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Moderating effect of personal innovativeness on mobile-RFID services: Based on Warshaw's purchase intention model

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ABSTRACT

As telecommunication market becomes more competitive and the customers' expectations regarding services or products increases, understanding customer or market needs is at the center of successful telecommunication business.

In this study, we attempt to explore the intention of using mobile services based on the Warshaw's purchase intention model. We also focus on a personal innovativeness in the domain of IT (PIIT) because we assumed that as characteristics of telecommunication services become increasingly sophisticated, personal innovativeness could be a key factor of telecommunication services usage. In this study, we examine whether PIIT has the moderating effect on purchasing mobile-RFID services. The result shows that both purchasability and perceived need collectively explain purchase intention of mobile-RFID services, as well as PIIT serves to moderate the relationship between perceived need and purchase intention of mobile-RFID services. The study findings also indicate that IT knowledge, responsiveness to IT news and ability to use mobile phone of customers are positively related with PIIT.

1. Introduction

The telecommunication market in Korea is becoming saturated in terms of the number of service subscribers and the industry growth rate. The growth rate of telecommunication service subscribers, such as broadband Internet access service subscribers and mobile telecommunication service subscribers, is rapidly decreasing [1,2]. Moreover, the growth rate of telecommunication industry is expected to decrease [2]. Recently, to overcome these crises, telecommunication companies have started to focus on data service rather than voice service, and the revenue from data service is gradually increasing [3]. In addition to such changes, telecommunication corporations are struggling to find new a business model through convergence services like Digital Multimedia Broadcasting (DMB), Internet Protocol Television (IPTV), and mobile-RFID services.

While developing these convergence technologies or services, telecom firms should consider several points, as not all new technologies are successful. Even though new technologies or services may be superior to existing ones, some of the new ones have difficulties in reaching users and being successful in the market. Factors affecting successful technology diffusion include the performance of the technology, market needs, socio-economic conditions, and government policy [4–8]. Among these factors, we focus on customers' needs because diffusion of new technologies usually results from a series of individual decisions to begin using the new technology. Individual decisions are the result of a comparison of the perceived values of the new technology with the uncertain costs of adopting it. Thus, it is worthwhile to understand the factors affecting this choice. This paper explores the personal perspective of technology adoption processes and therefore aids forecasting.

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In order to understand customers' behavior and intentions, researchers have applied the theory of reasoned action (TRA) [9] across a wide variety of areas. Since the TRA, however, is quite general, it should be tailored for specific behavior [10]. The technology acceptance model (TAM) by Davis [11], as an adaptation of the TRA, has been considered as an appropriate model for explaining computer usage behavior. On the other hand, Warshaw [12] has argued that TRA has weak predictive power in marketing applications, and thus he has suggested a new intention model specialized in product purchase situations.

Prior studies on intentions to use mobile services can be categorized by service types; studies on mobile advertisements [13–15], studies on mobile commerce and mobile banking [16–18], studies on mobile Internet [19], and studies on mobile entertainment [20,21]. However, most of these are based on TAM, few use product purchase intention theories in a marketing field. In a preliminary study, we found that the purchase intention model can be adopted to mobile-RFID service purchases, moreover, the purchase intention model has a better explanation power than TAM [22]. Based on this preliminary study, we expanded the present study into two steps and increased the sample size.

In the first step, we present our research model, based on Warshaw's purchase intention model, to examine whether the purchase intention model can be applied to purchasing mobile-RFID services. It is worth doing because Warshaw's model was developed and tested to predict the purchasing behavior of some products, such as detergent or shampoo, not for services [12]. Few studies have tried to apply product purchase intention theories to service purchases, especially in telecommunication services. Purchasing services versus products may differ in several aspect, however, the charge systems behind mobile-RFID services is similar to buying a product; in that the customer pays for each use. Therefore, we believe that the purchase intention model can be adopted.

As a second task in the first step, we examine whether a personal innovativeness in the domain of IT (PIIT), proposed by Agarwal and Prasad [23], has a moderating effect on the purchase of mobile-RFID services. As the characteristics of telecommunication services become increasingly sophisticated, personal innovativeness can be a key factor in determining telecommunication services usage.

In the second step, we attempt to find the relationship between PIIT and the personal characteristics of Korean customers for practical use. Even though the moderating effect of PIIT is significant, it is of little use because telecommunication service providers do not have information about the degree of PIIT possessed by their customers. Thus, we planned this second step to examine the relationship between PIIT and the personal characteristics that are available to service providers. Demographics and variables used in computer alienation [24] are tested.

2. Theoretical background and hypotheses

2.1. The adoption of new technologies

The adoption of new technologies by the ultimate users takes time. Rogers [25] defined the diffusion of innovation as the expansion of a new idea or product from its source to its ultimate adopters. Of the many new technologies introduced to the market every year, only a small percentage becomes successful. As the market becomes more competitive, and the customers' expectations regarding services or products increases, the probability of successful adoption of a new technology becomes more uncertain. This increased ambiguity shifts our attention from a 'technology-push' perspective to a 'demand-pull' perspective. In current research on technology adoption there are two main branches; one of them relates to new innovative processes or frameworks for successful technological adoption [26–28], the other one aims to discover critical factors through case analysis [4–8]. Factors affecting successful technology adoption include; technological factors; market-related factors; socio-economic factors; regulatory factors; and factors related to internal organization.

In a prior study focusing on market demand side of the technology adoption, Tang [7] considered the needs of the customers to answer the question as to what should be of interest to identify technology opportunities. The paper investigated the adoption process of five navigation technologies, to discover why some of them had more difficulty and took longer than the others to reach their eventual users. From the review of five cases, the research concluded that successful developments of technological innovations depend on the performance of those technologies; however, the adoption of an innovation depends on non-technical factors.

Shin [8] investigated the user factors that drive the adoption of IPTV. The research analyzed the demand for IPTV using the TAM as a conceptual framework and method of logistic regression. Shin [8] defined intrinsic factors as those individually motivated behaviors of users who want to seek intrinsic satisfaction, while extrinsic factors were defined as behaviors prompted by a user's need to interact with external entities. The findings suggest that a user's motivation can be explained in terms of intrinsic and extrinsic factors; intrinsic desire to enjoy individualized content and service, and extrinsic desire to interact with others. These findings further show that respondents who will adopt IPTV have used other convergent services.

Lee, Gemba and Kodama [27] expanded the concept of demand articulation to social demand articulation in order to analyze innovation based on environmental considerations. Demand articulation, usually used at the product development stage, is a skill that converts an unclear set of needs into well-defined products. Some individual firms successfully realize the needs of potential users through a process of demand articulation [29]. The study suggested a framework for social demand articulation that internalizes social demands in the corporate decision-making process. In the framework, the role of environmental knowledge and information flows is to connect firms and social stakeholders. The practical application of the framework, in the case of hybrid engines, revealed that knowledge and information flows on local air quality led to the development of high-efficiency and low-emission automobiles.

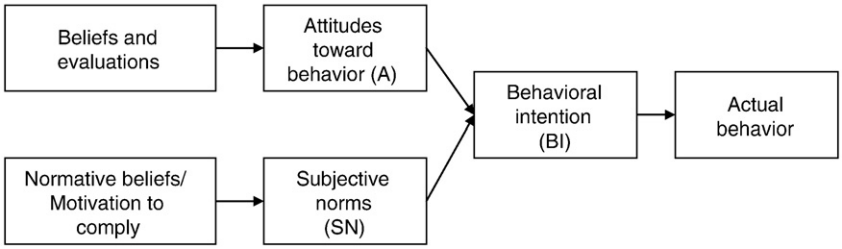

Fig. 1. Theory of reasoned action (TRA).

2.2. Behavioral intention

To understand the relationship between behavior and intention, researchers have been using the theory of reasoned action [9] across a wide variety of areas. According to TRA, a person's actual behavior is highly correlated with behavioral intention (BI), and both attitudes (*A*) and subjective norms (SN) are the determinants of a person's behavioral intention. BI is a subjective probability of one's performing the behavior. *A* is defined as an individual's attitude (positive or negative) toward the behavior, and SN refers to the social pressure that most people, who are important to the individual, exert on the individual influencing him or her to do (or not do) the specific behavior. Thus: BI = A + SN.

For example, if a person is going to purchase an automobile, the intention of buying (BI) an automobile precedes the actual purchase. Suppose the person had a strong desire (*A*) to buy a luxurious automobile, which may be unsound for the person. As a result, social force from close and respected colleagues (SN) may diminish the effects of buying intention that could influence an actual purchase. Similarly, even though *A* has a negative effect on BI, a strong positive effect of SN on BI could result in actual purchase.

One's attitude toward behavior (*A*) is determined by one's beliefs about the outcomes of performing the behavior, whereas perceived expectation of specific social groups of the behavior determines the subjective norms (SN). Fig. 1 illustrates the constructs of the theory of reasoned action.

However the theory of reasoned action is quite general, therefore it should be tailored to be more applicable to telecommunication services. The technology acceptance model (TAM) by Davis [11], as an adaptation of the TRA, is an appropriate model for explaining computer usage behavior. Because of the properties of TAM, it is also appropriate for in telecommunication service usage and a considerable amount of research has utilized TAM.

The main purpose of TAM is to provide an explanation of the impact of external variables on internal beliefs (perceived usefulness and perceived ease of use), attitudes, and intentions (Fig. 2). Perceived usefulness (*U*) refers to a person's tendency of using or not using an application to the extent that the person believes it will help him or her perform their job better [30]. Perceived ease of use (*E*) is defined as "the degree to which the prospective user expects the target system to be free of effort" [10].

According to TAM, actual computer usage is determined by behavioral intention to use the system (BI), and BI is determined by the person's attitude toward using the system (*A*) and perceived usefulness (*U*). That is: BI = *A* + *U*.

The BI–*A* relationship is based on TRA, however, compared to TRA, TAM does not include a subjective norm (SN) construct as a determinant of BI. Instead, TAM suggests the BI–*U* relationship is based on the hypothesis that people form intentions toward specific behaviors, such as using computer systems within organizational settings, based on a cognitive assessment of how it will increase their performance [10]. These two relationships are supported by previous IS research with empirical evidence. Although BI itself has seldom been measured, several articles have measured user attitudes (*A*) and have revealed a significant link between attitudes and usage [31]. Usefulness (*U*) also has been measured and has been linked to usage [32].

As illustrated in Fig. 2, attitude (*A*) is jointly determined by perceived usefulness (*U*) and perceived ease of use (*E*). This is based on TRA's link between attitude (*A*) and the beliefs that one's attitude toward a behavior (*A*) is determined by one's beliefs about the outcomes of performing the behavior. TAM posits two beliefs—perceived usefulness (*U*) and perceived ease of use (*E*). TAM's hypothesis on the *U*–*A* link, *U* has positive influence on *A*, is based on the previous research that positive outcomes often increase a person's affect toward the means [33], and it is supported by previous IS research containing empirical evidence [34]. The link between ease of use (*E*) and attitude (*A*) is inspired by self-efficacy and instrumentality [10].

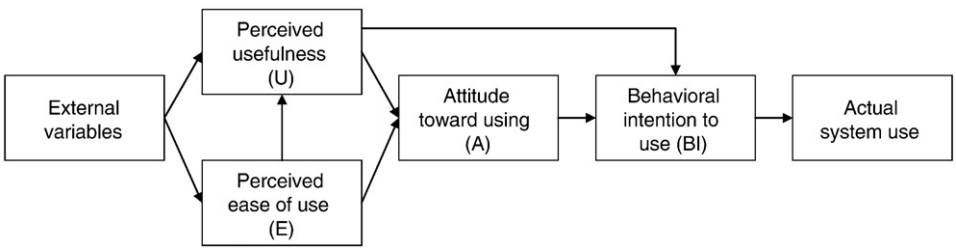

Fig. 2. Technology acceptance model (TAM).

Perceived ease of use (*E*) also has a positive influence on usefulness (*U*) directly, because improvement in *E* contributes to increased performance. Also, *U* can be influenced by other external variables, such as system characteristics, above *E*. Thus, *U* is jointly determined by E and external variables. Likewise, perceived ease of use (*E*) is determined by external variables such as system features [35], training, documentation, and user support consultants.

2.3. Purchase intention

Other theoretical frameworks have been proposed to explain customer behavior. Warshaw has proposed the purchase intention model [12] that is a more focused version of the TRA. He has argued that TRA has weak predictive power in marketing applications, and thus he has suggested a new intention model specialized in product purchase situations [12]. When compared to the TRA, the purchase intention model has shown higher stability and reliability in predicting purchase decisions and lower multicollinearity between independent variables of the purchase decisions [12]. Moreover, this model has proven successful in explaining and predicting purchase decisions across a wide variety of product types [36].

The purchase intention model focuses on motivational and non-motivational factors that influence purchase intention. The motivational factors indicate the willingness of a person to perform the purchase behavior. Both a person's own desire and perceived pressure determine the person's perceived need (X2). On the other hand, non-motivational factors are subsumed in purchasability (X1), which is determined by both affordability and accessibility. A purchase intention (BI) of a product is postulated as a function of the purchasability (X1) of the product and perceived need (X2) [12]. Fig. 3 shows the constructs of Warshaw's model.

In a preliminary study, we have found an indication that the purchase intention model has better explanation power than TAM [22]. Thus, based on the purchase intention model, we form hypotheses H1 and H2 as follows.

H1. Purchasability has a positive effect on purchase intention of mobile-RFID services.

H2. Perceived need has a positive effect on purchase intention of mobile-RFID services.

2.4. Personal innovativeness

Agarwal and Prasad [23] have proposed a new construct that illuminates the relationships in technology acceptance models, i.e., personal innovativeness in the domain of information technology (PIIT).

Personal innovativeness (PI) is one of the variables that potentially affect how people respond to innovations. This construct has been studied in innovation diffusion research [25] and particular marketing fields [37,38]. The operational definition of personal innovativeness centers on the willingness of individuals to adopt an innovation. Thus, a person is characterized as innovative, if he or she is early to adopt an innovation. Researchers in marketing have pointed the importance of drawing a distinction between global innovativeness and domain-specific innovativeness [37], since global innovativeness demonstrates low predictive power when it is applied to specific innovation adoption decision [39].

As a domain-specific innovativeness, Agarwal and Prasad [23] have defined PI in the domain of information technology (PIIT) as "the willingness of an individual to try out any new information technology." Following from the definition of PIIT, they suggest that PIIT serves as a key moderator in technology acceptance behavior (Fig. 4).

As a moderator of the antecedent of perceptions, PIIT moderates the development of perceptions; a person with higher levels of PIIT is expected to develop more positive perceptions about new IT. As a consequence, moderator PIIT epitomizes the risk-taking trait; an individual with higher levels of PIIT is expected to have more positive intentions to use of new IT.

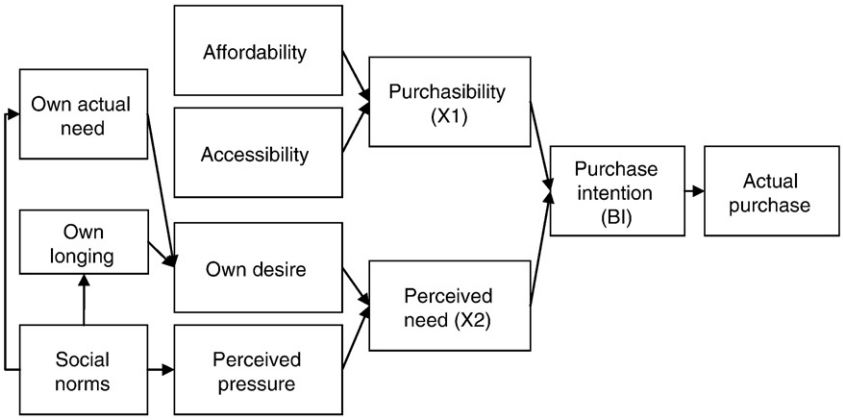

Fig. 3. Purchase intention model.

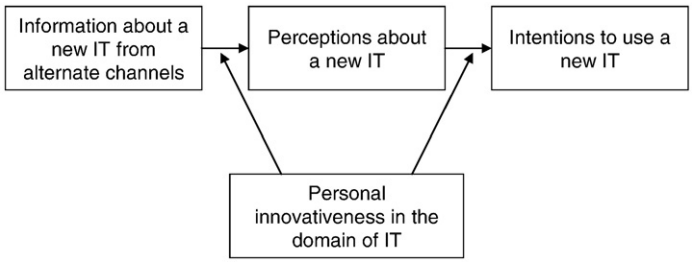

Fig. 4. Relationship between PIIT and other technology acceptance constructs.

Previous literature review on PIIT, which serves to moderate the relationship between perception and consequences of perception, leads to hypothesis 3 that PIIT serves to moderate the relationship between perceived need (perception) and purchase intention of mobile services (consequences of perception).

H3. PIIT has a moderation effect between perceived need and purchase intention of mobile-RFID services.

2.5. Research model

Based on Warshaw's model and the literature review discussed earlier, Fig. 5 shows the research model proposed for this study. Both purchasability and perceived need collectively explain purchase intention of mobile-RFID services, and as PIIT additionally serves to moderate the relationship between perceived need and purchase intention of mobile-RFID services.

For the second step, as explained in introduction, we explore the relationships between personal characteristics of customers and PIIT from a practical perspective (Fig. 6). We believe that it is easier for mobile operators to obtain information about subscribers' demographics and some types of personal information than it is to get information about their degree of innovativeness. Hypotheses 4 and 5 capture the positive associations between PIIT, and a respondent's knowledge of IT and a respondent's receptiveness to information about IT, respectively. According to Abdul-Gader and Kozar [24], computer knowledge alleviates negative attitudes toward computers and a low receptiveness to information sources about computers is significantly associated with computer alienation. Negative attitudes and alienation toward IT can reduce the willingness of an individual to try out any new information technology, thus we form H4 and H5.

H4. A direct relationship exists between PIIT and IT knowledge.

H5. A direct relationship exists between PIIT and respondent's receptiveness to IT news.

Ram [40] suggested that there are non-psychological characteristics of a consumer affect innovation resistance. He noted that a consumer with the willingness to innovate may not have the 'ability to innovate'. These characteristics are demographic variables such as education, age, and income. In this study, we form hypotheses from H6 to H10 based on the non-psychological characteristics of consumers. Hypothesis 6 states that consumers who possess a mobile phone with many functions may show a higher PIIT than consumers who possess mobile phones with only few functions. Consumers with high willingness to try new IT may try to use all functions of their mobile phone, thus Hypothesis 7 is postulated. Hypotheses 8 and 9 capture the positive relation between PIIT, and a consumer's monthly telecommunications service fee and a consumer's family income, respectively. Kirsch and

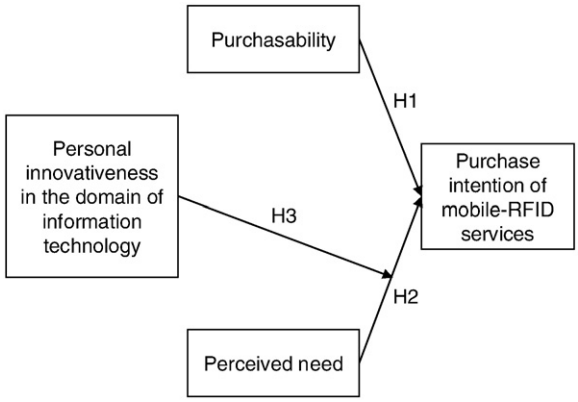

Fig. 5. Research model.

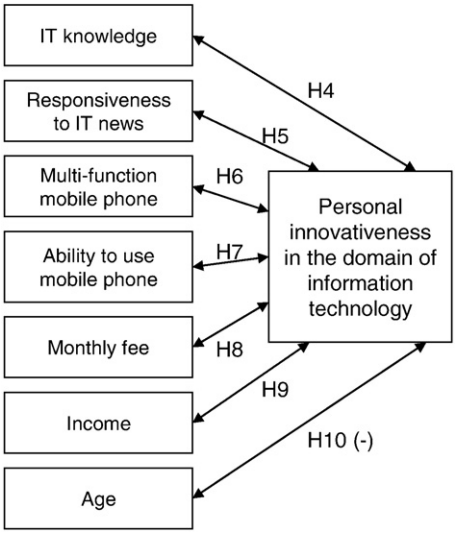

Fig. 6. Relationship between personal characteristics and PIIT.

Lengermann [41] have found age is positively related to alienation that may reduce the willingness to try new technology. This leads Hypothesis 10 that older respondents have less PIIT.

H6. A direct relationship exists between PIIT and multi-function mobile phone.

H7. A direct relationship exists between PIIT and respondent's ability to use mobile phone.

H8. A direct relationship exists between PIIT and monthly fee.

H9. A direct relationship exists between PIIT and income.

H10. An inverse relationship exists between PIIT and age.

3. Methodology

3.1. Study context

Mobile-RFID services attempt to deliver additional value to customers through telecommunication infrastructure with RFID technology. When the cellular phone which has a compact RFID-reader reads RFID tags, it provides various services with the

Connect to the mobile wireless internet through mobile phone, and hoosce “U-Tag” menu.

Place the mobile phone near the RFID tag that is attached to a wine bottle.

Information in the RFID tag is automatically sent to the server through mobile wireless internet.

Information related to the wine (the place of origin, taste, matching food, etc.) is shown.

Fig. 7. Wine information service through mobile-RFID.

Table 1
Measurement items of constructs

Construct	Measurement item	Reference
Purchasability	It is very easy for me to purchase mobile-RFID services.	Warshaw [12], Yang et al. [18]
	I can afford mobile-RFID services.	
	I am able to pay for mobile-RFID services.	
Perceived need	I feel very strong desire to purchase mobile-RFID services.	
	Because of the pressure I feel from others, I feel very strong desire to purchase mobile-RFID services.	
	Because of my own desires, I feel very strong desire to purchase mobile-RFID services.	
Purchase intention	Assuming that my phone supports mobile-RFID services, I intend to use it.	
	If mobile-RFID services are commercialized, I'll use the services.	
	I'll use mobile-RFID services.	
PIIT	If I heard about a new information technology, I would look for ways to experiment with it.	Agarwal and Prasad [23]
	Among my peers, I am usually the first to try out new information technologies.	
	I like to experiment with new information technologies.	
	In general, I am hesitant to try out new information technologies (R).	

(R): reverse scaled item.

mobile phone through mobile telecommunication networks. Thus, customers can get various information more easily and effectively through their mobile phone. The provision of mobile-RFID services was first attempted in Korea [42]. Korean companies, academia, research institutes, and government have established a mobile-RFID forum called "MOBION" in 2005 [43,44]. This forum has been operating for mobile-RFID standardization, has provided several pilot services, and aims at commercialization in 2007 [43,44]. Examples of pilot services are 'liquors authentication service', 'wine information service', 'movie information service', 'mobile taxi police service', 'tour information service' and etc [45,46]. Among these pilot services, we chose two services most interesting to customers ('mobile taxi police service' and 'wine information service') to explain mobile-RFID service to survey participants [45]. Fig. 7 shows the process for connection to the 'wine information service' that has been launched by KTF as pilot service in Korea.

3.2. Data collection and measures of the constructs

In this study, data was collected using web-based online and offline surveys. The offline questionnaire was collected from undergraduate students and graduate students in Korea. Both online and offline questionnaire surveys for mobile-RFID services (to examine H1–H3) were conducted during September 2007; 55 respondents were from online, 151 respondents were from offline. 14 samples were screened using reverse measurement items; thus, 192 samples were utilized to examine H1, H2, and H3. A survey to examine Hypotheses H4–H10 was conducted during September and October 2007; 115 respondents were from online, 262 respondents were from offline. 23 samples were screened; thus, 354 samples were utilized for the purposes of this study.

The definition and measurement items of each construct corresponded to a specific behavior (using mobile-RFID services). Table 1 shows measurement items of each construct which is used to examine H1–H3. All the items were measured on seven-point scales in the form of agreement (1 = strong disagreement, 7 = strong agreement).

Table 2
Operationalization of variables

Variables	Questionnaire item		
IT knowledge	Check all the terms that you are familiar with		
	1) CDMA	2) Operating system	3) IPTV
	4) VoIP	5) Word processing	6) Internet
	7) DMB	8) Databases	9) RFID
Responsiveness to IT news	I always like to hear news concerning information technology (IT).		
	1 = strongly disagree		
	…		
	5 = strongly agree		
Multi-function mobile phone	Check all the functions that your mobile phone supports		
	1) Camera	2) Mp3 player	3) DMB
	4) GPS	5) External memory	6) Bluetooth
	7) IrDA	8) Document viewer	9) Dictionary
Ability to use mobile phone	I know how to use most of my mobile phone function.		
	1 = strongly disagree		
	…		
	5 = strongly agree		
Monthly fee	On the average how much do you pay for mobile phone usage per month?		
Age	Respondent's age in years		
Income	Respondent's average monthly family income		

Table 3
Reliability and AVE of each construct

Construct	Item	Factor loading	Cronbach's α	AVE
Purchasability	PUR1	0.900	0.8380	0.756
	PUR2	0.869		
	PUR3	0.837		
Perceived need	PN1	0.934	0.9088	0.842
	PN2	0.887		
	PN3	0.931		
Purchase intention	IN1	0.912	0.8925	0.823
	IN2	0.918		
	IN3	0.892		
PIIT	PIIT1	0.808	0.8503	0.673
	PIIT2	0.862		
	PIIT3	0.903		
	PIIT4	0.692		

The operationalization of the personal characteristics of customers is represented in Table 2. In order to measure 'IT knowledge' and 'Multi-function mobile phone' variables, we used a number of checked items.

4. Analysis and results

Structural equation modeling (SEM) has been employed to examine H1–H3 in this study. Data analysis was performed using the PLS (Partial Least Square) method that includes two stages: (1) the assessment of the measurement model, which involves the reliability and validity test of the measures, and (2) the evaluation of path coefficients and adjust R^2 for the assessment of the structural model. Pearson product-moment correlations have been employed to examine H4–H10. PSL-Graph and SPSS software package has been used.

4.1. Reliability and validity test

In order to measure the reliability of each construct, Cronbach's alpha reliability index was calculated. According to the criterion that Cronbach's alpha should be higher than 0.7 [47], purchasability, perceived need, purchase intention and PIIT have strong reliability (Table 3).

In order to examine the convergent validity, the value of factor loading was calculated. The ideal level of factor loading value for measurement items is 0.7 or higher, however, 0.6 was considered to be an acceptable level for an application across disciplines. Table 3 shows that all the value of factor loading is larger than 0.7, thus, convergent validity is considered to be satisfactory. Table 4 shows the discriminant validity of each construct. To measure the discriminant validity, we examined whether the value of the square root of AVE (Average Variance Extracted) is larger than the value of correlations of each variable [48,49]. In Table 4, diagonal elements in bold are the square root of AVE, and off-diagonal elements are correlations between constructs. Discriminant validity is satisfactory because all the values of square roots of AVE are larger than the value of correlations of each variable.

4.2. Assessment of the research model and hypotheses

The research model addresses that both purchasability and perceived need collectively explain purchase intention of mobile-RFID services. As shown in Fig. 8, the path coefficient between purchasability and purchase intention is 0.250 and significant at $p<0.001$. Therefore, consumers with high purchasability have more purchase intention for mobile-RFID services. The path coefficient between perceived need and purchase intention is 0.521 and significant at $p<0.001$, thus consumers with high perceived need have more intention to use mobile-RFID services. As a result, Hypotheses H1 and H2 are supported.

To examine the moderating effect of PIIT between perceived need and purchase intention, we need to assess whether any change in the base relationship is significant under varying values of the moderator [50]. That is, the moderating effect is valid if the interaction between perceived need (independent variable) and PIIT (moderator) is significant. As shown in Fig. 9, the path coefficient between interaction term (PIIT × Perceived need) and purchase intention is −0.109 and significant at $p<0.1$. Thus PIIT has a moderating effect between perceived need and purchase intention, supporting hypothesis H3.

Table 4
Correlations and square root of AVE of each construct

	Purchasability	Perceived need	Purchase intention	PIIT
Purchasability	**0.869**			
Perceived need	0.603	**0.918**		
Purchase intention	0.653	0.829	**0.907**	
PIIT	0.346	0.355	0.410	**0.820**

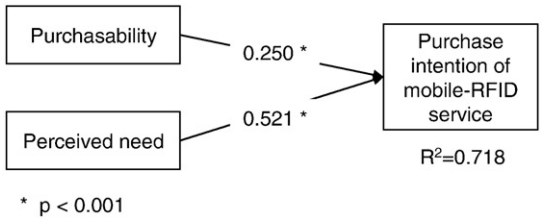

Fig. 8. Research model without moderating effect.

In order to explore relationships between PIIT and some personal characteristics, it was hypothesized that a customer's IT knowledge (H4), responsiveness to IT news (H5) and ability to use a mobile phone (H7) are positively related to PIIT. The results in Table 5 support all of these hypotheses. The correlation coefficient between PIIT and IT knowledge is 0.334. Customer responsiveness to IT news correlation coefficient is 0.413. Ability to use mobile phone correlation is 0.233. Those correlations are statistically significant at 0.001 level.

The other hypotheses are not supported; customer's age, income, monthly fee, and use of a multi-function mobile phone are not associated with PIIT. Pearson product-moment correlations are shown in Table 5 to test the Hypotheses H4–H10.

5. Conclusion and discussions

In this paper, we attempt to address three major questions;

1. Can the Warshaw's purchase intention model be applied to purchasing mobile services? Can purchasability and perceived need explain the purchase intention of mobile-RFID services? (Hypotheses 1–2)
2. Does personal innovativeness in the domain of IT (PIIT) have a moderating effect on using mobile-RFID services? (Hypothesis 3)
3. What are the relationships between PIIT and certain personal characteristics? (Hypotheses 4–10)

The results of this study indicate that purchasability and perceived need can explain purchase intention both mobile-RFID services. PIIT serves to moderate the relationship between perceived need and purchase intention of mobile-RFID services. As a result, perceived need enhances purchase intention and this effect is stronger to consumers with lower PIIT. Similarly, for the same level of purchase intention, consumers with higher PIIT would require less perceived need than consumers with lower PIIT.

The study findings also indicate that IT knowledge, responsiveness to IT news and ability to use mobile phone of customers are positively associated with PIIT. However, customer's demographics (age, income, monthly fee), and possession of multi-function mobile phone are not associated with PIIT.

5.1. Implications for researchers

A number of studies have been conducted concerning the impact of behavior on information system usage and IT service usage. However, most of prior studies are based on TAM, and few studies tried to apply product purchase intention theories to service purchase. This study has explored the adoption of another intention model, which has been examined in marketing field for products, not for telecommunication services. This study further investigates how exogenous variables (purchasability and perceived need) affect purchase intention of mobile services usage. The results also implicate a possibility that the purchase intention model can be applied to services that have similar charge systems to products. Moreover, we have found that the proposed model in this study has better explanation power than TAM, in our preliminary study [22].

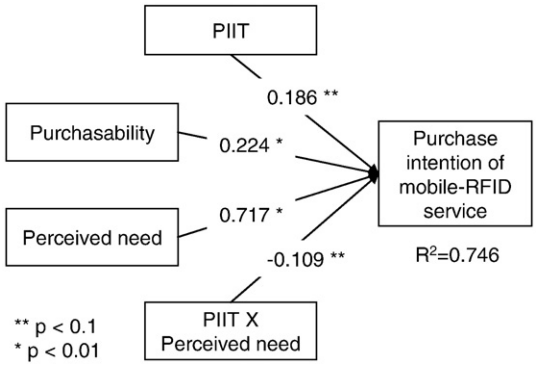

Fig. 9. Purchase intention model for mobile-RFID service with moderating effect.

Table 5
Correlation coefficients of the research variables with PIIT

Variables	Hypothesis	Pearson *r*	*p*-value	*N*
IT knowledge	H4	0.334	<0.001*	354
Responsiveness to IT news	H5	0.413	<0.001*	353
Multi-function mobile phone	H6	0.107	0.060	350
Ability to use mobile phone	H7	0.233	<0.001*	354
Monthly fee	H8	−0.016	0.786	346
Income	H9	0.090	0.154	293
Age	H10	−0.050	0.383	354

* Significant at 0.001 level.

5.2. Implications for practitioners

The result, that PIIT serves to moderate the relationship between perceived need and purchase intention, has implications for decision makers in telcom firms in that PIIT could be used as pre-segmentation criteria. As the market becomes more competitive, focusing on a valuable target segment is important in terms of effectiveness and efficiency. Focusing on highly innovative groups could be wise in telecommunication service markets based on these results.

In the second step of data analysis, we attempted to find the relationship between PIIT and the personal characteristics of Korean customers. These results also indicate what personal characteristics are associated with PIIT. It can be helpful for service providers to group their customers based on existing customer information.

5.3. Limitations and further research

The most critical limitation is that, since mobile-RFID services are not commercialized as of now, we could not collect data from respondents who have experienced mobile-RFID services. Respondents have answered the questionnaires only after reading 2 pages of explanation of what mobile-RFID services are. Therefore, the results could be distorted because of this limitation. Secondly, one must always consider the innate dynamic and unpredictability of human behavior. It is common fallacy by social scientists to seek immutable laws in human behavior, much like the physicist finds out physical laws through experiment [51]. Even though this research seeks to explain the relationship between purchase intention and PIIT, one should not overlook the fact that fundamental limits exist in the prediction of human behavior.

In conclusion, we would like to suggest further research directions. Although we have found that PIIT serves to moderate the relationship between perceived need and purchase intention of mobile-RFID services, the moderating effect may differ in accordance with the traits of mobile service. Mobile-RFID services are more innovative than other mobile services, such as short message service, in terms of the release date of the services. Therefore, it may be worthwhile to compare the role of PIIT in other mobile services. As for practitioners, we have to make sure that innovativeness is treated as a key factor for prior market segments by applying this model to other service industries. Further research on a reasonable price for mobile-RFID services is needed because commercializing the service will occur within the next year.

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