The Effect of Intension to use Biometric-based Non-Face-to-Face Authentication System in Financial Transactions - Focusing on Extended UTAUT Model

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Abstract

Objectives: This study intends to examine factors which have effects of the biometric-based non-face-to-face authentication system on end users’ willingness to use the system, and how such factors affect their willingness to use the biometric system. Methods/Statistical Analysis: This study offers a biometric system user model which adds user innovativeness, self-efficacy, and perceived playfulness, focusing on the unified theory of acceptance and use of technology (UTAUT) which proved to be very effective in explaining the willingness to use information technology of users. To test goodness of fit and hypotheses, hierarchical regression analysis was performed. Findings: The analysis proved that effort expectancy, social influence, user innovativeness, self-efficacy, and perceived playfulness have meaningful effects on the intention to use the system. And, the experience of using general biometric media was found to have moderating effects on the relationship between intention to use and social influence. Improvements/Applications: This study suggests that more efforts should be made to increase usefulness and convenience of the system and to strengthen the basis of facilitating conditions.

Keywords: Biometrics, Perceived Playfulness, Self-Efficacy, UTAUT, User Innovativeness

1. Introduction

Recently, in financial area, there are an increasing number of cases of adopting ‘non face-to-face authentication’ technology. It is now become possible to use financial services online or through mobile devices anytime and anywhere without personally visiting financial offices. Thus, new technology to authenticate persons using video call, bio information or others has come into spotlight. In December 2015, the Financial Services Commission changed its enforcement ordinance to allow users to open accounts with non face-to-face way, and offered five ways to authenticate account users: submission of photocopy of ID card; video call; authentication when access medium is delivered; use of existing account; biometric authentication. The commission designated that the account user is required to go through additional two authentication procedures through mobile phone and personal information as well as going through two of the above five ways. Recently, financial institutions like banks and security companies apply 2 to 3 out of the above five ways.

Against such a background, this study intends to discern factors affecting the willingness to use the biometric-based non face-to-face financial transaction system. In particular, this study designed the main model based on the UTAUT, which has proved through many researches to be excellent in examining factors affecting the willingness of users to use the biometric-based non face-to-face authentication system¹. In addition, this study suggests three variables which can be conceptualized as user characteristics in the UTAUT model — user innovativeness, self-efficacy, and perceived playfulness — and empirically tested how these variables affect the willingness of users to use the biometric-based non face-to-face system.

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At a time when biometric system is being actively adopted in the financial area, if major variables affecting the willingness to use such a system are tested, they can imply much in adopting and applying biometric technology for authentication.

2. Theoretical review

2.1 Biometric Technology

Biometric Technology is defined as “pattern recognition system which can discern physical or behavioral characteristics of users”, or “technology used to authenticate persons based on unique physical, behavioral characteristics of individuals”. As such, biometrics has characteristics which cannot be detached from individuals, which enables accurate authentication. Thus, without carrying around authentication devices, individuals can authenticate themselves with simple actions like approaching parts of their bodies to the biometric sensor.

As shown in Figure 1, there are two kinds of biometric authentication: static biological characteristics like fingerprint, iris, face, blood vessels on the back of hand, retinal blood vessels, lines of palm, ear shape, and DNA, etc.; dynamic biological characteristics like voice, online signature, gait, and key stroke, etc.

Security using biometric technology provides various merits as follows: mutual cooperation is unnecessary; physical location of user is guaranteed; it is highly efficient; biometric characteristics are neither forgotten, nor lost; it cannot be shared; it is cost-efficient; identity can be provided in emergency; identity is not stolen; it is attractive.

The system using biometric technology is used for two purposes. First, it is used to test whether the biometric information of the user stored in the system and the acquired biometric information of the user are the same. Second, it is used to discern a specific user among biometric information acquired from many people.

Biometric technology can be applied and used in a various industries. Specially, Shinhan Bank, for the first time in the Korean financial area, is conducting user authentication with palm vein at non face-to-face digital kiosk. The current situation in adopting biometric authentication in foreign financial institutions is shown in Table 1.

Table 1. International Financial Biometric Cases (2012~2014)

| Country | Bank          | Modality | Methods                                                                 |
|---------|---------------|----------|-------------------------------------------------------------------------|
| US      | US-Bank       | Voice    | - Enable customers to view and account information in the mobile app   |
|         | JPMorgan Chase| Voice    | - Identify authenticity for comparison with the audio information stored in |
|         | Wells Frago   | Voice    |                                                                         |
| UK      | Barclays      | Finger Vein | Approach that combines electronic signatures through the finger vein authentication Technology (PKI) |
|         | Biyokimlik    | Finger Vein | 3,400 branch ATM Sensor                                                 |
| Australia | National Australia Bank | Voice | Voice recognition system can be selected in phone banking system |
| Spain   | BBVA          | Voice    | Voice recognition support in banking apps                              |

Figure 1. Biological characteristics widely used in biometric technology.
### 2.2 UTAUT

For a long time, there have been researches in the MIS area on whether users will actively adopt and use new technology. Such researches can be classified into two types: researches on individual viewpoint and those on company viewpoint. TAM, TPB, and UTAUT belong to the former, and DOI, TOE Framework belong to the latter².

This study fits the study targeting general financial transaction user, that is, the study on individual viewpoint, and intends to apply the UTAUT model as a theory which can explain dispersion of willingness to use.

In³, aware that Technology Acceptance Model⁴ has less validity in the analysis of relationship between extraneous variables and other variables in explaining adoption of technology, performed empirical research by comparing existing Technology Acceptance Models (TAMs) to examine technology adoption in a comprehensive viewpoint¹². UTAUT suggested by¹³ included Effort Expectancy, Performance Expectancy, Social Influence as variables affecting willingness to use, and Facilitating Conditions as the variable affecting using behavior. In addition, this study suggests a new model which can integrate existing technology adoption theories through control variables like age, gender, experience and voluntariness of use. The conceptual model for UTAUT is shown in Figure 2.

![UTAUT conceptual model](image)

#### Figure 2. UTAUT conceptual model

**2.3 User Innovativeness**

User innovativeness is the willingness of user to try a new technology, and means adoption of a new technology by a user before other people¹³¹⁴. Rogers¹⁴ classified consumers into five stages depending on the time they adopt new products. Each consumer group has its own attributes, and such attributes have important effects on adopting and using new technology¹⁵. User innovativeness is the willingness to spontaneously use it, and the person who is high in innovativeness is consumer who is open to new experiences and new stimuli.

In¹³, through their research on the willingness to use mobile value service, suggested that user innovativeness has effect on recognized convenience. In¹⁶ argued that individual innovativeness influences willingness to use agile information system I the future.

As described above, user innovativeness is a factor enabling user to accept something new and change. A group high in user innovativeness has higher willingness to accept them than a group low in user innovativeness.
2.4 Self-Efficacy
Self-efficacy means subjective evaluation of self-efficacy to perform necessary work and activity. It is concept based on social cognitive theory, and suggested by Bandura for the first time. It is known that it not only affects human behavior and goal selection, but the will to pursue the goal. Self-efficacy is understood to be affected by various conditions existing in one's own behavior and given environment, and a crucial factor in self regulation.

In said that self-efficacy is useful because it functions as the basis of measurement of individualized self-capacity which changes in various ways between activity and situational environment.

2.5 Perceived Playfulness
Perceived playfulness is the degree to which the user feels interest or has fun while he or she uses a product or service. Perceived Playfulness is the essential trust in adopting information technology, and it affects the behavior of user. Perceived Playfulness is considered as cognitive and intellectual immersion at individual level, or orientation of each individual.

Among researches on Perceived playfulness emphasized that it can be considerably influenced by playfulness variable as well as by two TAM variables (convenience and usefulness). In using a product, enjoyment motive like pursuit of playfulness is an important utilitarian aspect pursued by consumers through use of products or technology. Perceived Playfulness means that using a product is pleasurable separate from performance of using the product. In particular, in the process where IT product and service are adopted by consumers and form attitude of users, such playfulness plays an important role.

3. Research Model and Research Hypotheses

3.1 Research Model
The aim of this research is to empirically examine the effect of use of the biometric-based non face-to-face authentication system on intension to use it. And, as the user who has experience of using biometric media is very likely to use a biometric system in financial transactions, this research tries to test moderating effect of moderating variable, Experience of Using Biometrics.

Thus, this research, based on existing theories and previous researches, formed a research model shown in Figure 3.

3.2 Research hypotheses

3.2.1 Performance Expectancy
This study defines Performance expectancy as the degree to which one believes that 'use of biometric system will be helpful in improving performance of financial transactions'.

Up to now, many researches have reported that performance expectancy is the antecedent variable statistically most meaningful in explaining the intention to use the system. Consequently, like merits of biometric technology, if a biometric system is based on generality, uniqueness, and continuity, the system will be more useful, leading users to wish to use it more than before. Thus, based on the above theories and existing researches, this research sets up the following research hypotheses about performance expectancy.

H1: Performance expectancy will have positive (+) effects on the intention to use.
H1a: The experience of using biometric will serve moderating effect.

3.2.2 Effort Expectancy
This research defines effort expectancy as 'the degree of convenience related with use of the biometric system'. As biometric system allows one to register one's bio information and use authentication easily, many people will intend to use the biometric system. Thus, based on the above theories and existing researches, this research sets
up the following research hypotheses about effort expectancy.

H2: Effort expectancy will have positive (+) effects on the intention to use.

H2a: The experience of using biometric will serve moderating effect.

3.2.3 Social Influence

Social Influence plays an important role in adopting innovative service in IT area. As innovative service is high in uncertainty in technology and market, consumers are low in their confidence of their judgment. So, they are likely to be dependent on information from others. When there are people who can affect the user behavior, in particular, those who have power to pay for activities of the user satisfying the expectation of them, or punish the activities unsatisfying the expectation of them, it is more likely for the user to act corresponding to the expectation of them.

This research defines social influence as ‘the degree to which I perceive that those who are important to me believe that I should use the biometric system. Thus, based on the above theories and existing researches, this research sets up the following research hypotheses about social influence.

H3: High recognition of social influence will have positive (+) effects on the intention to use.

H3a: The experience of using biometric will serve moderating effect.

3.2.4 Facilitating Conditions

This research defined facilitating conditions as ‘the degree to which, when the user uses the biometric system, he or she believes that organized and technological environment to support his or her financial transaction activities is formed.’ Given that the adoption of the biometric system is still at the initial stage, facilitating conditions can also be considered as a factor which can affect intention to use it. In this perspective, based on the above theories and existing researches, this research sets up the following research hypotheses about facilitating conditions.

H4: Facilitating Conditions will have positive (+) effects on the intention to use.

H4a: The experience of using biometric will serve moderating effect.

3.2.5 User Innovativeness

User innovativeness is the will of the user to try new information technology, and means the adoption of a technology in advance of others. In argued that, since those high in individual innovativeness actively pursue new ideas and are excellent in their capacity to endure uncertainty, they are likely to have positive intention in using new information technology. Many existing researches have shown that personal innovativeness has effect on adoption of new technology.

This research defined user innovativeness as ‘the degree to which a specific user is quick in adopting and using innovation (service or IT) in advance of others.’ Based on concept of user innovativeness suggested by and other researches, this research sets up the following research hypotheses about user innovativeness.

H5: User Innovativeness will have positive (+) effects on the intention to use.

H5a: The experience of using biometric will serve moderating effect.

3.2.6 Self-Efficacy

Self-efficacy is personal belief that one can successfully perform a series of projects and activities necessary to achieve a specific goal. It is known that it can not only affect human behavior and goal selection, but persistence of goal-pursuing action. In suggested that self-efficacy is a factor which has an important effect on behavioral intention of user in adopting mobile banking. Many researches related with information system have proven that self-efficacy is significantly related with intention to use.

This research defined self-efficacy as ‘the degree to which one believes that one can use the biometric technology in performing specific activities. Based on above theories and existing researches, this research sets up the following research hypotheses about self-efficacy.

H6: Self-efficacy will have positive (+) effects on the intention to use.

H6a: The experience of using biometric will serve moderating effect.

3.2.7 Perceived Playfulness

Perceived playfulness is the degree to which the user feels interest or fun in the process of using a product or service. In argued that, for entertainment-seeking IT use, internal motive variable like perceived playfulness is important, and suggested perceived playfulness as a factor affecting intention to adopt among blog users.

In, in their research on enlarged model on technology adoption in web use, reported that perceived
playfulness affects intention to use along with existing cognitive variables – usefulness and convenience.

This research defined perceived playfulness as ‘the degree to which one feels playfulness while using biometric system’. Based on the above theories and existing researches, this research sets up the following research hypotheses about perceived playfulness.

H7: Perceived playfulness will have positive (+) effects on the intention to use.

H7a: The experience of using biometric will serve moderating effect.

3.3 Operational Definitions of Variables and Measurement Tools

To secure measurement validity, all the questions adopted in this research are extracted from existing researches, and question items were revised properly to fit the design of this research. Using those questions, a survey was performed.

In total, 34 questions were used, and Likert-type 7-point scale was used. Operational definitions of variables, measurement items, and related researches dealt with in this research are summarized in Table 2.

4. Empirical analysis

4.1 Data Collection and Analytical Methods

To analyze the effect of biometric-based authentication system on intention to use, this research conducted online survey to those who have experiences in non face-to-face financial transactions. The measurement tools constituting the survey were operationalized referring to existing researches, and Likert-type 7-point scale was used. The survey was conducted to 386 respondents for about two months from January 29, 2016. Excluding 10 copies of the questionnaire presumed to have been filled out not sincerely, 376 copies were used in the final analysis.

To examine demographic characteristics of respondents, frequency analyses were performed, and reliability tests were done to test validity and reliability of variables. All the above analyses were performed with SPSS 22.0.

Table 2. Operational definitions of variables and number of measurement items

| Research variable            | Operational definition                                                                 | NO of measurement items | Related researches |
|------------------------------|----------------------------------------------------------------------------------------|-------------------------|--------------------|
| Performance Expectancy       | Degree to which one believes that use of biometric system will be helpful in improving performance of financial transactions | 4                       | (39) (10)          |
| Effort Expectancy            | Degree of convenience related with use of biometric system                              | 3                       | (40) (10)          |
| Social Influence             | Degree to which I perceive that those important to me believe that I should use biometric system | 4                       | (41) (10)          |
| Facilitating Conditions      | Degree to which user, when using biometric system, believes that there is organized and technological environment to support his or her financial transactions | 4                       | (42) (10)          |
| User Innovativeness          | Degree of quickness in adopting and using innovation (service or IT) in advance of other users | 8                       | (43) (40)          |
| Self-Efficacy                | Degree to which one believes that he or she has ability to use biometric technology in performing a specific activity | 3                       | (44) (42)          |
| Perceived Playfulness        | Degree of playfulness one feels while using biometric system                             | 3                       | (45) (43)          |
| Intention to Use             | Degree of intention, plan, or possibility to use biometric system                       | 4                       | (44) (41)          |
| Experience of Using Biometrics | Whether one has experienced use of general biometric media                               | 1                       | (44)               |
4.2 General Characteristics of the Sample

Frequency analyses on the demographic characteristics of respondents showed the followings: 258 males (68.6%) vs 118 females (31.4%) in gender; 149 respondents in their 40s (39.6%), 121 in 30s (32.2%), 65 in 20s (17.3%), and 41 in 50s or above (10.9%) in age distribution. Proportions belonging to different job categories are as follows: 239 office workers (63.6%), 42 college and graduate school students (11.2%), 31 government officials and professionals (8.2%), 16 self-employed workers (4.3%), 9 researchers (2.4%), 6 housewives (1.6%), and 2 others (0.5%) in descending order. Proportions belonging to final education categories are as follows: 255 university students or graduates (67.8%), 72 graduate school students or graduates (19.1%), 39 college students or graduates (10.4%), 10 high school graduates or below (2.7%) in descending order. In religion variable, 231 respondents (61.4%) had religions, while 145 (38.6%) did not have any. Proportions of respondents residing in metropolitan cities and provinces are as follows: 191 respondents (50.8%) living in Seoul, 83 (22.1%) in Gyeonggi province, 59 (15.7%) in Choongnam and Choongbuk, 31 (8.2%) in Kangwon province, 9 (2.4%) in Jeju province, and 3 (0.8%) in Gyeongnam and Gyeongbuk provinces.

4.3 Factor Analysis and Reliability Analysis

Before data analysis, reliability and convergent validity of variables were tested. To test validity, exploratory factor analysis was performed, and varimax rotation was done for principal component analysis.

The analysis to test validity of independent variables showed that all the factor loadings were higher than standard value .6, except for EE3 (.599). The range of Eigen values is 1.944~7.279 (≥ 1 criteria), and the range of Cronbach’s Alpha values is .850~.971 (≥ .7 criteria), proving that reliability and convergent validity of independent variables are secured.

The findings of factor analysis and reliability analysis of independent variables are shown in Table 3.

The findings of factor analysis of dependent variable are as follows: Factor loadings cover the range of .931~.950 (≥ .6 criteria), Eigen Value is 3.517 (≥ 1 criteria), and Cronbach’s Alpha is .945 (≥ .7 criteria), proving that reliability and convergent validity of dependent variable are also secured. The findings of factor analysis and reliability analysis of dependent variable are shown in Table 3.
The Effect of Intension to use Biometric-based Non-Face-to-Face Authentication System in Financial Transactions - Focusing on Extended UTAUT Model

reliability analysis of dependent variable are shown in Table 4.

Table 4. Findings of factor analysis and reliability analysis of independent variables

| Item  | IU  |
|-------|-----|
| IU 2  | .950 |
| IU 1  | .935 |
| IU 3  | .934 |
| IU 4  | .931 |
| Eigen Value | 3.517 |
| Total dispersion | 87.921 |
| Cumulative dispersion | 87.921 |
| Cronbach’s α | .945 |

Kaiser-Meyer-Olkin Measure of sampling adequacy = .958, Chi-square = 11721.709, df = 406, significance = p<.001

4.4 Correlation Analysis among Variables

There were significant positive correlations among all variables. Specifically, correlations among independent variables were .528 or over; correlations between moderating variable, experience of using biometric authentication, and independent variables were .289 or over; correlations between intention to use and independent variables were .652 or over, somewhat high values; correlations between intention to use and moderating variable was .346. Mean results among variables were as follows: independent variables were 4.95 or over; experience of using biometric authentication was .60, and intention to use was 5.19. The results of correlation analysis are shown in Table 5.

4.5 Results of Hypothesis Test

To compare the UTAUT model and the enlarged version of UTAUT model as model to explain intention to use the biometric-based authentication system, hierarchical regression analysis was performed, and the results are shown in Table 6 and Table 7. First, it was found that all of the four variables in the UTAUT model significantly affect dependent variable, Intention to Use (F=162.686, p<.001), and explanatory power of dispersion was 63.7%
Table 6. Results of Hierarchical regression analysis on Intension to Use (N=376)

| Model 1: UTAUT model | Model 2: Enlarged UTAUT model |
|----------------------|-------------------------------|
|                      | Non-stded coefficient | Stded coefficient | t-value | VIF | Non-stded coefficient | Stded coefficient | t-value | VIF |
|                      | B   | SE  | β   |                  | B   | SE  | β   |                  |
| Constant             | -.090 | .218 | -.412 | -.335 | .175 | -1.911 |
| PE                   | .229 | .059 | .200 | 3.863*** | .052 | .047 | .046 | 1.117 | 2.933 |
| EE                   | .190 | .062 | .167 | 3.052*** | .187 | .048 | .165 | 3.872*** | 3.164 |
| SI                   | .430 | .051 | .391 | 8.426*** | .215 | .042 | .196 | 5.179*** | 2.499 |
| FC                   | .162 | .048 | .156 | 3.388*** | -.047 | .042 | -.046 | -1.136 | 2.822 |
| UI                   |      |      |      | .088 | .039 | .087 | 2.253* | 2.620 |
| SE                   |      |      |      | .105 | .044 | .098 | 2.381* | 2.961 |
| PP                   |      |      |      | .447 | .034 | .492 | 13.182*** | 2.429 |
| R²                   | .637 |      |      |      |      |      |      |     |
| F Value              | 162.686*** |      |      |      |      |      |      |     |
| ΔR²                  | -    |      |      |      |      |      |      |     |
| FΔR²                 | -    |      |      |      |      |      | 88.711*** |     |

*** p < .001, ** p < .01, * p < .05

Table 7. Results of hypothesis test

| Path         | t-value | Result |
|--------------|---------|--------|
| H1 PE → IU   | 1.117   | Reject |
| H2 EE → IU   | 3.872***| Accept |
| H3 SI → IU   | 5.179***| Accept |
| H4 FC → IU   | -1.136  | Reject |
| H5 UI → IU   | 2.253*  | Accept |
| H6 SE → IU   | 2.381*  | Accept |
| H7 PP → IU   | 13.182***| Accept |

*** p < .001, ** p < .01, * p < .05
Next, to test moderating effect of Experience of Using Biometrics on the relationship between independent variables and Intention to Use, hierarchical regression analysis was performed. While explanatory power of Model 1 which does not include the moderating variable was 78.9% (R²=.789), that of Model 2 which includes the moderating variable was 79.8% (R²=.798). Increase of R² (ΔR²) was 0.9%, and F value for this change was 1.977. It was statistically significant. In particular, the moderating variable was found to have positive (+) effect on the relationship between Intention to Use and Social Influence. The results on the moderating effects are shown in Table 8.

5. Research Findings and Significances

5.1 Summary of Research Findings and Discussion

This study, adopting the biometric-based non face-to-face authentication system, that is, the UTAUT on the biometric system, tried to discern existing antecedent variables such as Effort Expectancy, Performance Expectancy, Facilitating Conditions, Social Influence and other three antecedent variables like User Innovativeness,

### Table 8. Moderating effect of Experience of Using Biometrics (N=376)

|                    | Model 1 |       |       |       |       |       |       |       |       |       |       |       |       |
|--------------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                    | B       | SE    | β     | t-value | VIF | B       | SE    | β     | t-value | VIF |       |       |       |
| Constant           | -.335   | .175  | -.1911|         | 2.933 | -.480   | .204  | -.2357|         | 6.348 |       |       |       |
| PE                 | .052    | .047  | .046  | 1.117  | 2.933 | .036    | .049  | .032  | .0736  |       |       |       |       |
| EE                 | .187    | .048  | .165  | 3.872  | 3.164 | .213    | .051  | .188  | 4.181  | 3.588 |       |       |       |
| SI                 | .215    | .042  | .196  | 5.179  | 2.499 | .268    | .044  | .245  | 6.122  | 2.842 |       |       |       |
| FC                 | -.047   | .042  | -.046 | -1.136 | 2.822 | -.046   | .043  | -.045 | -1.092 | 3.009 |       |       |       |
| UI                 | .088    | .039  | .087  | 2.253  | 2.620 | .048    | .041  | .047  | 1.155  | 2.947 |       |       |       |
| SE                 | .105    | .044  | .098  | 2.381  | 2.961 | .125    | .045  | .117  | 2.774  | 3.163 |       |       |       |
| PP                 | .447    | .034  | .492  | 13.182 | 2.429 | .427    | .035  | .470  | 12.142 | 2.663 |       |       |       |
| (EUB)              | -.003   | .071  | -.001 | -.047  | 1.276 | -.005   | .063  | -.002 | -.075  | 1.120 |       |       |       |
| PE * EUB           | -.005   | .063  | -.002 | -.075  | 1.120 | -.065   | .063  | .026  | 1.031  | 1.127 |       |       |       |
| EE * EUB           | .222    | .065  | .088  | 3.430  | 1.61   | .069    | .065  | .026  | 1.049  | 1.608 |       |       |       |
| SI * EUB           | -.083   | .064  | -.033 | -1.292 | 1.157 | -.031   | .063  | .012  | .489   | 1.096 |       |       |       |
| FC * EUB           | -.034   | .065  | -.013 | -.522  | 1.080 | -.034   | .065  | -.013 | -.522  | 1.080 |       |       |       |

**Note:**
- R² = .789
- F value = 196.563***
- ΔR² = .009
- F value (ΔR²) = 1.977"'

"**p<.001, ”p<.01, `p<.05"
Self-Efficacy and Perceived Playfulness and examine the effects of those variables on dependent variable Intention to Use. And, using experience of using biometric media as moderating variable, this research examined moderating effect of this variable. Major findings and hints derived from them can be summarized as follows.

First, in the enlarged UTAUT which is the research model of this study, Performance Expectancy and Facilitating Conditions were found not to have meaningful effects on Intention to Use. In the existing UTAUT, all the four antecedent variables were found to affect Intention to Use significantly. But, when other variables — User Innovativeness, Self-Efficacy, Perceived Playfulness — were added, Performance Expectancy and Facilitating Conditions became not significant.

Many previous researches have reported that Performance Expectancy is the antecedent variable which is the most significantly effective antecedent variable. But, this research showed contradictory results. The reason for the different results may be derived from the fact that, since the authentication system using bio information is still in its initial stage, users are not good at doing financial transactions such as settlement, payment, withdrawal, transfer, and opening new bank account on smart phone, they are not fully aware of them, and that complex authentication to strengthen financial security lead to satisfactory level of Performance Expectancy in the biometric system.

Facilitating Conditions was not significant as well in affecting Intention to Use. The reason for it may be derived from the fact that, since Facilitating Conditions is the variable which directly affects the use of a specific system and is defined as the degree of belief one has on organized and technological infrastructure which exists to support use of the system, it is easier to register one’s bio information, and authenticate oneself in financial transactions than using other complex information system. Thus, the variable, Facilitating Conditions, may have small effect on Intention to Use. For example, it is easy for customers to go through the bio information registration process from digital Kiosk some commercial banks are equipped with, with the help of bank employees. And, customers can also easily authenticate themselves with the help of visual communication with teller of digital kiosk and guiding message on the screen.

Second, it was found that User innovativeness and Self-efficacy significantly affect Intention to Use. The findings are consistent with previous researches. As a new emerging technology which enables customers to authenticate themselves using bio information gets attention as the government allowed financial institutions to adopt non face-to-face authentication, those who are high in innovativeness and self-efficacy intend to use the new technology more than other people do.

Third, among antecedent variables, Perceived Playfulness was found to be the strongest in its impact on Intention to Use. It is consistent with other researches showing that Perceived Playfulness significantly influences Intention to Use. It seems that, in the process of registering and authenticating oneself with one’s bio information, one feels playful.

Finally, the moderating effect of experiencing to use other biometric media was not statistically significant except for the case of the variable Social Influence. It means that whether one experienced using biometric media (fingerprint, iris, or finger vein, etc.) when one entered a facility or when one dealt with documents at public office does not have any influence in Intention to Use, which means that, even if one has experience of using authentication media, it does not work as motive of intention to use biometric media in the financial transaction environment (brief settlement, settlement, payment, withdrawal, transfer, and opening of new account, etc.). In the relationship between Intention to Use and Social Influence, for those who had experiences of using biometric media, social influence is more likely to increase intention to use. The finding is consistent with results of previous researches showing that when there are people who have power to give benefit to users when they do what is expected, and punish users who fail to do what is expected.

5.2 Significances of this Research and Future Direction of Research

Theoretical and practical significances of the research are as follows.

First, the research is meaningful in the sense that it conducted empirical research to potential users of what is currently at issue, biometric-based non face-to-face authentication service. Up to now, most researches dealing with non face-to-face authentication are researches on biometric technology in the perspective of information security, and little has been done on analysis on intention to use biometric system from the perspective of users. It suggests that more researches are necessary in the future.
Second, it is meaningful in the sense that it developed additional variables affecting intention to use biometric system, and designed an enlarged biometric system adoption model based on the UTAUT model, and empirically analyzed it through survey.

Third, financial institutions are considering adoption of biometric-based authentication system in various aspects. Thus, it is necessary to strengthen usefulness and convenience and the basis of Facilitating Conditions not in the perspective of system operator, but in the perspective of users as well as strengthening financial security.

Even if this research is theoretically and practically meaningful as described above, it also has some limitations as follows.

First, besides the independent variables in the model, we need to search for additional variables based on characteristics of biometric technology and user characteristics to apply them in the future research.

Second, this research which was done in the initial stage of biometric-based non face-to-face authentication system is not sufficiently deep. In particular, we need more enlarged researches on the differences caused by characteristics of non face-to-face channels and biotechnology. Thus, it is necessary to do more in-depth research on this subject.

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