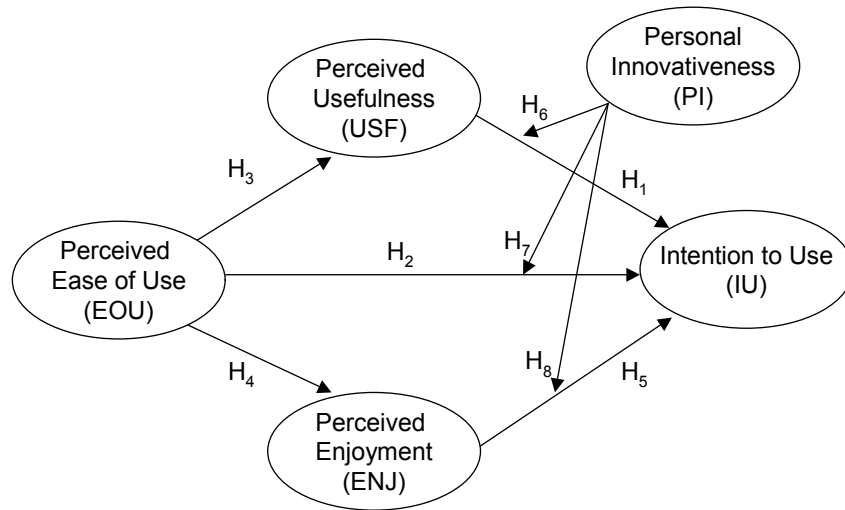


Figure 1. Research Model

study propose that internal/external constraints moderate the impact of a person’s favorable perception on mobile banking adoption. The conceptual model for this study is shown in Figure 1. Given that users’ actual usage can be successfully explained by their intention to use mobile banking, users’ usage behavior was not measured by actual usage, but by intention to use.

### III. Research Method

#### 3.1 Data Collection

Data was collected using a self-administered Korean-version questionnaire. To avoid cross-cultural methodology issues, backward translation (with the material translated from English into Korean and then back into English; versions compared; discrepancies resolved) was

used to ensure consistency between the Korean and original English versions of the survey [Mullen, 1995; Singh, 1995].

Meanwhile, for the survey of this study, Woori Bank of Korea gave a helping hand to make an online survey of the bank’s website. Also, the sample of this study’s targets was set to be customers who use mobile banking among the users of Internet banking service of the local banks. Here, it should be noted that, in Korea, mobile banking comes in various types such as IC chip type, VM (Virtual Machine) type, WAP (Wireless Application Protocol) type and smart phone type (iPhone OS or Android OS etc.). Therefore, in order to analyze mobile banking users and their characteristics, this study survey to be those who at least one type of mobile banking users.

This survey was conducted for 15 days in 2010, by putting a notice of the online questionnaire on



the websites of Woori banks. Motivation was provided for voluntary respondents of the survey to truthfully answer the questions, as a gift worth of \$15 was offered as an incentive. Also, unanswered questions were removed from the system.

Table 1 summarizes the demographic profiles of the respondents. There were no significant differences in gender, ages, and mobile banking usage experiences.

### 3.2 Measurements

All measurement scale items were obtained directly from previous studies (see Appendix A).

A seven-point Likert-type scale was used for all the measurement scale items, with anchors ranging from “strongly disagree” (1) to “strongly agree” (7). The TAM scales of USF, EOU, and intention to use were adapted from Davis [1989]. For USF and EOU, subjects were asked whether they perceived using mobile banking would enhance their banking performance and using mobile banking would be effortless. For intention to use, the respondents were asked to indicate the extent to which they agreed with a statement regarding their future usage intentions. Perceived ease of use was evaluated using four items adapted from the studies of Venkatesh [2000] and Van der Heijden [2004]. The respondents were asked to indicate whether they thought ENJ made a positive contribution to their usage intentions and behaviors. And, PI was measured using the

four-item scale proposed by Agarwal and Prasad [1998]. Respondents were divided into two groups, a high PI subgroup and a low PI subgroup, based on a median (4.00) split of the PI construct. The high PI subgroup (total 218) had a mean of 4.757 and standard deviation of 0.844, while the low PI subgroup (total 71) had a mean of 2.862 and standard deviation of 0.799. Since prior research suggested that experience [Taylor and Todd, 1995] and gender [Gefen and Straub, 2000] influenced individuals’ perceptions and use of IT, it was necessary to test the influence of experience and gender. Multivariate regression analysis indicated that gender and experience had no significant covariate effects on the use of mobile banking.

## IV. Data Analysis and Results

Partial least squares analysis (PLS) was used for data analysis. PLS employs a component-based approach for estimation purposes [Lohmoller, 1989] and can readily handle formative factors [Chin et al., 2003]. PLS also places minimal restrictions on the sample size and residual distributions [Chin et al., 2003]. In general, PLS is better suited for explaining complex relationships as it avoids the problems of inadmissible solutions and factor indeterminacy [Fornell and Bookstein, 1982]. PLS was therefore chosen to accommodate the presence of a large number of variables, formative factors, and

moderating effects.

#### 4.1 Measurement Model

The measurement model was assessed separately for the full sample and each subgroup. All constructs in the model satisfied the requirements for reliability (composite reliability greater than .70) and discriminant validity (average variance extracted greater than .50) (Table 2). The discriminant and convergent validity of each indicator was also examined [Chin, 1998]. To be discriminant and convergent, each indicator should load higher on the construct of interest than on any other latent variable. To be useful for subgroup analysis, items should load and cross-load consistently across samples [Reynolds and Paget, 1982; Carte and Russell,

2003]. The results presented in Tables 2 and 3 demonstrate adequate discriminant and convergent validity.

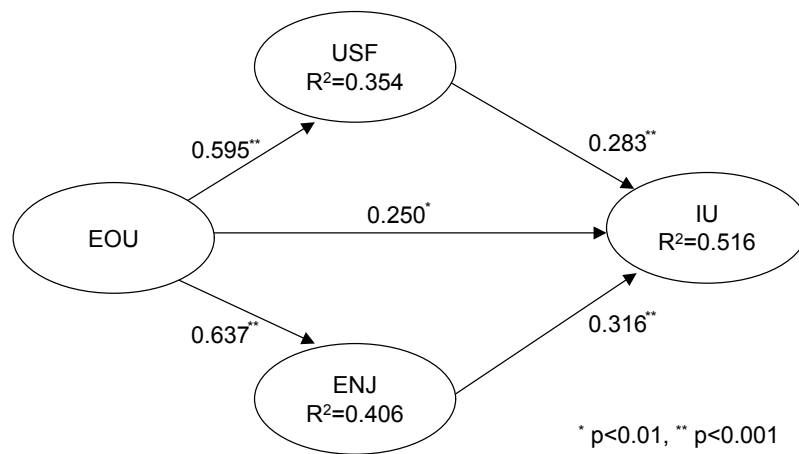
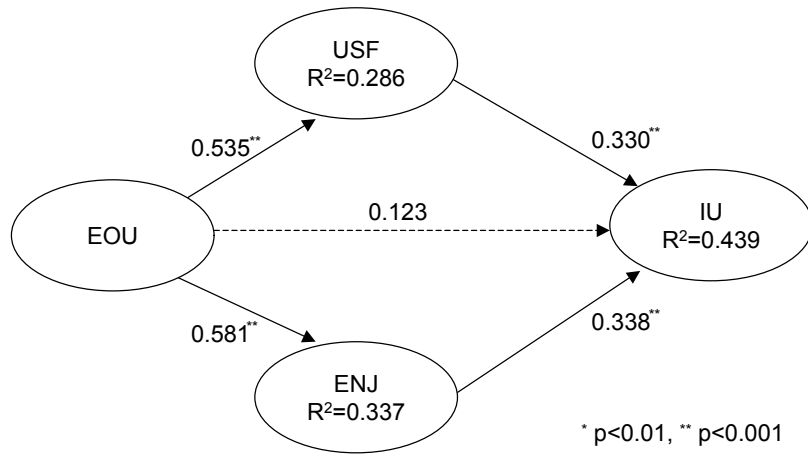
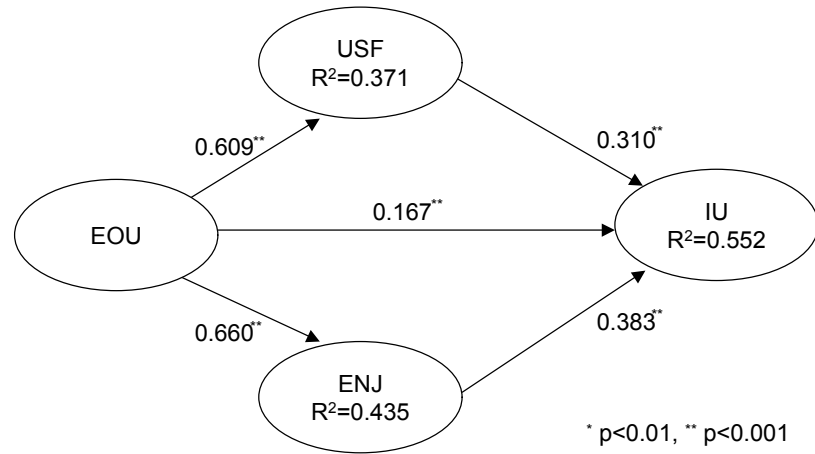
#### 4.2 Results

Prior to estimating the structural models, a series of structural models for the full sample and each subgroup were estimated. Some researchers have suggested that the moderated multiple regression or other techniques such as LISREL or PLS have greater capacity to detect moderation effects than the subgroup analysis strategy [Cohen and Cohen, 1983; Stone-Romero and Anderson, 1994]. However, in order to analyze the nomological network of relationships between IT-related constructs and to test the moderating effect of PI, the analysis in this study

Table 2. Reliabilities and Discriminant Validity

Model and Construct	<i>M</i>	<i>SD</i>	Cronbach's $\alpha$	Composite Reliability	Correlation of constructs				
					USF	EOU	ENJ	IU	
Full	USF	4.367	1.313	0.945	0.960	<b>0.926</b>			
	EOU	4.191	1.077	0.831	0.891	0.606	<b>0.821</b>		
	ENJ	4.071	1.002	0.848	0.896	0.553	0.653	<b>0.828</b>	
	IU	4.074	1.327	0.955	0.971	0.627	0.605	0.660	<b>0.958</b>
High PI	USF	4.685	1.179	0.943	0.959	<b>0.924</b>			
	EOU	4.470	1.000	0.808	0.880	0.535	<b>0.807</b>		
	ENJ	4.436	0.829	0.785	0.858	0.453	0.563	<b>0.780</b>	
	IU	4.494	1.207	0.942	0.963	0.561	0.492	0.547	<b>0.947</b>
Low PI	USF	3.780	1.350	0.931	0.951	<b>0.911</b>			
	EOU	3.674	1.024	0.806	0.877	0.588	<b>0.802</b>		
	ENJ	3.398	0.948	0.819	0.881	0.506	0.630	<b>0.807</b>	
	IU	3.299	1.186	0.950	0.968	0.586	0.618	0.612	<b>0.953</b>

Note: Diagonal elements in the “correlation of constructs” matrix are the square root of average variance extracted (AVE). The leftmost column is the composite reliability for each construct. For adequate discriminant validity, the diagonal elements should be greater than the corresponding off-diagonal elements.



was closely based on the analysis of Venkatesh and Morris [2000] as well as Keil et al. [2000]. Three separate models in PLS were estimated: the full sample, the high PI subgroup, and the low PI subgroup. Differences across all three models were then tested using the test for differences suggested by Chin [2004] and implemented by Keil et al. [2000]. To evaluate the predictive power of the structural models [58, Venkatesh and Morris, 2000], R2's were calculated for intention to use mobile banking. Interpreted like multiple regression results, the R2 indicates the amount of variance explained by the exogenous variables [1995]. Using a bootstrapping technique, path estimates and t-statistics were calculated for hypothesized relationships. The aim of this study was to investigate the

relationships between user intention to use mobile banking technology and the following constructs: USF, EOU, and ENJ. Hypotheses were formulated for the high PI subgroup and the low PI subgroup on the basis of prior research findings and theories. The hypothesized relationships were tested using PLS analyses to maintain consistency with earlier TAM studies. Figures 2, 3, and 4 present the results of the PLS analyses and hypothesis testing for the high PI subgroup and the low PI subgroup, respectively.

In H1, H2, and H5, the influence of USF, EOU, and ENJ on user intention to use mobile banking were investigated, irrespective of PI. Figure 2 indicates that user intention to use mobile banking was significantly influenced by USF (path coefficients = 0.310,  $t = 5.215$ ,  $p < 0.001$ ), EOU

Table 3. Items Loadings and Cross-Loadings

Items	High PI Subgroup				Low PI Subgroup			
	USF	EOU	ENJ	IU	USF	EOU	ENJ	IU
USF1	<b>0.827</b>	0.314	0.110	0.053	<b>0.811</b>	0.163	0.141	0.150
USF2	<b>0.891</b>	0.201	0.212	0.162	<b>0.865</b>	0.208	0.242	0.124
USF3	<b>0.880</b>	0.226	0.209	0.161	<b>0.861</b>	0.207	0.243	0.180
USF4	<b>0.829</b>	0.229	0.259	0.144	<b>0.805</b>	0.321	0.295	0.083
EOU1	0.289	<b>0.753</b>	0.130	0.283	0.315	<b>0.610</b>	0.137	0.368
EOU2	0.206	<b>0.657</b>	-0.058	0.297	0.116	<b>0.683</b>	0.234	0.061
EOU3	0.176	<b>0.847</b>	0.183	0.165	0.248	<b>0.778</b>	0.278	0.172
EOU4	0.165	<b>0.822</b>	0.286	0.048	0.286	<b>0.704</b>	0.179	0.263
ENJ1	0.246	0.325	<b>0.629</b>	0.356	0.182	0.337	<b>0.676</b>	0.368
ENJ2	0.186	0.305	<b>0.647</b>	0.332	0.057	0.341	<b>0.748</b>	0.321
ENJ3	0.194	0.183	<b>0.706</b>	0.162	0.355	0.143	<b>0.745</b>	-0.035
ENJ4	-0.055	0.118	<b>0.837</b>	-0.016	0.039	0.076	<b>0.799</b>	0.262
IU1	0.315	0.117	0.198	<b>0.854</b>	0.345	0.203	0.239	<b>0.824</b>
IU2	0.248	0.231	0.163	<b>0.858</b>	0.197	0.189	0.311	<b>0.848</b>
IU3	0.247	0.163	0.201	<b>0.857</b>	0.324	0.186	0.222	<b>0.846</b>

\* Entries in bold denote the factor on which the item was intended to load. All loadings in bold are significant at the 0.05 level (two-tailed test).

(path coefficients = 0.167, t = 2.826, p < 0.01), and ENJ (path coefficients = 0.383, t = 6.190, p < 0.001). Therefore, the results support H1, H2, and H5. This result is consistent with the original TAM [Davis, 1989; Davis et al., 1989] and the extended TAM [Davis et al., 1992].

In H3 and H4, the influence of EOU on USF and ENJ to use mobile banking was investigated, not taking into account PI. Figure 2 indicates that USF (path coefficients = 0.609, t = 11.008, p < 0.001) and ENJ (path coefficients = 0.660, t = 15.656, p < 0.001) were significantly influenced by EOU. Therefore, the results support H3 and H4.

In order to examine the effect of PI (H6, H7, H8), PLS analysis was conducted for each of the subgroups (Figures 3 and 4, Table 4). When examining the subgroups, researchers suggested comparing the model's explained variance (R2) and the associated regression results [Clearly, 1968; Linn, 1982]. A comparison of the results suggested that differences existed across the subgroups. The model of the high PI subgroup predicted 7.7% more of the variation of intention to use, 6.8% more of the variation of USF, and 6.9% more of the variation of ENJ than the low PI

subgroup model. In terms of the structural model, a simple comparison of standardized path coefficients suggested that USF, EOU, ENJ, and IU had different influences on each subgroup's use of mobile banking. T-statistics were calculated to compare the results across the subgroups more rigorously to evaluate the differences in path coefficients across models. The data satisfied the assumptions for comparing gammas suggested by Carte and Russell [2003], and so the following procedures described by Chin [1998] were used:

$$t_{ij} = \frac{p_1 - p_2}{\sqrt{\frac{(n_1 - 1) \times SE_1^2 + (n_2 - 1) \times SE_2^2}{n_1 + n_2 - 2} \times \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}}$$

where, pi: path coefficient in structural model of PI

nj: sample size of dataset for PI

SEi: standard error of path in structural model for PI

tij: t-statistic with n1 + n2 - 2 degrees of freedom

The results (see Table 4) indicated that the path coefficients from each path between USF (t=5.070, p<0.001), EOU (t=-13.815, p<0.001),

Table 4. Results of Hypothesis Testing

Hypotheses	Path	Coefficient	t-value	Results
H <sub>1</sub>	USF → IU	0.310	5.215	Accept
H <sub>2</sub>	EOU → IU	0.167	2.826	Accept
H <sub>3</sub>	EOU → USF	0.609	11.008	Accept
H <sub>4</sub>	EOU → ENJ	0.660	15.656	Accept
H <sub>5</sub>	ENJ → IU	0.383	6.190	Accept

Table 5. Statistical Comparison of Paths Coefficient

Hypotheses	Path	Category	High PI Subgroup	Low PI Subgroup	Results
H <sub>6</sub>	USF → IU	Standard Path Coefficient	0.330	0.283	Accept
		Standard Error	0.081	0.081	
		Sample Size.	218	118	
		Statistical Comparison (t-value)	5.070		
H <sub>7</sub>	EOU → IU	Standard Path Coefficient	0.123	0.250	Accept
		Standard Error	0.072	0.094	
		Sample Size.	218	118	
		Statistical Comparison (t-value)	-13.815		
H <sub>8</sub>	ENJ → IU	Standard Path Coefficient	0.338	0.316	Accept
		Standard Error	0.080	0.093	
		Sample Size.	218	118	
		Statistical Comparison (t-value)	2.267		

ENJ (t=2.267, p<0.05), and IU for the high PI subgroup and the low PI subgroup were significantly different from the corresponding coefficient in the structural model for the full model. In case of high PI subgroup, USF (high PI: 0.330 > Low PI: 0.283) and ENJ (High PI: 0.338 > Low PI: 0.316) more significantly affect the intention to use mobile banking than for the low PI subgroup. Therefore, the results supported H6, H8. Also, in the case of EOU, the low PI subgroup is more significantly affected in its intention to use mobile banking compare with the high PI subgroup (High PI: 0.123 < Low PI: 0.250).

Therefore, the result supported H7.

## V. Discussion

With the rapid diffusion of mobile technology, mobile banking services can now be provided. However, mobile banking in Korea with advanced mobile technology has not yet significantly developed, in comparison to the rapid diffusion of Internet banking.

This study empirically attempted to analyze which factors are important for developing the

mobile banking services. To facilitate the effectiveness of the study, USF and EOU were derived from a TAM model, and ENJ was added by considering the mobile environment. Furthermore, respondents were divided into two groups according to their personal innovative traits relating to mobile technology in order to identify the impact of PI on their acceptance intention to use mobile banking services.

Consistent with previous studies [Davis, 1989; Venkatesh, 2000; Venkatesh and Davis, 2000], the results showed in PLS analyses that USF and EOU were significantly associated with intention to use. This indicated that both USF and EOU were important determinants for a mobile banking customers' intention to use. In terms of the relative importance of these two determinants on customers' intention to use the services, USF was a stronger predictor than perceived EOU. This implies that when a given system provides desired utilities, customers are more likely to overcome difficulties encountered when using the system [Hu et al., 1999].

The most significant variable was ENJ, rather than USF or EOU, in the full model and each subgroup. In particular, it was discovered that the influence of USF and ENJ on mobile banking acceptance intention was much higher in the high PI subgroup compared with the low PI subgroup (see Table 4. Statistical comparison of path of USF = 5.070,  $p < 0.001$ , Statistical comparison of path of ENJ = 2.267,  $p < 0.05$ ). But the influence of EOU on mobile banking acceptance intention was

much higher in the low PI subgroup compared with the high PI subgroup (see Table 4. Statistical comparison of path = -13.815,  $p < 0.001$ ).

According to the prior research results, PI captures an individual's willingness to try new information technology [Agarwal and Prasad, 1998]. Individuals with high PI are likely to be impulsive by nature and may not think through the reasons and implications for their actions. In other words, they may "dive in" and try the technology due to their curious and risk-taking nature, and not necessarily base their decision on the concrete advantages for doing so.

This is possible due to the fact that despite some inconvenience, people in the high PI subgroup place high value on the usefulness of the system (results of this study indicate a higher degree of influence in terms of usefulness for the high PI subgroup than for the low PI subgroup) and the notion of ENJ compared with those in the low PI subgroup. On the other hand, members of low PI subgroup are discreet in accepting a new system. They are reluctant to adopt a new system that they feel is not sufficiently convenient or useful. From the perspective of the timing of a new information system, the high PI subgroup and the low PI subgroup can be regarded as the early and late adopters of mobile banking, respectively.

Reviewing the theoretical and practical suggestions of this study based on the above analytical results leads to the following conclusions.

First, this study applied the TAM model

reflecting enjoyment of mobile banking and got results similar to those of Van der Heijden [2004]. In that study, convenience had the biggest influence, followed by amusement and usefulness. In the current study, however, amusement was the biggest factor, followed convenience and usefulness. This shows that all three concepts must be included in explaining the acceptance of mobile banking.

Second, for the institutions that develop their mobile banking systems, the systems will be marketed when their usefulness is clear even with some inconvenience. After the market widens, the provision of additional convenient functions will be a desirable strategy.

Third, in Korea, various modes of mobile banking are appearing. When new mobile banking models are released, they need to target consumers by segmenting the market by innovations as well as system features.

If innovative consumers are targeted, marketing should stress usefulness and amusement of the mobile banking features. If less innovative consumers are the target, then emphasizing convenience rather than usefulness will be effective.

## VI. Conclusion

IT has become an integral part of a knowledge-information society. Literature concerning banking service organizations has

stressed the potential of technology for the improved delivery of customer services. At the same time, customers are likely to experience more stress when confronted with the adoption of new technologies, such as mobile banking technology. They often have negative attitudes toward new technology with consequent banking dissatisfaction. Given these contradictory scenarios, technology innovation literature has provided a useful insight into resolving such inconsistencies. This study highlighted factors that facilitate positive attitudes among customers toward technology and proposed ways to turn potential technology into real mobile banking environments. The results suggest that not only are technological characteristics such as USF and EOU widely confirmed in previous research, but they also play a key role in adoption along with ENJ.

We found that the high PI subgroup had a significant positive relationship between USF, ENJ and their intention to use mobile banking. But, the low PI subgroup had a significant relationship between EOU and their intention to use mobile banking. These findings implied that these two subgroups could be characterized as early or late adopters for the marketing target group of mobile banking operations. We believe that these findings provide an important management implication for mobile banking service design.

While the findings from this study provide some meaningful managerial implications, their



generalization should be taken with caution. This study has a number of limitations and, therefore, future studies are needed. First, the use of self-reporting scales to measure the proposed variables suggests the possibility of a common method bias for some of the results. In order to pursue further investigations, it would be appropriate to develop a more direct and objective measure for the USF, EOU, and ENJ variables and customer satisfaction. Second, the three variables such as USF, EOU, and ENJ may be influenced by externally controllable factors such

as individual lifestyles and mobile environments. Thus, a deeper understanding of three variables may require the inclusion of personal lifestyle and mobile environment factors. Third, in essence, our research model is a generic IS or IT services usage intention one merely validated in the acceptance on mobile banking. This reveals a fundamental weakness of this research. Therefore, the current research model should be more specialized by incorporating another constructs related to explaining the mobility of mobile banking.

Appendix A. Survey Instrument

<b>Perceived Usefulness</b>	<b>Davis, 1989</b>
USF1	Using mobile banking improves my performance in my finances.
USF2	Using mobile banking increases my productivity in my finances.
USF3	Using mobile banking enhances my effectiveness in my finances.
USF4	I find mobile banking to be useful in my finances.
<b>Perceived Ease of Use</b>	<b>Venkatesh and Davis, 2000; Van der Heijden, 2004</b>
EOU1	The interaction with mobile banking is clear and understandable.
EOU 2	Interaction with mobile banking does not require a lot of mental effort.
EOU 3	I find mobile banking easy to use.
EOU 4	I find it easy to get mobile banking to do what I want it to do.
<b>ENJ</b>	<b>Venkatesh, 2000; Van der Heijden, 2004</b>
ENJ1	I find using mobile banking to be enjoyable.
ENJ2	The actual process of using mobile banking is exciting.
ENJ3	The actual process of using mobile banking is pleasant.
ENJ4	I have an interest in using mobile banking.
<b>Personal Innovativeness</b>	<b>Agarwal and Prasad, 1998</b>
PI1	If I heard about a new information technology, I would look for ways to experiment with it.
PI2	Among my peers, I am usually the first to try out new information technologies.
PI3	In general, I am hesitant to try out new information technologies.
PI4	I like to experiment with new information technologies.
<b>Intention to Use</b>	<b>Davis, 1989</b>
IU1	I intend to reuse mobile banking shortly.
IU2	Assuming I have access to mobile banking, I intend to use it.
IU3	Given that I have access to mobile banking, I predict that I would use it.

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현재 대구대학교 경영학과 교수로 재직 중이다. 성균관대학교 경영학부를 졸업하고 성균관대학교에서 경영정보시스템 전공으로 석사 및 박사를 취득하였다. *Journal of MIS*, *Information and Management*, *Decision Support Systems*, *Journal of Computer Information Systems*, *Behavior and Information Technology*, *Cyber Psychology and Behavior*, *Electronic Commerce and Research Application*, *Expert Systems with Applications* 등에 논문을 게재하였으며, 국내에도 50 여편의 연구가 있다. 주요 관심분야는 SNS에서 재미, 인터넷 및 모바일에서 소비자행동, 온라인 커뮤니티에서의 집단지성 등이다.

<Abstract>

## 모바일뱅킹에서 개인혁신성의 조절효과

권순재

모바일뱅킹은 빠르게 성장하고 있으며 은행서비스의 많은 부분이 모바일 뱅킹에서 제공되고 있다. 하지만, 모바일뱅킹을 사용자들이 수용하는데 개인의 혁신성이 어떠한 영향을 미치는지에 대한 연구는 많이 이루어지지 않고 있다. 불행히도 모바일뱅킹은 그 특성상 제한된 화면을 사용자들이 사용하기가 용이하지 않다. 본 연구는 개인혁신성(PI)의 관점에서 모바일뱅킹을 수용하는데 영향을 미치는 요인을 밝히고자 하였다. 특히 다른 정보시스템에서 많이 사용된 지각된 유용성(USF) 및 사용의 용이성(EOU) 변수뿐만 아니라 지각된 즐거움(ENJ)의 요인을 추가하여 모바일 뱅킹 수용에서 영향요인을 분석하고자 하였다.

또한, 본 연구에서는 336명의 모바일 뱅킹의 사용자들에게 설문을 실시하였으며, 응답자들을 두그룹(개인혁신성이 높은 그룹과 낮은 그룹)으로 분류하여 구조방정식 모형에서 집단간 차이를 분석하였다.

본 연구결과 개인혁신성(PI) 모바일뱅킹수용에 영향을 미치는 것으로 분석되었다. 세부적으로 분석해보면 개인혁신성이 높은 그룹이 낮은 그룹보다 더 많은 영향을 받는 것으로 분석되었다. 특히, 사용의도와 사용의 유용성 그리고 지각된 즐거움 사이의 경로계수 값의 크기가 개인혁신성이 높은 그룹이 낮은 그룹보다 높았다. 여기서 지각된 즐거움의 경우 개인혁신성이 높은 그룹이 낮은 그룹보다 더 많은 영향을 받는 것으로 분석되었다. 이러한 연구의 결과는 모바일뱅킹서비스의 성장과 확대에 실무적으로 사용할 수 있을 것으로 분석된다.

**Keywords:** 모바일뱅킹(Mobile banking), 기술수용모형(Technology Acceptance Model), 개인혁신성(Personal innovativeness), 지각된 즐거움(Perceived enjoyment)

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