

# **The Determinant of Internet Banking Usage Behavior in Korea: A Comparison of Two Theoretical Models**

Seok-Jae, Ok  
Pusan National University, Korea  
[oksj@pnu.edu](mailto:oksj@pnu.edu)

Ji-Hyun, Shon  
Pusan National University, Korea  
[Cleen1209@hotmail.com](mailto:Cleen1209@hotmail.com)

## **Abstract**

*Internet banking is an information intensive business and becomes a major trend in the financial marketplace. It is important to understand what factors will impact the actual use of internet banking. Therefore, this paper is aimed at analyzing the determinants of internet banking usage behavior in Korea. This study compares two models that predict an individual's intention: Theory of Reasoned Action(TRA) and Theory of Planned Behavior(TPB). The results show that internet banking users' attitude and their perceived behavioral control play a vital role in influencing the behavioral intention of internet banking. However, intention is not formed by users' subjective norm in both TRA and TPB. In addition, attitude, subjective norm, and perceived behavioral control is, in turn, influenced by attitudinal belief structures, normative belief structures, control belief structures, respectively. Both TRA and TPB predict behavioral intention to use the internet banking quite well, with TPB having a slight empirical advantage.*

## **1. Introduction**

Internet banking becomes a major trend in the financial marketplace and the number of users of the internet banking has been increasing significantly. Internet banking is a new type of information system that uses the innovative resources of the Internet and WWW to enable customers to effect financial activities in virtual space [29]. One of the first examples of the growing importance of information systems in the banks was the establishment in October 1995 of fully-fledged virtual banking by the Security First Network Bank in the USA [15]. This venture has subsequently attracted considerable attention in financial and information technology communities [29].

In case of Korea, commercial banks have been quick to realize the importance of internet banking to competitive advantage. Internet banking users in Korea have risen dramatically since 1999 after its introduction. With the introduction of internet banking, customers can now perform transactions by themselves. Recent research conducted by The Bank of Korea (<http://www.bok.or.kr>) in 2006 found that the number of current internet banking users in Korea reached 22,570 thousand; the population of Korea in 2006 is 48,497 thousand. Nowadays, internet banking is very successful in Korea and is a necessity service for many banks in Korea.

Internet banking is extremely beneficial to customers because of the savings in costs, time and space it offers, its quick response to complaints, and its delivery of improved services, all of which benefits make for easier banking [38]. Bank customers, now, perform their banking transactions at the place and time of

their choice because of internet banking. Although internet banking may help banks to reduce costs, time and space, there are important considerations such as the factors that influence intention to use internet banking and that affect adoption to use new forms of internet banking. Research on the determinants of internet banking usage may, therefore, enhance the understanding of a customer's intention to use internet banking, and show how this intention affect internet banking usage behavior.

In recent years, understanding why people accept or reject computer systems such as internet banking has proven to be one of the most challenging issues in information system research [31]. Several theories and models have been proposed for the purpose of explaining and predicting internet banking usage behavior. Liao, Shao, Wang and Chen [20] used the TPB and innovation diffusion to study intention toward adopting internet banking in an international financial city. They postulated that the Theory of Planned Behavior(TPB) only partly explained relationships, in that behavioral intention is a function of attitude and subjective norm. Cho and Hwang [9] used the TPB to study intention toward adopting internet banking in a Korea financial market. They suggest that behavioral intention to use internet banking is formed by attitude, subjective norm, and perceived behavioral control. Suh and Han [30] conducted an investigation based on the Technology Acceptance Model(TAM) to analyze customer acceptance of internet banking. They claimed TAM as an appropriate model for explaining acceptance in the context of internet banking. Lai and Li [18] applied different levels of invariance analysis on the TAM construct in the context of internet banking acceptance. They concluded that the TAM construct was invariant for their internet banking users across different gender, age, and information technology competence subgroups.

Although studies of individuals adopting internet banking are not uncommon, most of them have dealt with foreign financial markets. User behavior in Korea may differ from overseas, but only a few studies have been undertaken. Therefore, understanding of Internet Banking usage behavior can help banks to formulate appropriate marketing strategies for internet banking in Korea. These considerations are also very vital to the practitioners who plan and promote internet banking in the current competitive market.

This paper is a comprehensive research in terms of using theoretical models to understand internet banking usage behavior in Korea. The purpose of this research is to test the ability of theoretical models to predict and explain user acceptance of internet banking. In addition, this study compares two models that predict an individual's intention to use internet banking. The first is the TRA, specifically designed by Fishbein and Ajzen [14] to predict use of an information system. The second is the TPB, discussed by Ajzen [2, 4]. TPB was designed to predict behavior across many settings, and can be applied to internet banking use. The research was conducted in Korea, because its geography and well-developed infrastructure meant that internet costs would be cheap, thereby allowing people to use internet without effort.

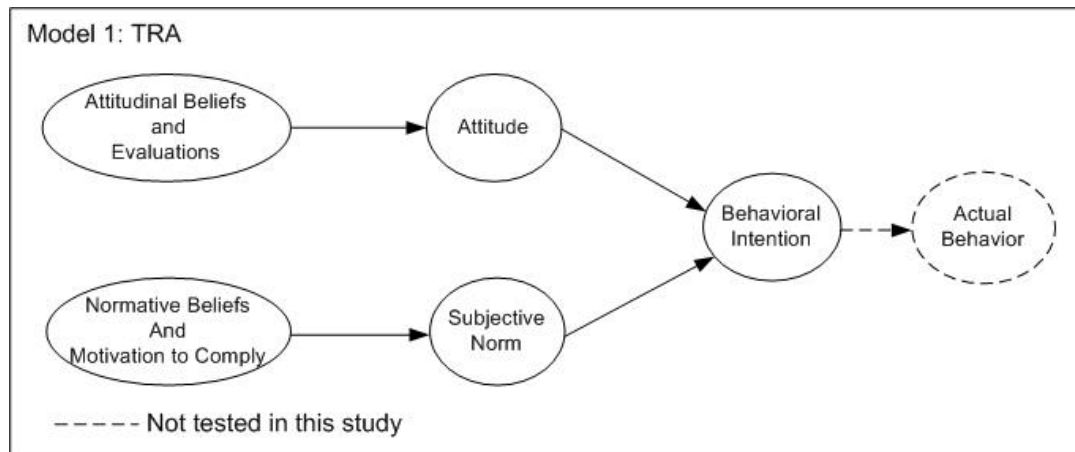
This paper proceeds as follows. It first reviews relevant literature including TRA and TPB. It then describes how this study was conducted. Third, the TRA and the TPB are compared using data from a survey of 202 individuals in Korea considering a decision to adopt and use internet banking. Finally, it concludes with discussion and conclusion.

## **2. Model Explanation**

### **2.1. Theory of Reasoned Action(TRA)**

TRA is a widely studied model from social psychology which is concerned with the determinants of consciously intended behaviors [7, 14, 28]. When employed to explain use of adoption behavior, the TRA embraces four general concepts: actual behavior, behavioral intention(BI), attitude(A), subjective norm(SN). According to the TRA, the primary determinant of behavior is not the person's attitude towards the behavior, but his or her intention to perform the behavior [24]. A person's performance of a specified behavior is determined by his or her behavioral intention to perform behavior, and behavioral intention is

jointly determined by the person's attitude and subjective norm concerning the behavior in question shown in Figure 1 [14]. Attitude and subjective norm are unpinned by sets of beliefs [7]. Behavioral intention is a measure of the strength of one's intention to perform a specified behavior [14]. Intentions are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior. As a general rule, the stronger the intention to engage in a behavior, the more likely should be its performance [5]. Attitude is defined as an individual's positive or negative feelings about performing the target behavior [14]. The affective component of attitudes has a like/dislike connotation [34]. Attitude is determined by his or her salient beliefs( $b_i$ ) about consequences of performing the behavior multiplied by the evaluation( $e_i$ ) of those consequences:  $A = \sum b_i e_i$ . Subjective norm refers to the person's perception that most people who are important to him think he should or should not perform the behavior in question. Thompson, Higgins and Howell [34] argued that subjective norm is a social factors. Triandis [36] defines social factors as a general construct that reflects individual norms, roles, and values, which are in turn influenced by subjective culture variables including referent group. Subjective norm represents an individual's normative beliefs ( $nb_j$ ) concerning a particular referent individuals or groups multiplied by the motivation to comply ( $mc_j$ ) with that referent [14]:  $SN = \sum nb_j mc_j$ .



**Figure 1. The pure form of the Theory of Reasoned Action**  
(Reproduced from [12], p.984)

TRA has been widely used in applied research settings spanning a variety of subject areas, while at the same time stimulating a great deal of theoretical research aimed at understanding the theory's limitations, testing key assumptions and analyzing various refinements and extensions [9, 10]. In the TRA, the belief structures are combined into unidimensional constructs (i.e.,  $\sum b_i e_i$ ,  $\sum nb_j mc_j$ ) [32, 33].

For our empirical case of Internet banking, attitudinal belief( $b_i$ ) refers to an individual's confidence that Internet banking represents faster, easier and more convenient banking service. The associated evaluation( $e_i$ ) would be the importance of improving banking service. For example, an individual may believe that using internet banking will result in better banking service, and may consider this a highly desirable outcome. The normative belief( $nb_j$ ) refers to an individual's perception of the use Internet banking by families, friends or colleagues. This perception plays the significant role in influencing the referent group's opinion. The relevant motivation to comply( $mc_j$ ) is the importance he or she attaches to the opinions of families, friends or colleagues. For instance, an individual may believe that his or her peers think that one should use internet banking and that complying with the wishes of peers is relatively

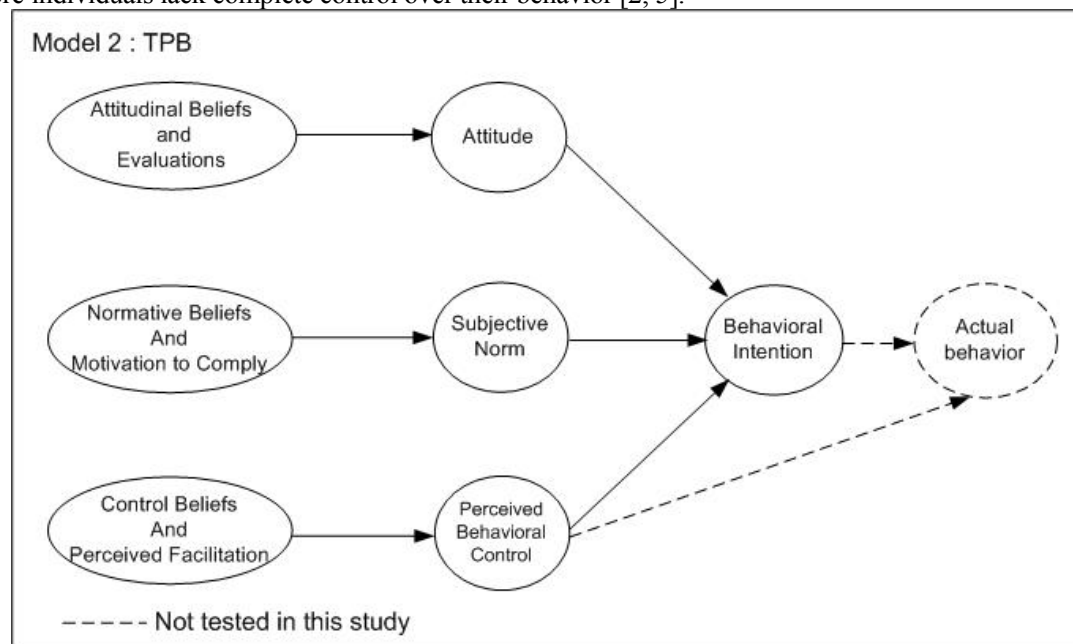
important. In addition, attitudinal belief structure( $\sum b_i e_i$ ) and normative belief structure( $\sum nb_j mc_j$ ) are monolithic belief sets. Although it is difficult to estimate eventual system use, an individual's intention to use the system can be measured [28]. There is considerable evidence that intention to perform a behavior predicts actual behavior. Sheppard, Hartwick and Warshaw [28] stated that there would be a significant and substantial relationship between individuals' intentions and behavior. Therefore, actual behavior is not tested in this study.

## 2.2. Theory of Planned Behavior(TPB)

The TRA is only intended to be applied to the prediction of volitional behavior [24]. However, the performance of many behaviors is not under complete volitional control. As Ajzen [3] argues, every behavioral choice is subject to some degree of uncertainty. Thus, in order to extend the TRA to the prediction of non-volitional behavior, Ajzen [3, 5] put forward the Theory of Planned Behavior(TPB).

Therefore, The TPB [2, 5], shown in Figure 2, extends from the TRA [14] by incorporating an additional construct, namely perceived behavior control(PBC). According to Ajzen [3], perceived behavior control should predict behavioral intention and, when people are correct in perceiving that they have control over the behavior, actual performance of the behavior. Some conception of perceived behavior control includes in the form of "facilitating factors" [37], "the context of opportunity" [27], "resources" [21], or "action control" [17].

To be specific, both the TRA and TPB assert that actual behavior is a direct function of behavioral intention. The TPB, like the TRA, assumes that behavioral intention is a function of attitude and subjective norm. Perceived behavioral control, however, is added to the TPB to account for conditions where individuals lack complete control over their behavior [2, 5].



**Figure 2. The pure form of the Theory of Planned Behavior**  
(Reproduced from [23], p.175)

As a general rule, the more favorable the attitude and subjective norm with respect to a behavior, and the greater the perceived behavioral control, the stronger should be an individual's intention to perform the behavior under consideration [5].

PBC reflects beliefs regarding access to the resources and opportunities needed to perform a behavior [2, 5, 6]. PBC depends on control beliefs( $cb_k$ ) weighted by perceived facilitation( $pf_k$ ):  $PBC = \sum cb_k pf_k$ . A control belief is a perception of the availability of skills, resources, and opportunities. Perceived facilitation is the individual's assessment of the importance of those resources to the achievement of outcomes. The more resources and opportunities individuals believe they possess, and the fewer obstacles or impediments they anticipate, the greater should be their perceived control over the behavior. For example, if a person did not have easy access to a personal computer, use would be much more difficult. In the TPB, the control belief structure is combined into unidimensional constructs (i.e.,  $\sum cb_k pf_k$ ) [32, 33].

For our empirical case of Internet banking, the control belief( $cb_k$ ) refers to knowing how to perform transactions via internet banking. An individual who is skillful in using a computer and the internet is more inclined to adopt internet banking. Perceived facilitation ( $pf_k$ ) refers to externally based resource constraints such as time, technological infrastructures and resources. In fact, banking services will be more feasible when resources become easily and readily available. For example, an individual may feel that he or she has the skill to use internet banking and that skill level is important in determining internet banking usage. In addition, control belief structure( $\sum cb_k pf_k$ ) is a monolithic belief set. Also, actual behavior is not tested in this study.

### 3. Research Methodology

#### 3.1. Subjects

To determine user intention to adopt internet banking, a survey was conducted during the first half of 2005. Questionnaires were distributed to 300 personal banking customers who use internet banking in Korea. Participation in the study was voluntary and was limited to customers with at least one bank account. A total 202 usable, complete responses were obtained; 55 respondents were female. These respondents ranged in age from 15 to over 55, but most(77.7%) were between 20 and 40. Most respondents(93.1%) had higher vocational training or university education. In addition, over half of the participants(62.4%) reported that they worked for a company; 17.8% were students. Detailed descriptive statistics relating to the respondents' characteristics are shown in Table 1.

**Table 1. Descriptive statistics of respondents' characteristics**

Measure	Value	Frequency	Percentage
Gender	Male	147	72.77
	Female	55	27.23

Age	<20	3	1.49
	20-29	89	44.06
	30-39	68	33.66
	40-49	36	17.82
	>50	6	2.97
Education	Some high school or less	14	6.93
	Some university or Bachelor's degree	97	48.02
	Some graduate or more	91	45.05
Occupation	Student	36	17.82
	Company employee	114	56.44
	Public official	7	3.47
	Specialist	20	9.90
	Self-employed	12	5.94
	Other	13	6.43

### 3.2. Measurement

A questionnaire using a 7-point scale was employed to collect the data for the constructs of the research model. Items from previous studies were modified for adaptation to the Internet banking context. The measurement items were common to TRA and TPB [2, 5, 7, 14]. The measures of behavioral intention, attitude, subjective norm, and perceived behavioral control were adapted from various studies related to the TRA and TPB, Mathieson [23], Taylor and Todd [32, 33] and Yoh [42], in particular. The items used for belief structures were redesigned from Mathieson [23], Taylor and Todd [32, 33], Cho and Hwang [11] and Shin and Fang [29], in particular. A summary of the Questionnaire items and Likert scores are shown in Table2.

According to the measurement, respondents reported high level of PBC1(mean equals 6.07 on a scale from 1 to 7) and PBC2(mean equals 6.00 on a scale from 1 to 7). Respondents, however, stated low level of normative belief structures(mean equals from 4.28 to 4.74 on a scale from 1 to 7).

## 4. Results

The two research models was analyzed using the structural equation modeling(SEM) technique, supported by SPSS10.0 software(SPSS for windows; SPSS Inc.) and AMOS4.0 software(Arbuckler, J. and Wothke, W., AMOS 4.0 User's Guide; Smallwaters Corp.). Data analysis proceeded in two stages [1]. The measurement model was first examined for validating and refining the research instrument, followed by the analysis of the structural equation model for testing the associations in our research model.

### 4.1. Reliability and validity of measurement model

The internal consistency reliability using SPSS10.0 was assessed by computing Cronbach's alpha. The value range from 0.7368(for  $\sum_{nb,mc_j}$ ) to 0.9156(for perceived behavioral control). Hair, Anderson, Tatham and Black [16] suggested that the lowest limit for Cronbach's alpha be 0.70. All constructs in our research model demonstrated acceptable reliability. These coefficients are represented for each of the constructs in Table 3.

We conducted the exploratory factor analysis using SPSS10.0 to examine the convergent validity of the constructs. Table 3 also shows that the principal component analysis with Varimax rotation yielded seven distinct factors. Factor loadings for all variables except BI3 and b4e4 were greater than 0.5. Together, the results confirm the existence of seven factors with eigenvalues greater than 1.0 that accounted for 79.920 percent of the total variance. Convergent validity is demonstrated if items load highly on their associated factor. All items, except BI3 and b4e4, load highly (loading  $\geq 0.5$ ) on their associated factors, confirming the convergent validity of the factors.

A confirmatory factor analysis using AMOS4.0 was conducted to test the result of exploratory factor analysis. This analysis is particularly useful in the validation of scales for the measurement of specific constructs [16]. The fit of the overall measurement model was estimated by various indices. The ratio of  $\chi^2$  to degrees-of-freedom(DF) was used, and a value of 2.346 was obtained, which is within the suggested value of 3. Also note the goodness-of-fit(GFI) and adjusted goodness-of-fit(AGFI) were 0.902 and 0.855, respectively. The normalized fit index(NFI) and comparative fit index(CFI) are two other indices of fit. We observed values of 0.927 and 0.957 for NFI and CFI indicating good model fit, because values are greater than 0.9 representing reasonable model fit. Convergent validity can also be assessed by factor loadings and squared multiple correlations from the confirmatory factor analysis shown in Table 4. The composite reliabilities range from 0.757(BI) to 0.921(PBC) which exceed the recommended level of 0.70. The variance extracted measures range from 0.511(BI) to 0.746(PBC) which also exceed the recommended level of 0.50 [16]. In addition, squared multiple correlations were above 0.5 in all cases. The result, therefore, demonstrate convergent validity of the measurement model.

**Table 2. Measurement items of internet banking and Likert scores**

Construct	Item	Questionnaire	Mean	S.D.
BI	BI1	I plan to use internet banking.	5.51	1.41
	BI2	I will frequently use internet banking in the future.	5.32	1.37
	BI3	I will add internet banking to my favorite links.	5.98	1.09
	BI4	I will strongly recommend others to use internet banking.	5.83	1.13
A	A1	I feel using internet banking is a wise idea.	5.71	1.14
	A2	I like to use internet banking	5.30	1.30
	A3	My attitude towards internet banking is favorable.	5.68	1.11
	A4	I think it is good for me to use internet banking.	5.73	1.07
SN	SN1	Most people who are important to me would think that using internet banking is a wise idea.	5.06	1.12
	SN2	Most people who are important to me would think that using internet banking is a good idea.	4.97	1.06
	SN3	Most people who influence my behavior would think that I should use internet banking.	4.74	1.19
PBC	PBC1	I would be able to operate internet banking.	6.07	1.01
	PBC2	I have the knowledge to use internet banking.	5.92	0.99
	PBC3	I have the ability to use internet banking.	6.00	0.93
	PBC4	Using internet banking is entirely within my control.	5.72	1.08
$\sum b_i e_i$	b1	Using internet banking will save time	5.24	1.29
	e1	The use of internet banking will save time is important to me.	4.88	1.33
	b2	Using internet banking has more advantages.	5.44	1.16
	e2	The advantages of internet banking are important to me.	5.27	1.28
	b3	The internet banking will be easy to learn.	5.08	1.15
	e3	The internet banking will be easy to learn is important to me.	4.98	1.24
	b4	Using internet banking will fit well with my lifestyle.	5.26	1.27
	e4	The internet banking that fit well with my lifestyle is important to me.	5.10	1.29
$\sum nb_j mc_j$	nb1	Most people would think that I should use internet banking.	4.77	1.72
	mc1	Generally speaking, I want to do what most people think I should do.	4.28	1.52
	nb2	My friends would think that I should use internet banking.	4.45	1.37
	mc2	Generally speaking, I want to do what my friends think I should do.	4.74	1.13
	nb3	Bank tellers would think that I should use internet banking.	4.29	1.37
	mc3	Generally speaking, I want to do what bank teller think I should do.	4.68	1.12
$\sum cb_k pf_k$	cb1	I have enough knowledge to operate internet banking.	5.82	1.18
	pf1	Knowing enough to operate internet banking is important to me.	5.17	1.26
	cb2	I could access network easily to use internet banking.	5.71	1.16
	pf2	Accessing network easily to use internet banking is important to me.	5.21	1.21
	cb3	I have the time to use internet banking.	5.53	1.20
	pf3	Having the time to use internet banking is important to me.	5.04	1.30

S.D. = Standard deviation

Discriminant validity can be tested by comparing the squared correlation between two constructs with their respective variance extracted measure [16]. Table 5 shows the squared correlation of each pair of constructs and the variance extracted measures. The variance extracted measures of each construct are in the diagonal. It shows that all squared correlations between two constructs are less than the variance extracted measures of both constructs.

## 4.2. Structure models

After assessing the reliability and validity, the hypothesized paths in two models were tested by the AMOS4.0 software to which a matrix of correlation between the variables was input, using the maximum likelihood estimated. For each model, overall fit, predictive power and the significance of paths were considered.  $R^2$  for each dependent construct was examined to assess explanatory power, and the significance of individual paths was assessed.

The fit statistics and  $R^2$  values for each of the two models are shown in Table 6. The standardized path coefficients for each of the hypothesized models are shown in Table 7. Moreover, Figure 3 is the result of TRA model which referred to Figure 1 and, Figure 4 is the result of TPB model which referred to Figure 2.

**Table 3. Results of exploratory factor analysis and reliability**

item	factor							Cronbach's alpha
	PBC	A	SN	$\sum cb_k pf_k$	$\sum b_i e_i$	BI	$\sum nb_j mc_j$	
PBC1	0.781							0.9156
PBC2	0.862							
PBC3	0.882							
PBC4	0.766							
A1		0.746						0.8999
A2		0.659						
A3		0.779						
A4		0.693						
SN1			0.845					0.8794
SN2			0.835					
SN3			0.814					
cb1pf1				0.789				0.9118
cb2pf2				0.808				
cb3pf3				0.814				
b1e1					0.818			0.8197
b2e2					0.756			
b3e3					0.501			
BI1						0.801		0.8504
BI2						0.754		

**Table 4. Results of convergent validity test**

Factor	Item	Standardized loading	Standard error	Squared multiple correlations	Composite reliability	Variance extracted
nb1mc1	BI1	0.773	0.795	0.597	0.750	0.738
nb2mc2	BI2	0.768	0.765	0.590	0.750	0.669
nb3mc3	BI4	0.872	0.304	0.760	0.634	0.634
Eigenvalues	A1	3.599	0.872	2.684	2.062	1.831
Variance explained (%)	A2	5.649	0.811	11.671	8.967	7.959
Extraction method	A3	0.819	0.399	0.670		
Rotation method	A4	0.878	0.259	0.771		
SN	SN1	0.870	0.302	0.758	0.854	0.661
	SN2	0.895	0.220	0.802		
	SN3	0.768	0.579	0.590		
PBC	PBC1	0.863	0.255	0.745	0.921	0.746
	PBC2	0.938	0.118	0.880		
	PBC3	0.951	0.082	0.904		
	PBC4	0.708	0.577	0.502		

The belief structures ( $\sum b_i e_i$ ,  $\sum nb_j mc_j$ ,  $\sum cb_k pf_k$ ) are combined into unidimensional constructs. They are monolithic belief sets. (Standardized loading=1.000,  $R^2$ =1.000)

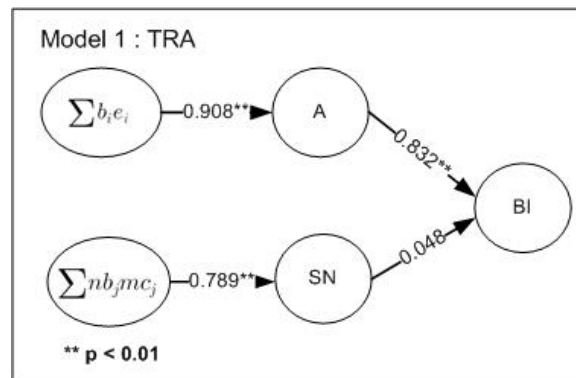


**Table 5. Discriminant validity**

	1	2	3	4
1. BI	(0.511)			
2. A	0.509	(0.633)		
3. SN	0.211	0.265	(0.661)	
4. PBC	0.340	0.341	0.066	(0.746)

#### 4.2.1. Model 1: TRA

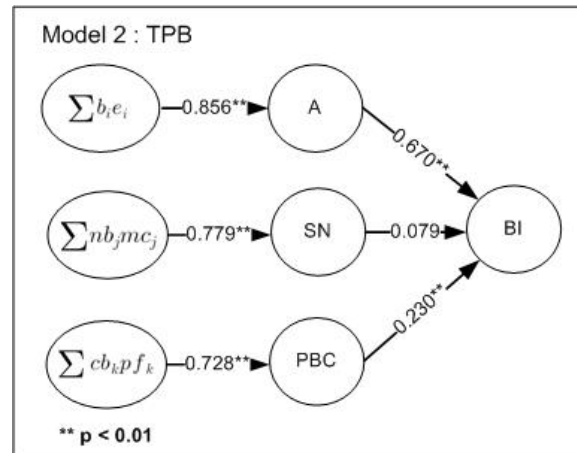
The fit statistics indicate that the TRA model provides a good fit to the data ( $\chi^2/DF=2.547$ ,  $p<0.01$ ;  $RMSEA=0.088$ ;  $AGFI=0.858$ ;  $CFI=0.953$ ). In terms of predictive power, the TRA accounts for over half of the variance in all three dependent variables ( $R^2_{BI}=0.739$ ,  $R^2_A=0.825$ ,  $R^2_{SN}=0.622$ ). Attitude and subjective norm explained 73.9% of the variance in behavior intention to use internet banking. Thus, overall the TRA model performs well.

**Figure 3. Path coefficients for the TRA**

As indicated in Figure 3, attitudinal belief structures (0.908;  $p<0.01$ ) and normative belief structures (0.789;  $p<0.01$ ) are significant determinants of attitude and subjective norm, respectively. Although attitude (0.832;  $p<0.01$ ) is a significant determinant of behavioral intention, subjective norm (0.048;  $p=0.478$ ) is not. This suggests that social pressures did not influence individual's decisions to use internet banking. The indirect effect of attitudinal belief structures is represented by the 0.755 path coefficient ( $0.908 \times 0.832$ ;  $p<0.01$ ) and the indirect effect of normative belief structures is 0.038 ( $0.789 \times 0.048$ ;  $p<0.01$ ). Attitude and attitudinal belief structures had significant direct and indirect effects on behavioral intention to use internet banking. Normative belief structures had only a small effect on behavioral intention.

#### 4.2.2. Model 2: TPB

The fit statistics indicate that the TPB model also fits the data reasonably well ( $\chi^2/DF=2.010$ ,  $p<0.01$ ;  $RMSEA=0.071$ ;  $AGFI=0.849$ ;  $CFI=0.957$ ). In terms of predictive power, the TPB is comparable to the TRA ( $R^2_{BI}=0.763$ ,  $R^2_A=0.732$ ,  $R^2_{SN}=0.607$ ,  $R^2_{PBC}=0.529$ ). Attitude, subjective norm, and perceived behavior control explained 76.3% of the variance in behavior intention to use internet banking.



**Figure 4. Path coefficients for the TPB**

As indicated in Figure 4, attitudinal belief structures (0.856;  $p < 0.01$ ), normative belief structures (0.779;  $p < 0.01$ ) and control belief structures (0.728;  $p < 0.01$ ) are significant determinants of attitude, subjective norm and perceived behavioral control, respectively. Attitude (0.670;  $p < 0.01$ ) and perceived behavioral control (0.230;  $p < 0.01$ ) are a significant determinant of behavioral intention. Attitude had a slightly stronger effect on behavioral intention than perceived behavioral control. However, subjective norm (0.079;  $p = 0.204$ ) is not significantly related to behavioral intention. The indirect effect of attitudinal belief structures is represented by the 0.573 path coefficient ( $0.856 \times 0.670$ ;  $p < 0.01$ ), the indirect effect of normative belief structures is 0.062 ( $0.779 \times 0.079$ ;  $p < 0.01$ ) and the indirect effect of control belief structures is 0.16 ( $0.728 \times 0.230$ ;  $p < 0.01$ ).

#### 4.2.3. Model comparison

Compared between TRA and TPB, the findings of this study strongly suggest that our TPB has a higher ability to predict and explain behavioral intention to use internet banking. Table 6 shows fit indices and explanatory power for TRA model and TPB model. Behavioral intention is clearly the most important determinant of internet banking usage behavior in two models. TRA explains 73.9% of the variance in behavioral intention, TPB explains 76.3%. This indicates that the addition of perceived behavioral control provides some additional insight into behavioral intention. It appears that TRA explains attitude and subjective norm much better than TPB. However, this result may be due to the fact that there was more variance in TPB.

Both TRA and TPB, shown in Table 7, indicate that attitude (in TRA 0.832; in TPB 0.670) is the major determinant of behavioral intention. The lack of a significant subjective norm (SN)-behavioral intention (BI) effect is also found in both models. In TPB, behavioral intention also depends on perceived behavioral control in some degree. Perceived behavioral control adds a little accuracy of behavioral intention to use internet banking.

**Table 6. Fit indices and  $R^2$  for each of the**

### hypothesized models

FIT and $R^2$ (Recommended value)		Models	
		TRA	TPB
FIT	$\chi^2/DF (\leq 3.000)$	2.547	2.010
	$P (\geq 0.050)$	0.000	0.000
	RMSEA (0.050~0.080)	0.088	0.071
	AGFI ( $\geq 0.800$ )	0.858	0.849
	CFI ( $\geq 0.900$ )	0.953	0.957
	PNFI ( $\geq 0.600$ )	0.673	0.736
$R^2$	$R^2_{BI}$	0.739	0.763
	$R^2_A$	0.825	0.732
	$R^2_{SN}$	0.622	0.607
	$R^2_{PBC}$	-	0.529

**Table 7. Standardized path coefficients**

Path	TRA		TPB	
	Path coefficient	P-value	Path coefficient	P-value
$BI \leftarrow A$	0.832**(0.105)	0.000	0.670**(0.103)	0.000
$BI \leftarrow SN$	0.048 (0.076)	0.478	0.079 (0.068)	0.204
$BI \leftarrow PBC$	-	-	0.230**(0.082)	0.000
$A \leftarrow \sum b_i e_i$	0.908**(0.005)	0.000	0.856**(0.004)	0.000
$SN \leftarrow \sum nb_i mc_i$	0.789**(0.008)	0.000	0.779**(0.007)	0.000
$PBC \leftarrow \sum cb_i pf_i$	-	-	0.728**(0.003)	0.000

( )Standard errors, \*\*p<0.01

## 5. Discussion and Conclusion

This study compares TRA with TPB in terms of their contribution to the understanding of internet banking usage. The aim was to test the ability of theoretical models and to provide useful results to help internet banking enterprises refine their strategic planning and enhance competitive advantage. Our analytical results show that both the TRA model and the TPB model exhibited a reasonable fit to the data. Both models are empirically strong, and provided good predictions of individuals' intentions to use internet banking. However, the TPB provides significantly best fit to the data and provides best prediction of internet banking usage. We also adopted explanatory power to evaluate them and determined which version was best [33]. The TPB model has better explanatory power for behavioral intention than the TRA model.

### 5.1. Understanding behavioral intention

The findings show that intention to adopt internet banking can be explained by attitude in both models. In addition, attitudinal belief structures and normative belief structures are related to attitude and subjective norm respectively in both models. In the TPB model, intention to adopt internet banking also can be explained by perceived behavioral control. Moreover, control belief structures are related to perceived behavioral control.

However, the path from subjective norm to behavioral intention failed to achieve significance in both model. According to Mathieson [23], Liao et al. [20] and Shin and Fang [29], behavioral intention was not predicted by subjective norm. In the early stages of user experience where user interaction with the

target system has been somewhat limited, even if an individual does not have a favorable reaction to the information system, the individual tends to comply with others' views and use the target system to attain a favorable reaction from important referents [39]. As direct experience with technology increases over time, however, individuals have a better assessment of the benefits and costs associated with using that technology. Even if their original decision was based on others' opinions, individuals begin to internalize others' opinions especially if they are consistent with the results of their own direct experience. Thus, the direct effect of subjective norm on behavioral intention is reduced [25, 40]. With increasing experience, user judgments reflect specific criteria that result from the interaction with the new system and less from normative influence. Reinecke, Schmidt and Ajzen [26] has shown that the direct effect of subjective norm on intention is strong in the early stages of new behavior and tends to wear off over time. The research of Venkatesh and Morris [39] suggests that the influence of people diminishes to non-significance over time with increasing experience with the target system. More than 75 percent of the sample respondents had at least two years' experience with the internet banking. They may be good at operate internet banking services. In addition, The Bank of Korea in 2005 indicated that internet banking in Korea has already become broadly accepted.

## **5.2. Comparison and selection of models**

This discussion provides some guidelines for choosing between the models. The models are compared on three criteria. The first is their ability to predict intention to use internet banking. TPB explains intention to use internet banking better than TRA. TPB provides a more accurate picture of the issues that developers should consider in addressing system acceptability. The second criterion is the value of the information provided by the models. TPB delivers more specific information, measuring the perceived behavioral control and control belief structures. The third criterion is the cost, time, efforts of using the models. TRA is easier to use than TPB. TRA provides a quick and inexpensive way to gather information about individuals' perceptions of the internet banking.

These two models could be used effectively under different condition. Suppose the internet banking had been built to offer users several banking services. An analyst could use TRA to identify satisfied or dissatisfied users and discover their opinion. TRA is suited to this purpose, since it is easy and inexpensive to apply and TRA's constructs are probably meaningful to most people. On the other hand, an analyst could use TPB to gain more detailed information about intention to use from satisfied or dissatisfied users. TPB is suited to this purpose, because this model has additional constructs. Therefore, the results of this study indicate that it would be a valuable strategy for enterprises to promote internet banking. Moreover, both TRA and TPB could apply to various information systems such as mobile banking [22], e-learning system [19], on-line tax e-service [41] and internet shopping mall [35]. Enterprises who want to develop or analyze information system could gain useful knowledge from TRA or TPB model.

## **5.3. Limitations**

Despite this, the study has some potential limitations. First, although intention to use internet banking was measured, the relationship between intention and behavior was not. However, this is not a serious problem because TRA and TPB both predict behavior from intention [28]. Additionally, there is substantial empirical support for the intention-behavior link. Ajzen and Madden [8] found a similar result for TRA and TPB. Second, various internet banking systems are used by many different people. We limited our research only in Korea. In other situations, subjective norm may influence behavioral intention. An objective for future research would be to identify the conditions under which subjective norms are important. Lastly, there is a need to search for additional variables that can improve our ability to more accurately predict usage intention. These limitations may provide a meaningful research area for the future.

## Appendix. Covariance matrix

	BI1	BI2	BI4	A1	A2	A3	A4	SN1	SN2	SN3	PBC1	PBC2	PBC3	PBC4	be	nbmc	cdpf
BI1	1.982																
BI2	1.334	1.872															
BI4	1.02	1.001	1.272														
A1	0.727	0.761	0.752	1.294													
A2	1.018	1.002	0.909	0.988	1.676												
A3	0.723	0.686	0.821	0.894	0.967	1.216											
A4	0.885	0.789	0.86	0.889	0.957	0.831	1.136										
SN1	0.514	0.733	0.426	0.586	0.586	0.524	0.56	1.254									
SN2	0.552	0.62	0.479	0.549	0.614	0.509	0.486	0.918	1.113								
SN3	0.39	0.692	0.371	0.545	0.503	0.413	0.426	0.896	0.867	1.419							
PBC1	0.633	0.552	0.675	0.624	0.633	0.537	0.627	0.328	0.275	0.221	1.005						
PBC2	0.66	0.501	0.63	0.556	0.623	0.445	0.578	0.267	0.265	0.123	0.812	0.984					
PBC3	0.639	0.505	0.614	0.52	0.554	0.436	0.535	0.257	0.228	0.119	0.757	0.822	0.861				
PBC4	0.591	0.536	0.649	0.434	0.496	0.391	0.464	0.284	0.258	0.155	0.614	0.7	0.693	1.163			
be	19.594	17.901	18.452	16.391	19.865	15.603	17.967	12.263	11.387	10.178	13.039	13.279	11.807	12.736	781.348		
nbmc	9.784	14.332	9.644	10.317	11.423	8.05	8.468	11.766	12.094	18.123	4.619	4.118	3.243	5.892	284.12	693.812	
cdpf	18.12	18.871	19.175	18.309	22.239	16.154	18	9.747	11.914	9.019	17.251	17.166	15.054	14.739	565.401	247.295	953.877

## 6. Reference

- [1] Anderson, J. C. and Gerbing, D.W., "Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach", *Psychological Bulletin*, Vol. 103, No. 3, 1988, pp. 411-423.
- [2] Ajzen, I., "From Intentions to Actions: A Theory of Planned Behavior", In J. Kuhl & J. Beckmann (Eds.), *Action Control: From Cognition to Behavior*, New York: Springer-Verlag, 1985, pp.11-39.
- [3] Ajzen, I., *Attitudes, Personality, and Behavior*. Chicago: Dorsey Press, 1988.
- [4] Ajzen, I., "Attitude Structure and Behavior", in A. R. Pratkanis, S. J. Breckler, and A. G. Greenwald(Eds.), *Attitude Structure and Funtion*, Lawrence Erlbaum Associates, Hillsdale, NJ, 1989, pp. 241-274.
- [5] Ajzen, I., "The Theory of Planned Behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50, 1991, pp. 179-211.
- [6] Ajzen, I and Driver, B. L., "Application of the Theory of Planned Behaviour to leisure choice", *Journal of Leisure Research*, Vol. 24, 1992, pp. 207-224.
- [7] Ajzen, I. and Fishbein, M. A., *Understanding Attitudes and Prediciting Social Behavior*, Englewood Cliffs, NJ: Prrentice-Hall, Inc, 1980.
- [8] Ajzen, I. And Madden, T. J., "Prediction of Goal-Directed Behavior: Attitudes, Intentions and Perceived Behavioral Control", *Journal of Experimental Social Psychology*, Vol. 22, 1986, pp. 453-474.
- [9] Bagozzi, R. P., "Attitudes, Intentions, and Behavior: A Test of Some Key Hypotheses", *Journal of personality and social psychology*, Vol. 41, 1981, pp. 607-627.
- [10] Bagozzi, R. P., "A Field Investigation of Causal Relations Among Cognitions, Affect, Intentions and Behavior", *Journal of Marketing Research*, 1982, pp. 562-583.
- [11] Cho, Dae-Woo and Hwang, Kyund-Yun, "Determinants of Internet Banking Usage Behavior: Applying Theory of Planned Behavior", *Korean Management Review*, Vol. 30, No. 4, 2001, pp. 1225-1249.
- [12] Davis, F. D., Bagozzi, R.P. and Warshaw P.R., "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models", *Management Science*, Vol. 35, No. 8, August 1989, pp. 982-1003.
- [13] Fishbein, M. A., *Readings in Attitude Theory and Measurement*. New York, John Wiley, 1967.

- [14] Fishbein, M. A. and Ajzen, I., *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*, Reading, MA: Addison-Wesley, 1975.
- [15] Grandy, T., "Banking in E-space", *The banker*, Vol. 145, December 1995, pp. 74-75.
- [16] Hair, J. F., Anderson, R. E., Tatham, R. L. and Black, W. C., *Multivariate Data Analysis*, Prentice-Hall, 5th Edition, 1998.
- [17] Kuhl, J., "Volitional Aspect of Achievement Motivation and Learned Helplessness: Toward a Comprehensive Theory of Action Control. In B. A. Maher(Ed.), *Progress in experimental personality research*, Vol. 13, 1985, pp.99-171. New York: Academic Press.
- [18] Lai, V. S. and Li, H., "Technology Acceptance Model for Internet Banking: An Invariance Analysis", *Information & Management*, Vol. 42, No. 2, 2005, pp. 373-386.
- [19] Liao, C., Chen, J. and David, C., "Theory of planning behavior (TPB) and customer satisfaction in the continued use of e-service: An integrated model" *Computers in Human Behavior*, In Press, Corrected Proof, 2006.
- [20] Liao, S. and Shao. Y. P., Wang, H. and Chen, A., "The Adoption of Virtual Banking: An Empirical Study", *International Journal of Information Management*, Vol. 19, No. 1, 1999, pp. 63-74.
- [21] Liska, A. E., "A Critical Examination of the Causal Structure of the Fisbein/Ajzen Attitude-Behavior Model", *Social Psychology Quarterly*, Vol. 47, 1984, pp. 61-74.
- [22] Luarn Pin and Lin Hsin-Hui, "Toward an understanding of the behavioral intention to use mobile banking", *Computers in Human Behavior*, Vol. 21, No. 6, 2005, pp. 873-891.
- [23] Mathieson, K., "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior", *Information Systems Research*, Vol. 2, No. 3, 1991, pp. 173-191.
- [24] Norman, P. and Smith, L., "The Theory of Planned Behavior and Exercise: An Investigation into the Role of Prior Behavior, Behavioral Intentions and Attitude Variability", *European Journal of Social Psychology*, Vol. 25, 1995, pp. 403-415.
- [25] Oliver, R. L. and Bearden, W. O., "Crossover Effects in the Theory of Reasoned Action", *Journal of Consumer Research*, Vol. 12, December 1985, pp. 324-340.
- [26] Reinecke, J., Schmidt, P. and Ajzen, I., "Application of the Theory of Planned Behavior to Adolescents' Condom Use: A Panel Study", *Journal of Applied Social Psychology*, Vol. 26, 1996, pp. 749-772.
- [27] Sarver, V. T., Jr., "Ajzen and Fishbein's Theory of Reasoned Action: A Critical Assessment", *Journal for the Theory of Social Behavior*, Vol. 13, 1983, pp. 155-163.
- [28] Sheppard, B. H., Hartwick, J. and Warshaw, P. R., "The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research", *Journal of Consumer Research*, Vol. 15, 1988, pp. 325-343.
- [29] Shih, Y. and Fang, K., "The Use of a Decomposed Theory of Planned Behavior to Study Internet Banking in Taiwan", *Internet Research*, Vol. 14, No. 3, 2004, pp. 213-223.
- [30] Suh, B. and Han, I., "Effect of Trust on Customer Acceptance of Internet Banking", *Electronic Commerce Research and Applications*, Vol. 1, No. 3-4, 2002, pp. 247-263.
- [31] Swanson, E. B., *Information System Implementation: Bridging the Gap between Design and Utilization*, Irwin, Homewood, IL, 1988.
- [32] Taylor, S. and Todd, P. A., "Decomposition and Crossover Effects in the Theory of Planned Behavior: A Study of Consumer Adoption Intentions", *International Journal of Research in Marketing*, Vol. 12, 1995a, pp. 137-155.
- [33] Taylor, S. and Todd, P. A., "Understanding Information Technology Usage: A Test of Competing Models", *Information Systems Research*, Vol. 6, 1995b, pp. 144-176.

- [34] Thompson, R. L., Higgins, C. A. and Howell, J. M., "Influence of Experience on Personal Computer Utilization: Testing a Conceptual Model", *Journal of Management Information Systems*, Vol. 11, Summer 1994, pp. 167-187.
- [35] Tony Ahn, Seewon Ryu and Ingoo Han, "The impact of the online and offline features on the user acceptance of Internet shopping malls", *Electronic Commerce Research and Applications*, Vol. 3, No. 4, 2004, pp. 405-420.
- [36] Triandis, H. C., *Attitude and Attitude Change*. New York: John Wiley, 1971.
- [37] Triandis, H. C., *Interpersonal behavior*. Monterey, CA: Brooks/Cole., 1977.
- [38] Turban, E., Lee, J., King, D. and Chung, H. M., *Electronic Commerce: A Managerial Perspective*, Prentice-Hall, Upper Saddle River, NJ., 2000.
- [39] Venkatesh, V. and Morris, M. G., "Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior", *MIS Quarterly*, Vol. 24, No. 1, 2000, pp. 115-139.
- [40] Warshaw, P. R., "A New Model for Predicting Behavioral Intentions: An Alternative to Fishbein", *Journal of Marketing Research*, Vol. 17, 1980, pp. 153-172.
- [41] Wu, Ing-Long, and Chen, Jian-Liang, "An extension of Trust and TAM model with TPB in the initial adoption of on-line tax: An empirical study", *International Journal of Human-Computer Studies*, Vol. 62, No. 6, 2005, pp. 784-808.
- [42] Yoh, E., *Consumer Adoption of the Internet for Apparel Shopping*, Ph. D. Dissertation, Iowa State University, 1999.