A Study on the Factors Affecting the Intention to Use Smartphone Banking: The Differences between the Transactions of Account Check and Account Transfer

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Abstract

Banking transactions using smartphones or more commonly known as "smartphone banking" are increasingly becoming popular as a way for financial transactions given the growing number of smartphone users. The smartphone banking is considered to be different from mobile banking because of the unique and innovative features of smartphones - a combination of a computer and mobile phone that can easily access the Internet.

This study based on the Technology Acceptance Model(TAM), examines the factors that influence the intention to use smartphone banking by surveys and analyzing the findings gathered from previous mobile banking related researches. Furthermore, this research identifies the issues of security risk and trust in using smartphone banking in addition to its perceived ease of use and perceived usefulness as key factors suggested under TAM.

Statistics on the usage frequency of smartphone banking in Korea shows that the proportion of account transfer transactions are much smaller than the account check transactions, compared with the Internet banking in general. This study explains such less common usage of smartphones for account checking transactions than account transfer transactions, by showing that the key factors (i.e. perceived ease of use and perceived usefulness) have greater impact in account check than in account transfer, and trust has greater impact on account transfer transactions than account check transactions in smartphone banking.

Keywords: *Smartphone Banking, Technology Acceptance Model, Account Check, Account Transfer, Trust, Security Risk*

1. Introduction

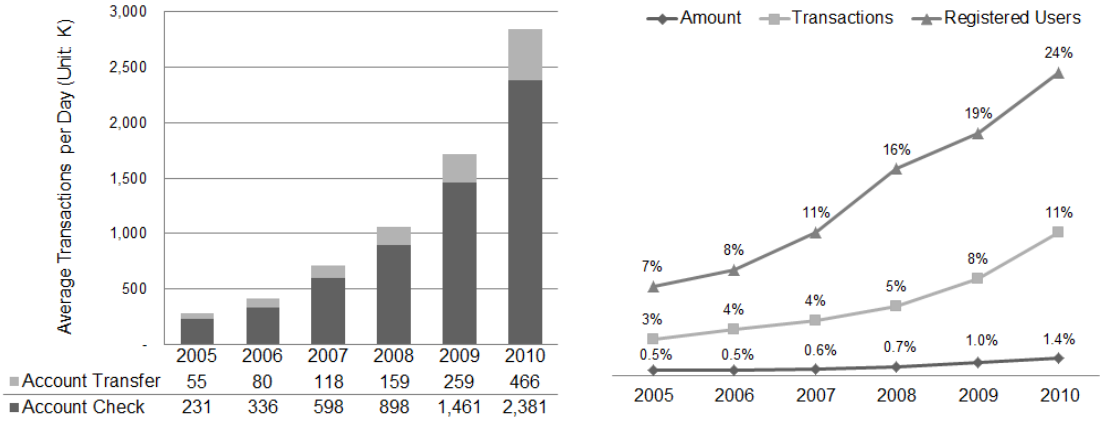
Although, the banks ultimately offered mobile banking services, the influence of telecommunications companies on mobile banking was also very strong because they provided service portal and channels of communication. Tensions were formed between banks and telecommunications companies with respect to gaining more profits and this was why the development and promotion of mobile banking services were not active.

A smartphone, which has spread in Korea since 2009, was the catalyst that caused the change of mobile banking. Using a smartphone, it became possible to use mobile banking service via the wireless Internet without connecting to telecommunications companies' proprietary network and to download and install mobile banking application without going through the portal. For this reason, the influence of telecommunication companies on mobile banking almost disappeared in smartphone banking and banks started to expect that smartphone banking would become prevalent like Internet banking. As banks began to

compete fiercely in order to attract new customers or not to lose existing customers by dominating smartphone banking market, mobile banking in Korea started to grow rapidly.

In 2003, the number of registered customers for mobile banking in Korea was 189,000. However, in 2010, the number rose up to 15,749,000- about 30% of the total population of South Korea. Though the number of mobile banking transactions was only 47,000 on daily average in 2003, it sharply increased by 60 times to 2,847,000 in 2010[1]. The number of registered customers for smartphone banking, which was only 13,000 in 2009, increased exponentially up to 2,609,000 in 2010 – 17% of the whole number of registered customers for mobile banking. In terms of the number of transactions, the growth of smartphone banking was more remarkable. As of the end of 2010, the number of smartphone banking transactions accounted for 70% of the total number of mobile banking transactions[1]. This shows that smartphone users are a group of users who use mobile banking more actively than feature phone users. Considering that the number of smartphone users continues to grow rapidly, it is expected that smartphone users-oriented mobile banking will become more active from now on.

Mobile banking can be divided into account check and account transfer. In case of Korea, the number of checking balances accounted for 84% of daily average number of mobile banking transactions while the number of transfer was only 16% in 2010 as seen in Figure 1 (A). Comparing mobile banking with PC-based Internet banking, the percentage of mobile banking in the whole online banking was 24% in terms of the registered number of customers, but it was 11% in terms of the number of transfer, and only 1.4% on the basis of the amount of transfer as seen in Figure 1 (B). In other words, the number of mobile banking users' account transfer is significantly less than that of the PC-based Internet banking, and the amount of account transfer is relatively very small.



(A) (B)

Figure 1. (A) Trend of Mobile Banking Transactions in Korea, (B) Portion of Mobile Banking Transactions in the Total Online Banking Transactions (source: The Bank of Korea)

There are several reasons why transferring through mobile banking is not more activated than a PC-based Internet banking. Among them, the concerns about reliability and security of mobile banking are considered to be the important issues. Concerns about trust and security of smartphone banking are expected to grow more than those of mobile banking. A smartphone is easy to be exposed to the PC-level hacking and malicious code because

smartphone users can freely download and install various applications and the frequency of wireless Internet access is high.

In this study, by focusing on smartphone banking, which is expected to be the main part of mobile banking in near future, we investigated the reasons why using smartphone banking is not active as compared with the increase of registered users, why most of the transactions are account checking, and why the number and the amount of account transfer transactions stay in low level. In this paper, we studied the difference of usage intention between account check and account transfer based on the technology acceptance model and especially focused on the impact of the security risk and trust considering these issues are becoming main concerns in smartphone banking.

2. Literature Review

In the past, many exploratory studies to identify the factors that influence the usage intention of mobile banking service were conducted. Most of these were based on the Technology Acceptance Model(TAM) by Davis [2]. The Technology Acceptance Model is a general model to explain the user's IT adoption process that is widely used to predict user acceptance of information technology as well as mobile banking. TAM presents two elements – the perceived usefulness and the perceived ease of use- based on Fishbein and Ajzen's Theory of Reasoned Action(TRA) [3]. The model shows that actual behavior is determined by the behavioral intention which is affected by user's attitude and subjective norms. The perceived usefulness is the belief that the system will improve their job performance and the perceived ease of use is the expectation that efforts are not needed to use the system. The Technology Acceptance Model presented that the perceived usefulness has a direct effect on the attitude toward use and behavioral intentions and that the perceived ease of use has a direct impact on the perceived usefulness and the attitude toward use. TAM was validated as a robust and powerful model through many empirical studies and some scholars offered new models by expanding or modifying it [4, 5].

Although many of the existing literature on Korea's mobile banking confirmed that the perceived usefulness affects the usage intension, there were some studies that the perceived ease of use had no significant effect on the usage intension [6, 7]. Also, there were a number of studies related to mobile banking that in addition to the perceived usefulness and ease of use, risk and trust are also other major factors that affect the intension to use.

Yang et al. classified the perceived risk of mobile banking into performance risk, financial risk, risk on loss of time, and social risk8 based on the theory of Cunningham[9]. They analyzed the perceived risk by excluding the risk of physical safety and substituting the risk related to the security of mobile banking for performance risk. They reported that financial risk and security risk have the most profound effect on the perceived risk and that time loss and social risk were insignificant.

Moon and Jung concluded that in addition to convenience, discomfort, innovativeness and previous experience, risk has a significant influence on the intension to use [10]. They defined the risk in terms of security, privacy invasion, the possibility of financial loss, and confidence in the result.

Lee et al. compared Internet banking users with mobile banking users [11]. They concluded that trust has a valid effect in both Internet banking and mobile banking. On the other hand, Lee et al. analyzed by adding trust besides the perceived usefulness and ease of use [12]. They verified the hypothesis that trust might have a positive impact on the intention to use was effective in the Internet banking, but it was not in mobile banking.

Kim et al. performed an intensive empirical research to analyze the impact of trust on the adoption of mobile banking services [13]. They classified the types of trust into relational trust for service providers and transactional trust for mobile channels. They considered self-trust to encompass the concept of internal locus of control as another independent type. The result of this analysis showed that self-trust has the most important effect and trust for the mobile channel also has a significant impact. However, the trust for provider did not have a significant effect. They considered that it was because customer's trust in the bank, which is the mobile banking service provider, had already been formed through the offline experience.

Lee et al. reported that in the mobile banking, security (confidentiality, user authentication, data integrity, and non-repudiation) had a valid influence on both the perceived usefulness and attitudes [7]. However, in Internet banking, security affected attitudes but did not have a valid impact on the perceived usefulness. Their report was somewhat conflicting because security had a positive (+) relationship to the perceived usefulness and had a negative (-) relationship to the attitude toward using mobile banking. They conjectured that the reason could be found in complicated security procedures of mobile banking, which might increase usefulness by reducing hacking risk and decrease attitude toward use by causing inconvenience. Their study indicates that security has a significant impact on the usage intension of mobile banking but additional research is required.

Aforementioned research can be summarized as in Table 1. In this study, we examined research papers mainly on mobile banking in Korea, considering that technologies and services for mobile banking are different by each country and it is significantly affected by the tendency of user group.

Table 1. Factors Affecting the Intention to use Mobile Banking and Related Empirical Research Results

	Validity Exists	Validity Does not Exist
Perceived Usefulness	In most research results	
Perceived Ease of Use	In most research results	[6],[7]
Perceived Risk	[8], [10] ,[14]	
Trust in General	[11],[14],[15],[16]	[12]
Trust on the Security of Channel	[7] ,[13],[17]	

3. Research Model

Particularly over the past five years, technologies which mobile banking is based on rapidly changed. Mobile banking in Korea has changed from the hardware-centric method, which required dedicated mobile phones and IC chips, to software-oriented method, which is provided through the network of carrier from carrier's portal. Further, since the smartphone gained popularity, mobile banking has changed to more open approach of installing the application and using the service through the Internet. Because of the rapid changes in mobile banking services and technologies, although the research is on the same topic, the meaning of mobile banking could be different depending on the timing of the research.

The perceived usefulness, ease of use, cost, risk, trust, etc. are proven factors that have significant effect on the intention to use mobile banking service from the prior research on mobile banking. However, the majority of research on mobile banking is done prior to year 2008, and smartphone banking in Korea especially have started to grow rapidly from year 2010. Therefore, the findings from the prior research might not be applied to the case of smartphone banking. There exist significant differences between smartphone banking and

mobile banking considered in the previous studies. Comparison of the differences is as follows.

Perceived Usefulness: Information processing speed of the smartphone is fast since it has high-performance hardware specifications. And, the smartphone can connect to Wi-Fi network as well as the carrier's network. The users can access the information they want more easily and rapidly since smartphone have larger screen sizes than feature phones and provide high resolution and graphics processing power in general.

Perceived Ease of Use: Smartphone is easy to control by anyone from a child to elderly since most smartphones adopt multi-touch and intuitive user interface functions. But, copying the digital certificate from PC to smartphone is required to use smartphone banking in Korea, unlike the case for mobile banking. Thus, in some senses, the registration process for smartphone banking has become more inconvenient, compared to the mobile banking.

Risk: A smartphone has the characteristics of frequent application installation and network connection/access. And, we can argue that this raised the security risk of hacking and malicious code execution. Further, there exists a vague anxiety about the security of smart phone due to the fact that not much time has passed since its first introduction. However, there could be many people who think that security level for smartphone banking is raised in comparison with earlier mobile banking since Korean smartphone banking regulations made the implementation of a variety of security technologies such as PKI-based digital certificate, keyboard security, antivirus vaccine, firewalls, etc. additionally mandatory.

Trust: The trust in the service provider is considered to be the same, since the service provider is the preferred bank for transactions regardless of whether it is for mobile banking or smartphone banking. However, there could be a change in trust in the channel since the wireless network, to which the smartphone can connect, are extended to Wi-Fi, etc. in addition to carrier's network. And, there could be bigger changes in the trust of the system for smartphone banking than prior mobile banking since the system related to the smartphone banking is still in the early stage of development.

This study based on Davis' TAM model basically hypothesized that perceived usefulness and perceived ease of use affect the intention to use smartphone banking. By analyzing the implications of prior mobile banking research from previous chapter, we also hypothesized that trust further affects the perceived usefulness and the intention to use. Moreover, we suggested a hypothesis that security risk with respect to threat is another key factor that affects the intention to use. Trust is defined based on the findings from the research conducted by Kim et al.[13] and Lee et al.[11], encompassing the concept of self confidence in addition to relational trust and transactional trust. Risk is focused on the security risk of mobile banking with respect to information leakage, exploitation caused by hacking, etc., which are based on the research conducted by Cunningham[9], Yang et al.[8], and the Moon and Jung[10].

The research model and hypotheses used in this study are shown in Figure 2 and as follows.

- H1: Perceived Usefulness will positively(+) affect the Intention to Use.
- H2: Perceived Ease of Use will positively(+) affect the Perceived Usefulness.
- H3: Perceived Ease of Use will positively(+) affect the Intention to Use.
- H4: Trust will positively(+) affect the Perceived Usefulness.
- H5: Trust will positively(+) affect the Intention to Use.
- H6: Security Risks will negatively(-) the Intention to Use

- H7: There will be a positive(+) relationship between Trust and Perceived Ease of Use.
- H8: There will be a positive(+) relationship between Security Risks and Perceived Ease of Use.
- H9: There will be a negative(-) relationship between Trust and Security Risks.

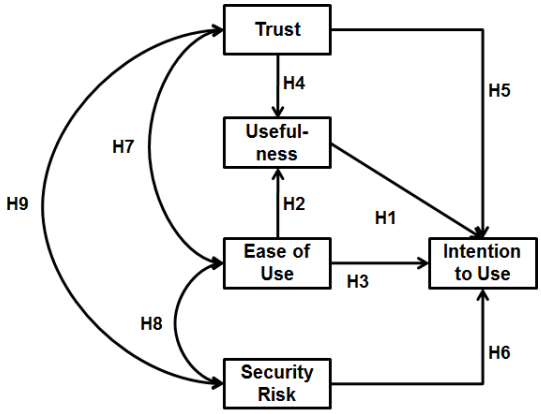


Figure 2. Research Model and Hypotheses

4. Data Collection and Analysis

In order to validate the hypotheses, we performed online survey in January, 2011. The respondents were general public Koreans using smartphones and Internet banking services. The total number of respondents was 247, of which 62% were male. 52% of the respondents were in their 30s, and 22% were in their 40s. 20s were 15% and 11% of the respondents were aged over 50. 31% of the respondents said their primary bank is KB bank, the largest retail bank in Korea, while other Korean major banks such as Woori and NH bank accounted for considerable portions as well. 52% of the respondents said their smartphones are Android-based, and 40% were iPhone users.

The questionnaire consisted of 19 questions and Likert 7-point scale was used. We performed factor analysis with Varimax rotation to check discriminant and convergent validities. In order to measure reliability of each factor, Cronbach's alphas were examined, too. Factor loadings were above 0.6 and variables were clearly classified into five factors. Cronbach's alphas were all above 0.8.

The goodness-of-fit indices summarized in Table 2 generally support the integrity of the overall model. Figure 3 shows standardized path coefficients and corresponding p-values in account check and account transfer transactions. The path analysis confirms that all paths except two were highly significant. The paths connecting security risk to trust, and perceived ease of use to the intention to use, were not significant. Based on the result, hypotheses H1, H2, H4, H5, H6, H7, H8 were accepted, and hypotheses H3 and H9 were rejected in both account check and account transfer.

Table 2. Goodness-of-fit Indices

	GFI	AGFI	NFI	NNFI	CFI	RMR	RMSEA
Account Check	0.995	0.919	0.995	0.965	0.996	0.030	0.098
Account Transfer	1.000	1.000	1.000	1.016	1.000	0.030	0.098
Recommend	>= 0.90	>= 0.80	>= 0.90	>= 0.90	>= 0.90	<= 0.05	<= 0.10

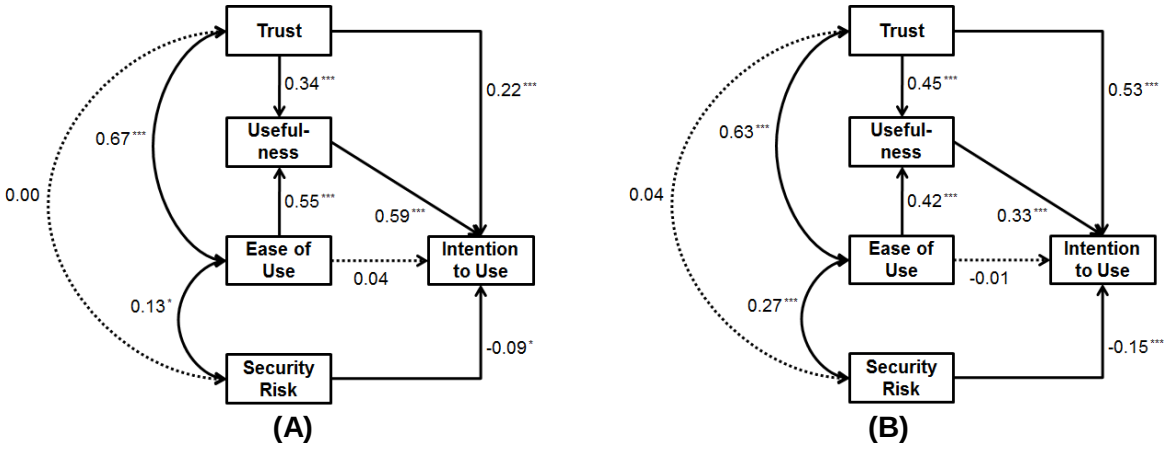


Figure 3. The Results of Path Analysis: (A) Account Check, (B) Account Transfer (* p<0.05, *** p<0.001)

Table 3 summarizes direct, indirect, and total effects of the factors. It can be seen that the perceived usefulness has the greatest effect on the usage intention of account check, and trust has the greatest effect on the usage intention of account transfer.

Table 3. Standardized Path Coefficients

	Account Check				Account Transfer			
	Direct	Indirect	Total	p-value	Direct	Indirect	Total	p-value
Ease of use -> Usefulness	0.554	0	0.554	***	0.416	0	0.416	***
Trust -> Usefulness	0.338	0	0.338	***	0.449	0	0.449	***
Trust -> Intention to use	0.223	0.200	0.423	***	0.526	0.149	**0.675**	***
Security risk -> Intention to use	-0.089	0	-0.089	0.023	-0.147	0	-0.147	***
Ease of use -> Intention to use	0.038	0.327	0.366	0.556	-0.012	0.138	0.126	0.837
Usefulness -> Intention to use	0.591	0	**0.591**	***	0.333	0	0.333	***

For factor-by-factor comparison of the perceived difference between account check and account transfer, we performed two sample t-test and paired t-test, as shown in Table 4. The paired t-test result indicates that a person feels no significant difference in perceived ease of use and perceived usefulness between account check and account transfer. However, in terms of the intention to use, the difference between account check and account transfer was significant.

Table 4. T-test and Paired t-test of each Factor

	Account Check	Account Transfer	t-test (p-value)	Paired t-test (p-value)
Intention to use	5.49	5.33	1.37 (0.170)	3.23 (0.001)
Perceived usefulness	5.56	5.50	0.55 (0.582)	1.59 (0.114)
Perceived ease of use	5.50	5.46	0.40 (0.693)	1.10 (0.272)
Trust	5.07	5.04	0.32 (0.751)	0.82 (0.412)
Perceived security risk	5.18	5.27	-0.79 (0.432)	-1.88 (0.062)

5. Conclusion

In this study, it was confirmed that the perceived usefulness, trust, security risk were the significant factors affecting the intention to use smartphone banking for both account check and account transfer transactions. Security risk had negative effect on the intention to use both account check and account transfer, and the degree of negative effect was greater in account transfer. In account check transactions, the factor having the greatest effect was the perceived usefulness, while trust was the factor with the greatest effect in account transfer. The effect of trust was greater in account transfer than in account check.

The perceived ease of use turned out to have significant influence on the perceived usefulness. But, it did not have significant direct effect on the intention to use in our study. As described in the literature review section in this paper, our study is not the only one that did not identify significant direct effect of the perceived ease of use on the intention to use mobile banking. Our study and previous studies with the similar result indicate that the influence of the perceived ease of use on the intention to use needs further investigation, at least in the mobile and smartphone banking context.

The usage statistics of smartphone banking in Korea conforms to our result of the less intention to use smartphone banking in account transfer than in account check. Our study suggests that such difference in the intention to use can be explained by factors besides the perceived usefulness and ease of use. It seems in smartphone banking, people perceive higher security risk in account transfer transactions than in account check transactions. Combining this with the results showing that trust and security risk have higher influence in account transfer than in account check, we can conclude that trust and security are the major factors explaining why people hesitate using smartphone banking for account transfer transactions besides the perceived usefulness.

The main contribution of our research is in that trust and security risk are confirmed as important factors affecting the intention to use smartphone banking besides perceived usefulness and ease of use. In addition, that fact that there was no significant correlation between trust and security risk suggests that they can be regarded as two independent constructs in the model. Trust can be further refined into trust on service provider, communication channel, institution, and self-confidence, and so on. Further investigation on trust in the context of smartphone banking will be an interesting topic for future research. Also, other types of perceived risk, besides security related risk, seem to be an interesting research topic in smartphone banking.

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