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Abstract

As China's accession into the World Trade Organization and opening its financial market, competition in the banking industry is getting throat-cutting in China. Using Internet banking to acquire market shares is critical for banks' survival and therefore understanding drivers for Internet banking adoption is critical for banks' success. Applying Davis's technology acceptance model and incorporating other unique and salient factors for e-commerce adoption in China (i.e., perceived risk, trust and structural assurances), this study develops and tests a research model to investigate factors affecting Internet banking acceptance in mainland China. Results of the data analysis generally support the model as well as six of seven of the proposed hypotheses. In particular, trust toward e-channels, perceived ease of use, perceived risk and structural assurances were found to have significant direct and/or indirect impact on Internet banking adoption. Contributions and implication of the study are discussed.

Keywords: *Internet Banking, Technology Acceptance Model, trust, perceived risk, structural assurances*

UNDERSTANDING INTERNET BANKING: AN EMPIRICAL INVESTIGATION OF POTENTIAL CUSTOMERS' ACCEPTANCE IN MAINLAND CHINA

Introduction

Internet Banking (IB) is banks' providing services to their customers through the Internet. The potential benefits of IB include lowering operational cost, facilitating interactions with customers, and enabling the provision of value-added services (e.g., access to professional knowledge in financial management) (Nielsen 2003; Tan & Teo 2000), as such, IB may enhance customer loyalty, drive customers to carry higher balances and be willing to refer their banks to others (Market Research 2006). Therefore, it is not surprising that the 120 largest banks in the US all offer their customers with IB services (Scruggs & Nam 2002). Indeed, IB has become a critical component of banks' business and attracting customer to adopt IB is of great importance for banks' survival in the hyper-competitive market.

With China's accession to WTO, the market in mainland China is gradually open to foreign banks (Xue et al. 2002). We expect that IB will become an important area in which banks compete against each other. Providing banks with insights into factors driving Chinese customers to adopt IB is of great significance. Especially, the extant literature suggests that antecedents of IB adoption are different across different regions and countries, due to various social and economic reasons (e.g., Chau 2003; Chan 2004; Park 2004; Kim 2004). Given foreign banks' lack of experience in the market of mainland China and the unique characteristics of mainland China's social-economic environment, a study assessing the antecedents of IB adoption in mainland China is imperative.

In this research, we draw upon the Technology Acceptance Model (TAM) (Davis et al. 1989; Davis 1989) and consumer behavior theory to study the drivers for customers' IB acceptance in mainland China. Following prior research on e-commerce acceptance (Jarvenpaa et al. 2000; Pavlou 2003; Gefen et al. 2003; Gupta et al. 2004), we examine the effects of the constructs suggested by consumer behavior theory (i.e., perceived risk and trust in e-channels), in addition to the constructs suggested by TAM. Also, we assess the influence of structural assurance on consumers' trust. The rationale for focusing on the effect structural assurance is that infrastructure to protect consumers' interests is relatively weak and there is little legislation regarding electronic transactions and the Internet in China (Yin 2003). The research model is tested with data collected in a metropolitan city in China. By conducting this research, we attempt to help advance our understanding of customers' IB adoption in a transitioning economy and provide practitioners with guidance to promote their IB services.

The rest of the paper is organized as follow. In section 2, we provide a literature review and articulate our research model. In section 3 and section 4, we describe our research methodology and present our data analysis results, respectively. The final section is our discussion and conclusion.

Literature Review and Research Model

In the view that IB is a channel through which customers interact with banks by world wide web, which has high uncertainty due to the security and reliability of infrastructure involved, customers' technology-based and trust-based belief should work together to influence the decision to adopt IB. This section reviews relevant literature and derives research hypotheses.

TAM and Internet Banking

The essence of IB is using IT to facilitate the interactions between customers and banks. As such, customers' intention to adopt IB should in part be explained by the technology acceptance model (TAM) (Davis et al. 1989; Davis 1989). This model has theoretical roots in the Theory of Reasoned Action (Ajzen and Fishbein 1980). It has been widely referenced and adopted by IS researchers. Numerous empirical tests have shown that TAM is a parsimonious and robust model of users' technology acceptance in various technological and cultural contexts (Venkatesh et al. 2003; Gefen and Straub 2000; Straub 1998). Although TAM has been mainly used to understand IT adoption in organizational settings, the theory is applicable and has been successfully applied to understand individuals' e-commerce acceptance (e.g., Pavlou and Gefen 2004; Jarvenpaa et al. 2000; Gefen 2002). In short, TAM posits that individuals' belief about the target technology, namely perceived usefulness (PU) and perceived ease of use (PEOU), are the primary constructs that determining their intention to adopt the technology, which in turn, predicts their actual usage of the technology (Davis et al. 1989; Davis 1989).

The adoption of IB, as one kind of e-commerce, is explained by TAM. For example, Suh and Han (2002) found significant impact of PU and PEOU on Korean people's IB acceptance and Chan and Lu (2004) had similar findings with subjects in Hong Kong. Also, Chau and Lai (2003) found PU and PEOU had positive effect on individuals' attitude toward IB. In addition, these studies all confirmed that PEOU also indirectly affects IB acceptance by influencing PU. We expect that these relationships between PU, PEOU and behavioral intention can be extended to the current research context. PU is defined as a customer's belief of the utility offered by IB and PEOU is a customer's subjective assessment of the cognitive effort needed to utilize IB. As customers react rationally when they decide whether to adopt IB, the more useful and easy to use is the IB, the more likely they will have intention to adopt IB.

H1: PU will positively affect customers' intention to adopt IB.

H2: PEOU will positively affect customers' intention to adopt IB.

H3: PEOU will positively affect PU of IB.

Trust, Perceived Risk and Internet Banking

The technology setting and the transaction environment of e-commerce are drastically different when compared with conventional IT and the typical traditional financial service environment. According to Pavlou (2003), the unique dimensions of e-commerce include extensive use of technology for transactions, distant and impersonal nature of the on-line environment, and implicit uncertainty of using open technological infrastructures for transactions. These features reduce e-commerce customers' control over on-line transactions and expose them to high risk (Pavlou 2003; Gefen 2002; Gefen et al. 2003; Jarvenpaa et al. 2000). To get over the obstacle of high uncertainty and risk, the presence of trust is required.

As an important mechanism to reduce individuals' perception of risk involved, trust is an important construct in sociology, marketing, and e-commerce (Pavlou 2003; Gefen 2002). In the extant literature, there exist various definitions of trust across different disciplines. Yet, the central components of all these trust definitions are ones' confident expectations and willingness to be vulnerable (Rousseau et al. 1998). That is, trust allows individuals to rule out many undesirable possible outcomes of a specific behavior, such as trading with an unfamiliar seller, and so make them get over the risk hurdle to conduct this specific

behavior (Gefen 2002). This argument is rooted in TRA, which posits that an individual's expectation about a behavior's outcome affects the individual's behavioral intention (Ajzen and Fishbein 1980). Indeed, researchers have established theoretically and empirically that trust creates a positive attitude toward e-commerce, which in turn leads to customers' e-commerce adoption (e.g., Jarvenpaa et al. 2000; Pavlou and Gefen 2004; Gefen et al. 2003; Gefen 2002).

While both trust toward the seller and trust toward the electronic channel are relevant in e-commerce, we choose to focus on the later kind of trust in the current study due to two reasons. First, banks have historically regarded as trustworthy parties and this trust can be transferred to the IB context (Gefen and Straub 2004). Second, the security and reliability of the infrastructure employed to interface with customers is of paramount significance in IB. If an unauthorized is able to access the online banking portfolio of a customer, an entire array of the customer's financial information may be compromised and there might be sizable financial losses. Thus, risk imposed by e-channels is exacerbated in IB and becomes the most significant obstacle for customers' IB adoption. We define trust toward e-channels as customers' confident expectation that the e-channel of IB is secure and reliable to support transactions. Based on the extant research on trust's effect on e-commerce in general and IB adoption in particular (Suh and Han 2002; Wang 2003; Kim and Prabhakar 2004; Liao and Cheung 2002), we propose the following hypothesis.

H4   Trust toward e-channels positively affects customers' intention to adopt IB.

Trust toward e-channels relies on the existence of guarantees, safety nets and impersonal structures (Pavlou and Gefen 2004; Kim and Prabhakar 2005). Especially, structural assurances, defined as safety nets such as legal recourse, guarantees, and regulations that exist (McKnight et al. 1998; Zacker 1986; Shapiro 1987), are of particular relevance to trust toward e-channels in IB because of the high uncertainty due to the novelty of e-channels (Gupta et al. 2004; Kim and Prabhakar 2005). The establishment of private key infrastructure, legislations recognizing the legitimacy and validity of electronic transactions, regulations and measures against computer frauds and system hacking help customers create trust toward e-channels.

H5   Structure assurances positively affect trust toward e-channels.

Perceived risk, another subjective concept in social relations, is critical for e-commerce acceptance (Gefen 2002; Jarvenpaa et al. 2000; Pavlou and Gefen 2004). As discussed above, risk in e-commerce prevents customers from conducting transactions on-line. While this risk is critical, it is difficult to measure. Also, it is the perception of risk rather the objective actual risk that affects individuals' decision on whether to undertake a specific behavior. Therefore, the extant research has focused mainly on perceived risk (e.g., Jarvenpaa et al. 2000; Pavlou and Gefen 2004). Perceived risk is an individual's subjective belief about the likelihood of a loss in pursuit of a desired outcome (Povlou 2003). As a antecedent belief, perceived risk makes customers create a negative attitude toward e-commerce (Pavlou 2003; Gefen 2002; Pavlou and Gefen 2004; Jarvenpaa et al. 2000). This effect can also be explained by TRA (Ajzen and Fishbein 1980) and it has gained consistent empirical support (Jarvenpaa et al. 2000; Pavlou and Gefen 2004).

We expect that perceived risk affects customers' intention to adopt IB in this current study. Following the above-mentioned uncertainty involved in IB, we define perceived risk from conducting IB as customers' perception that there is some probability of suffering a loss when using IB services. Prior studies on IB, though conducted in regions and countries other than mainland China, support the negative relationship between perceived risk and IB adoption (e.g., Jih 2005). In addition, trust is interrelated with perceived risk. As discussed above, trust reduces individuals' perception of risk associated with performing a behavior (Jarvenpaa et al. 2000; Gefen 2002). Therefore, we expect that trust has a negative effect on customers' perceived risk of IB.

H6   Perceived risk negatively affects customer's intention to adopt IB.

H7   Trust toward e-channels negatively affects perceived risk of IB.
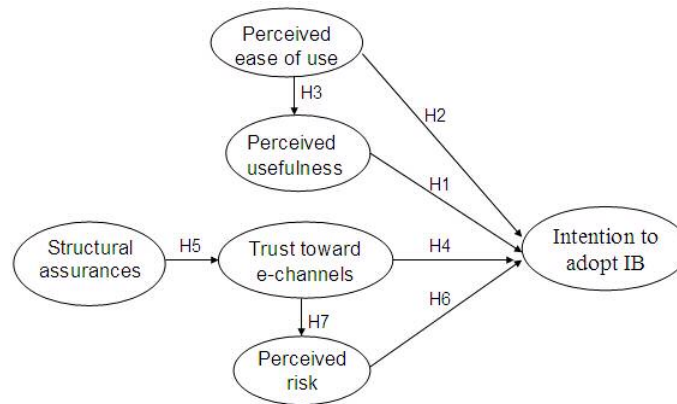

Figure 1. The Research Model

Research Design and Method

Questionnaire Development and Pretest

A questionnaire, using a 5-point Likert scale, was employed to collect data in mainland China. The measurement items of our questionnaire were adapted from existing and well tested scales offered by the extant literature. These scales have been proved to have good validity and reliability. In order to maintain the technical and conceptual equivalence of these instruments, we applied a translation and back-translation strategy when developing the Chinese version of questionnaire. Two bilinguals translated the measures originally written in English into Chinese, and then another two bilinguals translated the Chinese-written measures back into English again. A reviewer was hired to compare both the original versions and the back-translated versions of survey instruments and highlight any discrepancies in meanings. After the review process was done, all four translators, together with the reviewer, held a meeting to discuss problems found during the review process. They corrected errors in grammar and syntax and resolved problems of equivalence among the different versions. In addition, we consulted the experts in e-commerce and banking regarding preliminary design of questionnaire. Based on their comments and suggestions, we modified some of the wording and format of the questionnaire to enhance its readability.

After the questionnaire was developed, a pilot test of the measures was conducted with some Executive MBA students in a leading university in southwest of China, and 96 useful filled-out questionnaires were acquired. According to the analysis result of pilot test, we deleted some poor measurement items. We also further modified the wording of the questionnaire according to the feedbacks from these subjects.

Participants

As most banks identified college-educated and computer-literate customers as their targeted user groups for Internet banking services (Chau and Lai 2003), we intended to collect data with individuals of this group. However, it is not easy to identify these people from their appearance. As such, we sent our questionnaire to the adults shopping in five large malls in a metropolitan city in southwestern China. Then based on their answers about their education level and computer literacy, we included only those individuals who were college-educated and computer-literate in our data analysis.

Results

Sample Characteristics

Totally we sent out 600 questionnaires and 558 questionnaires were returned. So the response rate of this study was 93%. Among the returned questionnaires, there were 325 copies filled out by college-educated and computer-literate individuals. To test the possible non-response bias, we followed the method suggested by Armstrong and Overton (1977). That is comparing the chi-squares of the responses from the first 25% of the respondents to that of the final 25%. Significant differences between late responders and early responders indicate the presence of non-response bias. Our results indicated no significant differences between these two groups on key measures. The sample distribution is listed in Table 1.

Table 1 Sample Distribution

Items		Frequency	Percentage
IB use	Yes	172	52.9%
	No	153	47.1%
Gender	Male	171	52.6%
	Female	154	47.4%
Age	Less than 24	70	21.5%
	25-30	123	37.8%
	31-35	72	22.2%
	More than 35	60	18.5%
Education	Associate Bachelor, Bachelor	284	87.4 %
	Master, PhD	41	12.6%

Reliability Analysis

Descriptive statistics and internal consistency reliability analysis were conducted with SPSS12.0, and the result is listed in Table 2. Cronbach's alpha of each construct was between 0.702 and 0.929, indicating the instrument's high reliability.

Table 2 Mean, Standard Deviation, and Reliability

Items	Mean	Standard	Cronbach's α
Perceived usefulness			0.810
PU1	4.31	0.797	
PU2	4.34	0.825	
PU3	4.46	0.743	
Perceived ease of use			0.798
PEOU1	4.20	0.939	
PEOU2	4.03	0.962	
PEOU3	4.10	0.864	
Perceived risk			0.702
PRISK1	3.57	0.997	
PRISK2	3.52	1.063	
PRISK3	3.26	1.028	
Structrual assurances			0.749
SASSU1	3.79	0.893	

SASSU2	3.59	0.951	
SASSU3	3.88	0.859	
Trust toward e-channel			0.739
TRUST1	3.57	0.827	
TRUST2	3.25	0.945	
TRUST3	3.32	0.905	
Intention to adopt			0.929
INT1	3.49	1.008	
INT2	3.63	0.990	
INT3	3.56	0.963	
INT4	3.33	0.987	
INT5	3.49	1.044	

Measurement model

We assessed the measurement model for the constructs by confirmatory factor analysis using LISREL 8.70. Six common model-fit measures were used to assess the model's overall goodness of fit: normalized fit index (NFI), non-normalized fit index (NNFI), comparative fit index (CFI), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), and root mean square error of approximation (RMSEA). The observed values were 0.930, 0.948, 0.957, 0.873, 0.834, 0.067 for the six indices, respectively (Table 3). All the model-fit indices exceed their respective recommended minimum threshold (Chau 1997), suggesting a fairly good fit.

Table 3.   Fit Indices for the Measurement Model

Fit indices	Recommended value	Sample
χ^2/df	$2<\chi^2/df<5$	2.458
NFI	>0.9	0.930
NNFI	>0.9	0.948
CFI	>0.9	0.957
GFI	>0.8	0.873
AGFI	>0.8	0.834
RMSEA	<0.1	0.067

We further assessed the measurement model by examining construct reliability and validity. Construct reliability was evaluated by item reliability and composite reliability. All item's reliability（IR）was higher than the suggested benchmark of 0.5 (see Table 4), demonstrating the measurement items' reliability. Composite reliability of all constructs were greater than 0.8, surpassing the recommended threshold (Nunnally and Bernstein 1994). Construct validity was assessed by convergent and discriminant validity. Convergent validity was evaluated by item loadings and average variance extracted. As shown in Table 4, all factors' loading was higher than 0.6 and was considered significant and as evidence of convergent validity. Average variances extracted of all constructs were greater than 0.5, demonstrating adequate convergent validity.

Table 4. Factor Loading, Composite Reliability and Average Variance Extracted

Factor	Items	Factor Loading	IR	CR	AVE
PU	PU1	0.68	0.827	0.820	0.606
	PU2	0.75	0.804		

	PU3	0.89	0.851		
PEOU	PEOU1	0.60	0.574	0.809	0.590
	PEOU2	0.86	0.688		
	PEOU3	0.82	0.658		
PRISK	PRISK1	0.81	0.663	0.806	0.583
	PRISK2	0.65	0.656		
	PRISK3	0.82	0.652		
SASSU	SASSU 1	0.86	0.629	0.826	0.615
	SASSU 2	0.78	0.559		
	SASSU 3	0.70	0.610		
ETRUSST	ETRUST1	0.75	0.706	0.805	0.579
	ETRUST2	0.72	0.691		
	ETRUST3	0.81	0.682		
INT	INT1	0.79	0.913	0.930	0.726
	INT2	0.89	0.896		
	INT3	0.89	0.897		
	INT4	0.83	0.909		
	INT5	0.86	0.891		

Note: All factor loading are significant at the levels of 0.001

$CR=(\sum L_i)2/[(\sum L_i)2+\sum Var(E_i)]$

$AVE=\sum L_i2/[\sum L_i2+\sum Var(E_i)]$

L_i is factor loading of each item on it's construct

$Var(E_i)$ is error variance of each item

Discriminant validity can be evaluated by comparing the shared variances among constructs and the average variance extracted of the related individual construct. Lower shared variances among constructs than the average variance extracted of individual constructs suggest discriminant validity. Table 5 present the correlation between among constructs and the square roots of average variance extracted of individual constructs. The result provided support for the discriminant validity.

Table 5 Correlations between Constructs
(Diagonal Elements are Square Root of AVE)

	PU	PEOU	PRISK	SASSU	ETRUST	INT
PU	0.778					
PEOU	0.381	0.768				
PRISK	-0.051	-0.063	0.734			
SASSU	0.150	0.185	-0.339	0.784		
ETRUST	0.114	0.140	-0.447	0.759	0.761	
INT	0.231	0.319	-0.358	0.394	0.488	0.852

Structural Model

The research model was tested by analyzing data collected using LISREL 8.70. We examined the structural model in terms of model goodness-of-fit, overall explanatory power and postulated individual causal links. We used the same common model fit measures to examine the overall goodness-of-fit of the structural model as those for the measurement model. As shown in Table 6, all the fit indices were higher than the recommended benchmark value. The results demonstrate a very good model

fit. Thus, we can use the structural model to validate the hypotheses.

Table 6.   Fit Indices for the Structural Model

Fit indices	Recommended value	Sample
χ^2/df	$2<\chi^2/df<5$	2.696
NFI	>0.9	0.920
NNFI	>0.9	0.941
CFI	>0.9	0.948
GFI	>0.8	0.856
AGFI	>0.8	0.822
RMSEA	<0.1	0.072

Properties of the causal paths, including complete standardized path coefficients, p values and the coefficients of determination (R^2) for each endogenous constructs are presented in Figure 2.
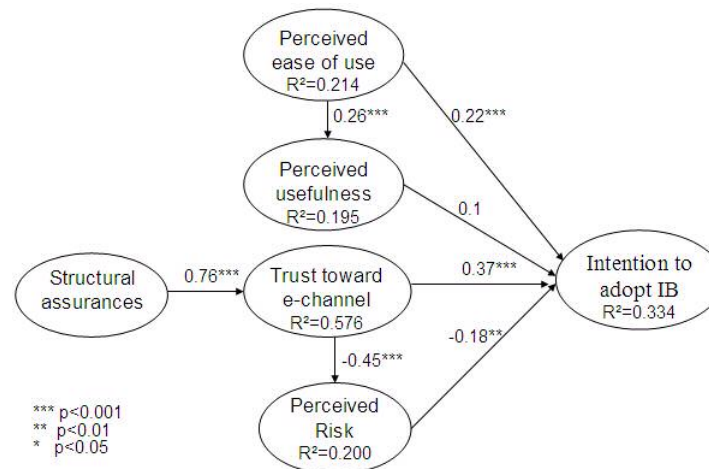

Figure 2. Structural Model

The model was capable of explaining 33.4% of the variance in intention to adopt IB. Also, we examined the significance and relative strength of individual links specified by our research model. Six out of the seven postulated paths were found to be statistically significant: one at the 0.01 level and seven at the 0.001 level. Therefore, all hypotheses, except Hypothesis 1, were supported by the data. Our result shows that PU doesn't have a significant effect on the intention to adopt IB. The result of the direct, indirect and total effect of each factor on intention to adopt IB was shown in Table 7. The three antecedents having the largest impact on IB adoption intention are trust toward e-channel, structural assurances, and perceived ease of use.

Table 7. Direct, Indirect and Total Effect of Each Factor

Factors	Direct effect	Indirect effect	Total effect
ETRUST	0.370	0.081	0.451
PRISK	-0.18	0	-0.18
SASSU	0	0.232	0.232
PEOU	0.220	0	0.220
PU	0	0	0

Discussion and Conclusion

The research findings of this study are consistent with those of prior research in general. More specifically, our finding of trust's effect on IB adoption intention is consistent with the findings of Kim (2004) and Suh (2002), which were conducted in US and Korea, respectively. Indeed, trust was found to be the most significant determinant of IB adoption. This observed significant effect of trust indicates the importance of the role of trust in the adoption of the new IB technology. In this light, nurturing trust and improving the security and reliability of underlying infrastructure are critical to promote IB in mainland China.

Perceived risk exhibited a strong negative effect on adoption in our study. This is consistent with the findings of prior e-commerce adoption research (e.g., Pavlou and Geffen 2004; Jarvenpaa et al. 2000). Also, perceived ease of use had a significant direct effect and indirect effect (through perceived usefulness) on IB adoption. This finding is consistent with prior TAM research in general and IB adoption in particular (e.g., Chau and Lai 2003; Suh 2002). Also, structural assurances demonstrated a positive impact on IB adoption through its influence on trust toward e-channels, confirming the finding of Kim (2004). This high effect suggests that developing the safety nets to protect customers from computer fraud and system hacking may play a significant role in Chinese's embracing IB.

Different from prior research, our study did not find support for perceived usefulness' effect on IB adoption. This may be explained by two reasons. First, there is a lack of value-added IB services, in the view that IB development was at the very early stage in mainland China. Second, access to traditional banking services is convenient. In China, banks are open seven days a week and their locations are within walking distance from where people work and/or live. Therefore, traditional banking, as competing channels of IB, may have higher perceived usefulness, compared to banking services in other countries, which in turn diminishes the value of IB. However, the effect of perceived usefulness on IB adoption should be further studied in mainland China to enrich our understanding.

In addition, this study does have its limitations. Although the research results suggest several significant factors affecting the acceptance of IB, the findings are based on a single study that involved customers in a particular geography. Therefore, caution needs to be taken when generalizing our research results to other customers in other economic and social environments. Also, the research model explained only 33.4% of the variance of the dependent variable, which is comparable to results of most prior similar studies, the unexplained variance suggests that there exist other factors that are important to IB adoption. Therefore, future research should explore the effect of other salient antecedents on IB adoption.

To conclude, this research studied salient factors affecting internet banking adoption among potential customers in mainland China. It made both theoretical contributions and had practical implications. Given that mainland China's social, political and economic environment is very different, the research models well tested in developed countries may not be readily applicable to China. This study applied the well tested TAM model and incorporated additional variables that were theoretically justified and unique to the Chinese research context. Therefore, the current research helps extend our understanding of IB adoption in mainland China and allows researched to compare different effects of salient factors on IB adoption in different countries and regions. Also, our study provides guidelines for practitioners to promote IB in China, a rising economic power house.

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Appendix: Final Research Instruments

Perceived usefulness

PU1. IB allows customers to conduct banking transactions more effectively.

PU2. IB eliminates time constraint, thus customer can use banking services at any time I like

PU3. IB eliminate geographic limitation, thus customers can bank any place that has Internet connection.

Perceived ease of use

PEOU1. Learning to operate IB would be hard for me

PEOU2. It would be easy for me to become skillful at using the IB system

PEOU3. IB system is easy to use

Perceived risk

PRISK1. Others will know information concerning customer's IB transaction

PRISK2. Others can tamper with information concerning customer's IB transaction.

PRISK3. It is very easy for the money to be stolen if using IB.

Structural assurances

SASSU1. The bank has clearly stated policies about the proper use of personal and financial information

SASSU2. The bank has clearly stated protection policies against fraud resulting from the use of IB.

SASSU3. The IB site implements security

Trust toward e-channel

ETRUST1. The Internet technology which is used by Internet bank can perform as well as other technologies such as the telephone

ETRUST2. The course of data transmission of IB via Internet can be continuous

ETRUST3. I trust the Internet technology which is used by IB

Intention

INT1. I intent to experiment or regularly use IB during the next 12 months

INT2. I would like to use more functions of IB

INT3. I intent to increase the frequency of using IB

INT4. I will increase the sum of transaction through IB

INT5. I will frequently use IB