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An Empirical Study about RFID Acceptance - Focus on the Employees in Korea -

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***Abstract*—**The number of the companies accepting RFID in Korea has been increased continuously due to the domestic development of information technology. The acceptance of RFID by companies in Korea enabled them to do business with many global enterprises in a much more efficient and effective way. According to a survey[33, p76], many companies in Korea have used RFID for inventory or distribution manages. But, the use of RFID in the companies in Korea is in the early stages and its potential value hasn't fully been realized yet. At this time, it would be very important to investigate the factors that affect RFID acceptance. For this study, many previous studies were referenced and some RFID experts were interviewed. Through the pilot test, four factors were selected - Security Trust, Employee Knowledge, Partner Influence, Service Provider Trust - affecting RFID acceptance and an extended technology acceptance model(e-TAM) was presented with those factors. The proposed model was empirically tested using data collected from employees in companies or public enterprises. In order to analyze some relationships between exogenous variables and four variables in TAM, structural equation modeling(SEM) was developed and SPSS12.0 and AMOS 7.0 were used for analyses. The results are summarized as follows: 1) security trust perceived by employees positively influences on perceived usefulness and perceived ease of use; 2) employee's knowledge on RFID positively influences on only perceived ease of use; 3) a partner's influence for RFID acceptance positively influences on only perceived usefulness; 4) service provider trust very positively influences on perceived usefulness and perceived ease of use 5) the relationships between TAM variables are the same as the previous studies.

***Keywords*—**RFID, TAM, Security Trust, Employee Knowledge, Partner Influence, Service Provider Trust.

I. Introduction

RFID(Radio-Frequency Identification) is a technology for automated identification of objects and people. So far, RFID has been gaining enormous attention from both academicians and practitioners. It has also been bringing drastic changes to the Korean economy, society, and culture as a core foundation technology of the Ubiquitous Sensor Network (USN).

It was widely spread among the industries with the strong support of related institutions based on the u-IT839 strategy in Korea. There are some government institutions which are encouraging and supporting the companies to accept the RFID. Among the government institutions, the RFID/USN research team of ETRI(Electronics and Telecommunications Research Institute in Korea) have conducted very vigorous researches and activities about RFID and it held many international conferences for RFID. Due to the development of information technology in Korea, the speed of accepting a new technology was very swift and many domestic companies and public enterprises have accepted RFID and have a plan to accept it. For example, Korea's two largest retailers, Emart and Hanaro Mart, started to introduce RFID tracking into their inventory systems in 2008. The companies each have reached agreements with several of their major suppliers to begin labeling boxes and pallets with RFID tags before shipping to their warehouses [46].

The new technologies have also been the important means to enable domestic companies to establish contacts with global enterprises throughout the world, in turn enabling them to participate in the world economy. So, it is necessary to accept the RFID technology in order to do a business with global enterprises requiring RFID tag.

Despite RFID's popularity, not all companies are eagerly adopting it. The use of RFID in most companies is at the early stages and its potential value hasn't been fully realized yet. In addition, many researches have shown the risk relevant to RFID in terms of privacy, security, organizational change, and cost.

The countries that are widely using RFID are doing so in quite varied ways even to healthcare. Many companies in Korea have used RFID for inventory or distribution manages. They are in supply chains both at home and abroad and they are being influenced from other higher-level companies or consumers. According to Teresa Henry at IDTechEx (www.idtechex.com), the US is by far the largest adopter of RFID. It has the largest number of cases of RFID in action. In addition, its orders tend to be the world's largest in value. According to just RFID case studies, the United Kingdom holds second place behind the US. In terms of money spent, however, that title goes to China—with Korea and Japan offering fierce competition. From this report, doing a study about the RFID acceptance in Korea will be well worth enough!. So, it will be very important to investigate the factors that affect RFID acceptance and to find out which factor is most important.

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Most theories of the acceptance have been developed on the basis of the technology acceptance model(TAM). So far, numerous studies have validated the effectiveness of TAM in predicting the user's intention to use information technology. There have been many studies to investigate TAM and extend it with various exogenous variables. Many researches have shown that innovation factors, organizational factors and environmental factors are significant factors influencing companies' decision to accept a special information technology. In this study, an investigation was taken to find the very important factors influencing on the RFID acceptance. From the literature review and in-depth interviews with RFID specialists, the influencing factors on RFID acceptance were decided as follows: Security Trust, Employee Knowledge, Partner Influence, Service Provider Trust. An extended technology acceptance model(e-TAM) that integrates the four factors was also used.

II. Theoretical Background

A. TAM

The Technology Acceptance Model (TAM), developed by Davis , is one of the most influential research models in studies of the determinants of information systems/information technology (IS/IT) acceptance to predict the intention of use and acceptance of IS/IT by individuals. Since the development of the model, many intensive researches were carried out to understand the factors that influence the acceptance of new technologies by the user [15], [24], [5], [13], [28], [31].

Based on the TRA Model, TAM points out two particular beliefs, perceived ease of use (PEOU) and perceived usefulness (PU). PEOU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" and PU is defined as "the degree to which a person believes that using a particular system would be free of effort" [15]. In the TAM model, PEOU positively affects the PU. Moreover, PEOU and PU positively affect the attitude toward an information system, and further, positively affect individuals' intentions to use and accept the information system.

The attitude toward IT and acceptance intention are treated differently according to the current position of the technology. Especially, many researches related to the innovation technology showed that the attitude toward technology is a very important variable in the new technology acceptance [3]. In the case of the technology already passing the diffusion stage, it is rightly considered that an attitude toward the technology influences on the acceptance intention. In the case of a new technology, on the other hand, the attitude toward the technology was emphasized to predict the acceptance intention.

Numerous empirical tests have indicated that TAM is a robust model of technology acceptance behaviors in wide variety of information systems and countries [12].

Since RFID is information technology, TAM is suitable to be applied in explaining RFID acceptance behavior.

B. RFID

To deliver the information of object, attachment or identification method is needed. Among these methods, bar code has been widely used and RFID has been substituted for it nowadays. RFID is a small tag containing an integrated circuit chip and an antenna, and it has the ability to respond to radio waves transmitted from the RFID reader in order to send, process, and store the information of objects such as industrial containers, palettes, individual products and also human objects. RFID has been used for various experimental purposes for a number of decades and a variety of new applications have been tested in pilot projects. While RFID has a greater number of benefits than its predecessor, the bar code, it currently comes at a price that many businesses still consider prohibitive.

It was surveyed that RFID systems excel above all in their performance compared to other Auto ID systems such as barcode, smartcard, and OCR. Leading corporations have recognized the intrinsic advantages of RFID and recently moved to introduce the technology in SCM by establishing a mandate, forcing suppliers to use RFID as well. With the advent of global standards and reduction in tag costs, its acceptance has proved to highlight many benefits, including increased visibility and accuracy, and a reduction in labor costs.

Recently, a number of the world's largest retailers and government agencies such as Wal-Mart and the U.S. Department of Defense introduced mandates for RFID acceptance. Wal-Mart not only believes that RFID can reduce its labor and inventory costs but also thinks that its revenues will be increased by limiting the out-of-stock items throughout its chain stores around the world. Due to the enormous purchasing power and influence of world retailers on the global suppliers, they have become large enough to achieve the potential to create a driving force to push for worldwide acceptance of RFID. Many global companies in Korea have exported their products with RFID tag to their partners requiring it.

But, regardless of the large potential benefits for business, careful consideration will be needed to be taken continuously in respect of issues such as system integration, security, system performance, spectrum usage, and privacy. The problems such as employee's attitudes toward the system change in organizations, partner's influence, and IT service providers have to be also solved. So, there is still reluctance in the business community to invest large amounts of capital in such new technology that has yet to prove itself.

There were some research studies about the consumer or customer acceptance issues relevant to RFID, but there was little research about the employee's acceptance. Günther and Spiekermann carried out a survey about RFID and its acceptance with 129 representatively chosen customers of the Metro Future Store [34]. The majority of the participants in the survey understood and accepted the benefits of RFID in consumer products, such as easier operation of returns and

guarantee services without the need of a receipt of purchase. Muhammad and Victor contextualized TAM within the context of RFID about consumer acceptance [30].They selected seven factors affecting 'the intention to use RFID' as follows; Perceived Convenience, Perceived Culture's Influence, Importance of Personal Privacy and Unwillingness to Sacrifice Privacy(Perceived Privacy), Perceived Regulations' Influence, and Importance of Personal Information Security and Unwillingness to Sacrifice Security(Perceived Security). Matta and Moberg proposed a model for RFID acceptance with four antecedents: top management support, organizational size, expected return on investment, and external pressure from outside forces [43].

III. Research Model and Hypotheses

The research model is shown in Fig. 1. Security Trust in a company, employee's RFID knowledge, partner's influence on RFID acceptance, and service provider trust are modeled as exogenous latent variables in an extended technology acceptance model(e-TAM). In the previous research [33], antecedents of PU and PEOU didn't affect directly on the attitude toward RFID. So, the direct affect of the antecedents on the attitude toward RFID were not considered. Table 1 summarizes the research constructs.

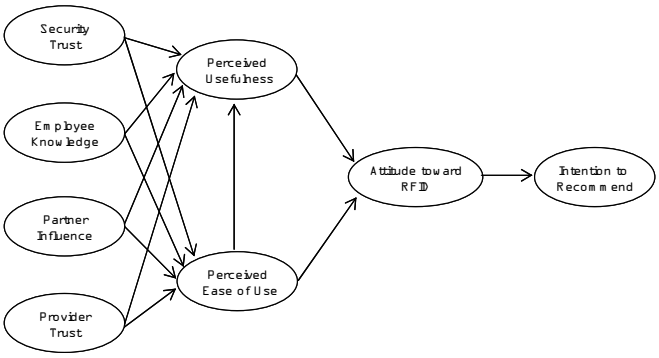


Fig. 1 Research Model

TABLE I
SUMMARY OF CONSTRUCTS

Constructs	Definition	Items	Source
Security Trust	The degree of the security trust that employees have in their company	Personal Privacy Information Leak Security Policy	Shalhoub(2006)
Employee Knowledge	The level of employee's RFID knowledge	Employee Ability Overall Knowledge Advantage of RFID	Thong(1999)
Partner Influence	The degree of the partner's influence on RFID acceptance	RFID Acceptance Spec Decision Policy Decision	Chwelos et al.(2001) Iacovou et al.(1995) Neo et al.(1995)
Provider Trust	The degree of trust in the service provider based on the past service	Beneficence Reputation Provider Ability	Lui & Jamieson(2003) Abrams et al.(2003) Meints(2007)
PEOU	Perceived easiness of using and understanding RFID	Understanding Skill Easiness	Davis(1989) Lui & Jamieson(2003)
PU	Perceived usefulness of RFID	Performance Efficiency Effectiveness	Davis(1989)
Attitude toward RFID	Attitude toward RFID	Interesting Profitability Positive	Davis(1989)
Intention to Recommend	The degree of the intention to recommend RFID to the others	To-fellow To-boss	Vijayasarathy(2004)

Accordingly, the following hypotheses were cast and tested:

A. The Relationship of Security Trust to PU and PEOU

The importance of security has been discussed in many studies of the new technology acceptance [16], [30], [9], [26]. Muller-Seitz et al., Hossain and Prybutok and Perakslis and Wolk stressed the importance of security in the acceptance of RFID and Vijayasarathy did in an on-line shopping.

Security refers to the condition of being protected against danger, loss, and criminals. The use of RFID system presents potential security risks because a third party can gather or steal important information knowingly or unknowingly. So, security is a major issue pertaining to the RFID acceptance.

Because there may be the following business risks associated

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with RFID system, companies have to have their own security policy to guarantee an employee's privacy and prevent a business information leak. (1) Direct attacks on RFID system components could potentially undermine the business processes the RFID system was designed to enable. (2) An adversary or competitor potentially could gain unauthorized access to RFID-generated information and use it to harm the interests of the organization implementing the RFID system. (3) The misuse of RFID technology could violate personal privacy when the RFID application calls for personally identifiable information to be stored on or associated with a tag.

For these reasons, security policy in a company plays an especially crucial role with reference to RFID. Employees will accept the risks if they believe that the accrued benefits are worth the risk and the RFID systems fit the requirement of their task. These lead to the following hypotheses:

H1a: The security trust in a company positively affects the perceived usefulness of RFID.

H1b: The security trust in a company positively affects the perceived ease of use of RFID.

B. The Relationship of Employee Knowledge to PU and PEOU

Accepting a new technology may require changes in the work attitudes of the employees, as well as their qualifications, their level of performance and the extent of their knowledge of the technology. So, acceptance of special technologies might impose heavy knowledge burdens on employees.

Many organizations have attempted to delay the acceptance of an innovation or new technology until they had acquired sufficient expertise [23]. If the employees already know about RFID, then the organization may be more disposed to adopt the technology [29]. In a survey, Tan and Teo found that one of the main reasons for not adopting a new technology is the lack of internal expertise [42] .

Companies that are more innovative than others have a system of values that encourages individual and collective behavior to creative endeavour [8]. Sharif et al. emphasized the organizational learning when introducing new technology into a company [2]. For these reasons, the following hypotheses were established:

H2a: The employee's knowledge of RFID positively affects the perceived usefulness.

H2b: The employee's knowledge of RFID positively affects the perceived ease of use.

C. The Relationship of Partner Influence to PU and PEOU

Rogers' diffusion study suggested that interactive technology had zero utility until other individuals had adopted the technology as well. Interorganizational systems(IOS) such as RFID might be the same [14].

Iacovou et al. showed that external pressures most often derive from competitors, clients and trading partners (including suppliers and contractors), and other characteristics of the marketplace such as legal requirements [7]. Especially, the influence of trading partners in the supply chain has been very important on the acceptance of information technology such as EDI and e-commerce [1], [19]. For example, it was shown that companies with close and significant trading relationships with EDI initiators felt pressured to adopt EDI in order to maintain their business relationships, even to the extent of adopting the EDI vendor recommended by their trading partner without further investigation [19].

Yang and Jarvenpaa insisted that collective trust among member companies is critical for the successful acceptance of RFID assuming that RFID system is being adopted within an alliance in which member companies have relatively balanced power [17].

The pressure from suppliers and buyers can also accelerate the acceptance process. Since RFID is a new and emerging technology and many supply-chain partners compel their suppliers to accept the technology, even to the specification and policy.

In Korea, many large enterprises have forced and helped their suppliers to accept RFID because they cannot only conduct their business in all markets. So, they want to establish partnerships with suppliers in the context of RFID systems. These lead to the following hypotheses:

H3a: The partner's influence on RFID positively affects the perceived usefulness.

H3b: The partner's influence on RFID positively affects the perceived ease of use.

D. The Relationship of Provider Trust to PU and PEOU

Most studies indicated that trust plays a significant role in accepting technology. Empirical research has shown that trust increases user intention to accept a technology. Specifically, it was shown that user's attitude toward an information technology was determined by the third party's trust [41], [37].

Service Provider refers to an IT-related external consultant company. The external service provider may be a key enabler of technology acceptance, since many companies in particular often lack access to sufficient internal IT resources [35], [27]. Kim, Lee and Kim, Korean researchers, have all stressed the importance of the role of service provider in the acceptance of the information technologies [44], [22], [21].

Morgan and Hunt, looking at inter-organizational trust, defined trust as: "when one party has confidence in an exchange partner's reliability and integrity" [40]. Mayer et al. pointed out that the definition of trust is "the willingness of a party to be vulnerable to the actions of another party in the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control the other party". They also defined three characteristics

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of inter-organizational trust: ability, benevolence and integrity, which appear to explain a major portion of trustworthiness [38]. Ability refers to the group of skills, competencies and characteristics that enable a party to have influence within certain specific domains. Benevolence is the extent to which a trustee is believed to want to do good to the trustor, aside from an egocentric profit motive. Benevolence suggests that the trustee has some specific attachment or positive orientation to the trustor. In a business relationship, companies often provide help beyond what is specified in their formal agreements. This extra-contractual helping behavior is called benevolence . On the other hand, integrity is the trustor's belief that the trustee will make a trustworthy agreement, tell the truth, act ethically and fulfill promises.

Meints identified 'the trust in the service provider' for RFID acceptance as follows: (1) availability and quality of the service, (2) reputation of the service provider, (3) perceived fairness of the price (4) non-intrusiveness of the service, privacy preservation and data security (5) perceived control over devices, services and personal data [32].

The definition of the service provider trust was modified using three characteristics of party trust defined by Mayer et al. and the following hypotheses were established:

H4a: The trust in a service provider positively affects the perceived usefulness of RFID.

H4b: The trust in a service provider positively affects the perceived ease of use of RFID.

E. The Relationship of TAM variables

In the TAM model, PEOU positively affects the PU. Moreover, PEOU and PU positively affect the attitude toward a new technology, and further, the attitude toward a new technology positively affects individuals' intentions to use and accept it. In this study, the following hypotheses were also established:

H5: The perceived ease of use of RFID positively affects the perceived usefulness.

H6: The perceived usefulness of RFID positively affects the attitude toward it.

H7: The perceived ease of use of RFID positively affects the attitude toward it.

H8: The attitude toward RFID positively affects the intention to recommend to the others.

IV. Research Methodology

An online survey method was used to collect the data for this study. Data analysis was conducted in two stages using SPSS 12.0 and AMOS 7.0. First, validity and reliability of the independent constructs were evaluated using an Exploratory Factor Analysis and Cronbach's α coefficients. Second, a Confirmatory Factor Analysis was conducted prior to evaluating the hypotheses using SEM(Structural Equation Modeling) with the use of AMOS 7.0.

A. Sample and Data Collection

An online survey was conducted to verify this research model.

Most questions in this questionnaire were taken from prior studies and interviews. For the content validity, a questionnaire was tested by an extensive literature review, in-depth interviews with RFID specialists, and a pre-test of the survey by an experienced researcher and three staffs in charge. And then the questionnaire was revised many times. Each item of the questionnaire was assessed using a seven-point Likert scale with end points of 'strongly disagree' and 'strongly agree'.

For the data collection, the questionnaire was e-mailed and circulated to 2000 employees of the companies and public enterprises that were registered in the Korea RFID/USN society, venture company society and IT company list on July to August, 2007. A small gift was offered for the sincere answer.

Only 10% among them responded to this request. After removing incomplete surveys from the 196 returned questionnaires, 166 usable and completed surveys were included in this study. Although the response rate may be considered a bit low, the overall usable sample size is well within the acceptable level for SEM.

The respondent profile and the company profile are shown in Table 2 and Table 3. 56.02% of the respondents were IT-related employees and 43.98 were the others. Among the respondents, most were in the positions of assistant manager or manager.

TABLE II
RESPONDENT PROFILE

		frequency	percentage
division	IT-related	93	56.02
	others	73	43.98
position	clerk	33	19.88
	assistant / manager	81	48.80
	deputy / general	27	16.27
	director	25	15.06
	total	166	100.00

In Table 3, it can be seen that employees in companies over middle standing answered the most in the point of the prior sales, and they engaged in a variety of industries. Because Korea is an IT-powerful country, it has the most respondents engaging in the IT industry.

Two more questions were asked to survey the situation of RFID acceptance and the reason of hesitating to accept it. The survey results about the situation of RFID acceptance were shown in the following order: (1) There is no possibility to accept RFID in short time(42.8%), (2) we have a plan to accept

RFID in 2 years(28.3%), (3) We already accepted RFID(13.9%), (4) We already accepted RFID and have a plan to extend(10.2%), (5) We broke off in the middle of accepting RFID(4.8%). The reason of hesitating the acceptance was shown in following order: (1) insufficient necessity, (2) unclear effectiveness, (3) insufficient internal expert , (4) cost, (5) insufficient CEO recognition, (6) insufficient examination time.

TABLE III
COMPANY PROFILE

		frequency	percentage
prior sales (million)	~$1	27	16.63
	$1~$50	44	26.51
	$50~	95	57.23
industry	public	29	17.47
	petrochemistry	17	10.24
	distribution	11	6.63
	transportation	4	2.41
	machine/metal	7	4.22
	IT	38	22.89
	fiber/food	6	3.61
	construction	7	4.22
	agro-livestock	2	1.20
	wood/nonmetal	1	0.60
	electricity/electron	26	15.66
	other	18	10.84
total		166	100.00

B. Validity and Reliability of Measurement Model

Because the relations among the variables were not specified a prior, the exploratory factor analysis on the exogenous variables was first executed. Factors were extracted using the maximum likelihood method, followed by a varimax rotation. This factor analysis empirically grouped the scale items of the exogenous variables as predicted, confirming the original groupings except for the last group. For security trust, one item, personal privacy, was dropped to keep the measurement scale unidimensional. After dropping the one item, the overall factor solution explains 79.07 percent of the variation and Cronbach's alpha becomes 0.809, 0.856, 0.887 and 0.803, respectively, for each group, all exceeding the 0.70 standard, indicating a reasonable level of internal consistency among the items making up the construct [20]. Therefore, convergent and discriminant validity for all measures are strongly supported. These procedures were summarized as Table 4.

TABLE IV
ROTATED FACTOR MATRIX ON THE EXOGENOUS VARIABLES

Survey items	Factors			
	1	2	3	4
RFID Policy Decision	.920	.082	.033	.000
RFID Spec Decision	.899	.112	.042	.021
RFID Acceptance	.861	.052	.072	.015
Employee's Ability	.029	.896	.180	-.059
Overall Knowledge	.116	.844	.232	-.003
Advantage of RFID	.095	.844	.067	.032
Beneficence	.125	.148	.849	.045
Provider's Ability	.034	.179	.807	.076
Experience & Reputation	.206	.026	.782	-.168
Personal Privacy	.210	-.157	-.486	.117
Business Information	-.054	-.002	-.062	.913
Security Policy	.088	-.017	-.044	.910
Cronbach's α after dropping one item	.809	.856	.887	.803

Variance explained 79.07%(when one item is dropped)
Extraction method : Principal Component Analysis
Rotation method : Varimax with Kaiser normalization

V. ANALYSES AND RESULTS

After dropping one item in the Security Trust construct, the correlation analysis was conducted. Descriptive statistics(means and standard deviations) and $\sqrt{AVE}$ (AVE : Average Variance Extracted) as well as the correlation matrix of all variables are presented in Table 5. It is shown that almost all variables have a statistically significant correlation and since the correlation coefficients aren't 0.7 or higher, there isn't multicolinearity.

TABLE V
DESCRIPTIVE STATISTICS, CORRELATION MATRIX, AND $\sqrt{AVE}$ OF PRINCIPAL CONSTRUCTS

	mean	s.d.	Security Trust	Employee Knowledge	Partner Influence	Provider Trust	PU	PEOU	Attitude toward RFID	Intention to recommend
Security Trust	4.90	1.16	0.90							
Employee Knowledge	4.12	1.30	-0.03	0.86						
Partner Influence	4.10	1.25	-0.01	.35(**)	0.87					
Provider Trust	4.21	1.04	-0.08	.33(**)	.19(*)	0.80				
PU	5.23	1.03	.27(**)	.28(**)	.23(**)	.44(**)	0.89			
PEOU	4.85	1.01	0.14	.39(**)	.06	.33(**)	.45(**)	0.88		
Attitude toward RFID	5.33	1.12	.20(*)	.27(**)	.15	.33(**)	.65(**)	.62(**)	0.88	
Intention to recommend	4.58	1.40	0.10	.34(**)	.18(*)	.33(**)	.48(**)	.46(**)	.61(**)	0.91

s.d. : standard deviation
Shaded diagonal cells represent squared root of AVE(Average Variance Extracted)

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* p<0.05, ** p<0.01

The result of Confirmative Factor Analysis is shown in Table 6. The Squared Multiple Correlation(SMC) represents the degree contributed to explain its construct. This value is in general required to be over 0.4. The composite reliability and average variance extracted(AVE) for each construct are used to assess the reliability of the constructs. Thompson et al. suggested the acceptable value of composite reliability to be 0.7 or higher [39]. Since the composite reliability for all constructs are 0.8 or higher, all constructs show a high degree of internal consistency. AVE is in general a more conservative measure than composite reliability and Fornell and Larcker suggested the acceptable value of AVE to be 0.5 or higher. As shown in Table 6, all constructs and items meet these criteria [6].

The AVE can also be used to evaluate discriminant validity. To fully satisfy the requirements for discriminant validity, the squared root of AVE for each construct should be greater than the correlations between the constructs and all the other constructs. These results are shown in Table 5.

TABLE VI
RESULT OF CONFIRMATORY FACTOR ANALYSIS

construct	items	nsfd	sfd	t value	error variance	SMC	composite reliability	AVE
Security Trust	Information leak	1.00	0.77		0.41	0.59	0.82	0.80
	Security policy	1.19	0.90	4.59	0.19	0.81		
Employee Knowledge	Employee Ability	1.00	0.85		0.28	0.72	0.86	0.74
	Overall knowledge	1.04	0.89	11.97	0.21	0.79		
	Advantage of RFID	0.82	0.71	9.90	0.50	0.50		
Partner Influence	Policy decision	1.00	0.92		0.15	0.85	0.89	0.76
	Spec decision	0.90	0.89	14.71	0.21	0.79		
	RFID acceptance	0.85	0.76	11.87	0.42	0.58		
Provider Trust	beneficence	1.00	0.83		0.31	0.69	0.80	0.64
	Reputation	0.85	0.73	8.69	0.47	0.53		
	Provider ability	0.76	0.70	8.45	0.51	0.49		
PEOU	understanding	1.00	0.79		0.37	0.63	0.87	0.79
	skill	1.25	0.95	12.33	0.10	0.90		
	easiness	0.96	0.74	10.31	0.45	0.55		
PU	performance	1.00	0.84		0.29	0.71	0.87	0.77
	efficiency	1.02	0.78	11.23	0.39	0.61		
	effectiveness	1.01	0.87	13.00	0.24	0.76		
Attitude toward RFID	interesting	1.00	0.85		0.28	0.72	0.88	0.78
	profitability	1.05	0.87	14.03	0.24	0.76		
	positive	0.95	0.82	13.17	0.33	0.67		
Intention to recommend	to-fellow	1.00	0.87		0.24	0.76	0.87	0.82
	to-boss	1.09	0.88	11.66	0.23	0.77		

sfd: standardized factor loadings
nsfd: nonstandardized factor loadings
SMC: Squared Multiple Correlation (This is also named as congeneric reliability)
AVE: Average Variance Extracted

After assessing the reliability and validity of measurement model, the hypotheses and overall fit of the path model were tested by using the maximum likelihood(ML) technique to estimate the parameters. The model fitness was identified and the path coefficients were estimated using Covariance Structure Analysis.

Multiple fit indices as well as the traditional chi-square(χ^2) test are shown in Table 7. Because the χ^2-test is inappropriate for large sample sizes, eight other indices are included. These are absolute fit indices, parsimony fit indices, and incremental fit indices. The test demonstrates a reasonable fit between the data and the proposed structural model. All values are within the accepted thresholds for Confirmative Factor Analysis.

The result of the hypotheses test and the path coefficients are also shown in Table 8 and Fig. 2. The path coefficients of Security trust to PU(H1a), Employee knowledge to

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PEOU(H2b), Partner influence to PU(H3a), Provider trust to PU and PEOU(H4a and H4b), PEOU to PU(H5), PU and PEOU to Attitude(H6 and H7) and Attitude to Intention(H8) are significant at the 0.01 significance and Security trust to PEOU(H1b) is significant at the 0.1 level of significance. In other words, these mean that H1a, H2b, H3a, H4a, H4b, H5, H6, H7, and H8 are difficult to reject at the 0.01 level of significance and H1b at the 0.1 level of significance. It can also seen that the provider trust is the most important construct on PU and PEOU in the RFID context.

TABLE VII
OVERALL MODEL FIT INDICES OF THE RESEARCH MODEL

Index	Fitness	Recommended values
χ^2/df	1.01 (χ^2=194.63 , df=135)	< 3
GFI	0.914	> .9
AGFI	0.88	> .8
RMR	0.085	< .1
NFI	0.923	>.9
RFI	0.901	0 ~ 1
IFI	0.999	0 ~ 1
CFI	0.999	> .9
PNFI	0.723	> .6

TABLE VIII
RESULT OF HYPOTHESES TESTS

Hypothesis	path	path coefficient	t-value	p-value	Hypothesis supported?
H1a	Security trust->PU	0.273***	3.583	0	Yes
H1b	Security trust ->PEOU	0.141*	1.721	0.085	Yes
H2a	Employee knowledge->PU	0.026	0.311	0.756	No
H2b	Employee knowledge ->PEOU	0.332***	2.959	0.003	Yes
H3a	Partner Influence->PU	0.197***	2.639	0.008	Yes
H3b	Partner Influence ->PEOU	-0.102	-1.314	0.189	No
H4a	Provider trust->PU	0.36***	3.956	0	Yes
H4b	Provider trust ->PEOU	0.274***	2.959	0.003	Yes
H5	PEOU->PU	0.289***	3.342	0	Yes
H6	PU->Attitude	0.568***	7.087	0	Yes
H7	PEOU->Attitude	0.336***	4.594	0	Yes
H8	Attitude->Intention	0.697***	8.613	0	Yes

*path significant at p < 0.1
*** path significant at p < 0.01

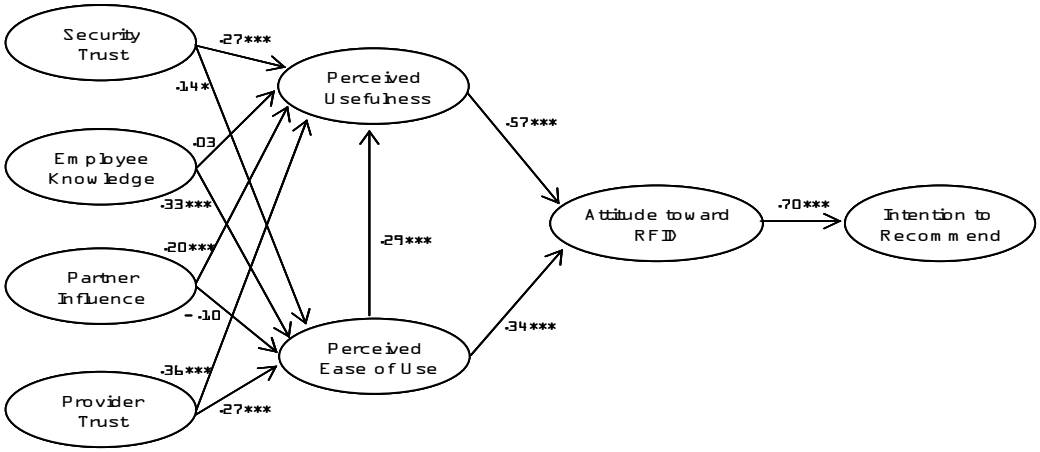


Fig. 2 The Standardized Path Coefficients

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VI. Discussion and Implication

Korea has extended the use of RFID in many different industries as an IT powerful country. For this reason, the RFID acceptance study will be very important from an academic and practical viewpoint because of the increased interest in RFID and the positive effort to diffuse it.

In this study, an investigation was conducted to find out the important factors to affect RFID. And then, the extended version of TAM that integrates Security Trust, Employee Knowledge, Partner Influence, and Service Provider Trust was successfully applied in RFID context and some relationships between the four antecedent factors and TAM variables were analyzed empirically.

The finding suggests that 1) security trust perceived by employees positively influences on perceived usefulness and perceived ease of use; 2) employee's knowledge on RFID positively influences on only perceived ease of use; 3) partner's influence for RFID acceptance positively influences on only perceived usefulness; 4) service provider trust very positively influences on perceived usefulness and perceived ease of use 5) the relationships between TAM variables are the same as the previous studies.

It is concluded that service provider trust is the most important factor affecting perceived usefulness and perceived ease of use of RFID. From an employee's point of view, service provider trust may be tested to be important because RFID installation in a company is most reliant on the service provider.

The second most important factor was the level of security trust perceived by employees. The security policy of a company has to be more strictly enforced to protect personal privacy and information leaks. As RFID usage in a company increases in diverse ways, employees may more easily recognize the security problems. The service provider trust rather than the security trust might be recognized more importantly because the use of RFID in Korea was at the early stage when this study was proceeding. In the other study about RFID acceptance in Korea, it was shown that Koreans highly perceived the usefulness of RFID in spite of the perceived risk (Lee, 2007).

VII. Limitation and Future Direction

As with the other studies, the major limitation of this paper involves the sample. Because of the economic crisis, many employees refused to answer the questionnaire. So many samples representing the Korea industry couldn't be collected. But, since the respondents answered sincerely, the proposed model could be analyzed despite of the small sample.

Another issue is that this study didn't cover all the factors relevant to RFID acceptance, despite an extensive literature review about IT and in-depth interviews with RFID specialists. This study uses only four factors which are considered as the most important thing. Since scientific studies on the acceptance of RFID are scare, there isn't a well-developed, meaningful scale to measure the constructs used in RFID related studies [30].

Finally, the respondents of this study are employees from companies and public enterprises in Korea. As the usage of RFID spreads in the society, customers will more easily recognize that their privacy isn't safe. So, in the next study, the area of the acceptance of RFID by customers also offers tremendous research potential.

Appendix

In this study, the following constructs were used.

Security Trust

1. Personal Privacy : I trust that our company will safeguard personal privacy.
2. Information Leak : I trust that there won't be business information leaks.
3. Security Policy : I trust the security policy of our company.

Provider Trust(based on the past experience)

1. Beneficence : I trust that our IT service provider has worked for our company's benefit.
2. Experience & Reputation : I trust that our IT service provider has many experiences and reputation.
3. Provider's Ability : I trust that our IT service provider has the ability to install RFID system.

Employee Knowledge

1. Employee Ability : I believe that our employees have the ability to use RFID system.
2. Overall Knowledge : I believe that our employees have the overall knowledge about RFID system.
3. Advantage of RFID : I believe that our employees know the advantage of RFID compared with bar code or smart card.

Partner Influence

1. RFID Acceptance : I think that there would be a partner's influence on the procedure of RFID acceptance.
2. Spec Decision : I think that there would be the partner's influence on the procedure of RFID specifications decision.
3. Policy Decision : I think that there would be the partner's influence on the procedure of RFID-related policy decision.

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