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Factors Influencing Work-Related Use of Smartphones: An Empirical Investigation

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ABSTRACT

This paper touches the limitations of existing theories related to technology acceptance, which mainly focus on users' perceived ease of use and usefulness, and proposes the role for sensory capabilities and enjoyment in understanding smartphone use. Furthermore, we develop a model that explains smartphone usage and intention to use it for a task and analyzes 442 questionnaire survey responses of smartphone users. First, perceived usefulness, perceived sensory capability, and perceived enjoyment influenced smartphone usage. Second, we found that both perceived usefulness and smartphone use were significantly associated with users' intention to utilize the smartphone for their job-related tasks. Finally, both perceived sensory capability and enjoyment were found to be more powerful factors than ease of use in explaining smartphone use. From the study findings, implications and future research directions are also discussed.

Keywords: Smartphones, Intention to utilize for a task, Sensory capability

Ⅰ. Introduction

People use smartphones for daily working practices in firms and organizations (Li and Lin, 2016). The smartphone is a hybrid device that combines the features of a digital mobile phone and a personal digital assistant (PDA) (Laudon and Laudon, 2006), and its widespread use as an interpersonal communication tool and a personal information processing system has made it an ideal digital device for a computing-oriented environment (Lee et al., 2017; Park and Choi, 2013).

The usage of smartphones in the evening for work-related matters has been debated in terms of quality of life or well-being (Ohly and Latour, 2014). Trends in the smartphone market are rapidly changing. First, the market is currently dominated by the iPhone and Android smartphones because

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they have better sensory capabilities than many other smartphones (Gartner, 2012). Second, smartphone manufacturers and OS developers are competing more on improved user interfaces rather than hardware performance. For instance, patent infringements are more common for smartphone user interfaces and software technologies rather than in telecommunication and hardware technologies (Bloomberg, 2012). Third, after the release of the iPhone in 2007, companies have been working to enhance the intuitiveness of their interfaces such that the devices can be operated using human senses (i.e., by touch and voice recognition) without traditional input devices such as a keyboard and mouse (Milosevic et al., 2011). Fourth, Smartphones can link users to the state-of-the art technologies such as IoT (Internet of Things), using artificial intelligence (AI) and big data analytics. Thus, compared to the personal computer (PC) market, an important factor in smartphone diffusion is not only improving hardware performance but also enhancing ergonomic features. In addition to perceived usefulness and ease of use, which have been discussed in research based on the technology acceptance model (TAM), further research into the user acceptance process in terms of their intentions to use smartphones for their tasks is also required (Kim et al., 2018). This paper develops a model that explains the smartphone users' usage behavior extending to their intention to use their smartphone for job-related tasks.

Ⅱ. Theoretical Background

2.1. Development of Technology Acceptance Theories

There are several proposed theories about the IT acceptance process, including the theory of reasoned action, theory of planned behavior, and the technology acceptance model (TAM). The theory of reasoned action expands on Fishbein (1967) expectancy value theory and is widely used in social psychology research, especially in predicting human behavior (Fishbein and Ajzen, 1975). However, despite its widespread use in research, including the extensions and modifications, it is limited by its abstract and simple concept of the determinants of behavioral intention. The theory of planned behavior also suffers from similar limitations (Marks, 1996; Sutton 1998). The TAM, which uses perceived ease of use and usefulness (Davis, 1985; Davis et al., 1989), was developed as a response. However, though TAM is a useful theory for understanding the acceptance of information systems (IS) and IT, it also has some limitations, including its oversimplification of contexts and overemphasis on user judgments (Malhotra and Galletta, 1999). Venkatesh and Davis (2000) proposed a theoretical extension to address these issues, known as TAM2, which uses external variables such as the social influence process, job relevance, output quality, and result demonstrability. Subsequently, Venkatesh et al. (2003) extended existing theories of technology acceptance and proposed a unified theory of acceptance and use of technology (UTAUT), which incorporates social influence in addition to perceived ease of use and usefulness. Wu and Lederer (2009), based on their meta-analysis of TAM-based studies, suggest that there is no significant relationship between the two core TAM factors (perceived ease of use and usefulness) and actual usage. In addition, most research into technology acceptance focuses on the relationship between users' use intentions and its antecedents. Experimental research examining the relationship between use intention and actual use of IT is still relatively scarce (Beaudry and

Pinsonneault, 2010).

After the advent of smartphones, users' emotional responses to the product has grown in importance, so there are some limitations to understanding smartphone acceptance with existing technology acceptance theories such as TAM. For instance, though the Microsoft Windows smartphone was based on the Windows PC OS (and therefore had a high level of usefulness and ease of use) and was available for about 10 years, it failed to capture the market. Even Nokia's Symbian smartphones, which leveraged Nokia's mobile phone expertise and reached some 112 million users worldwide as of 2010 (Gartner, 2012), was eventually trumped by Apple's iPhone and Google's Android smartphones, which had better sensory capabilities.

Theories from other disciplines also use emotional factors to explain new technology acceptance. For instance, in the field of marketing, Kotler et al. (2010) proposed a market classification to explain how marketing has changed from being product- (i.e., Marketing 1.0) to customer-centered (i.e., Marketing 2.0), and the more recent change to human factor-centered (i.e., Marketing 3.0), which involves connecting emotional factors. In addition, company value propositions should consider this generation of consumers' functional, emotional, and spiritual aspects (Kotler et al., 2010). Meanwhile, researchers in the ergonomics field have examined emotional factors in the use of interactive products such as smartphones (Desmet and Hekkert, 2002; Hassenzahl and Tractinsky, 2006; Lavie and Tractinsky, 2004; Rafaeli and Vilnai-Yavetz, 2004). These attempts suggest the importance of human factors such as emotion and the effect when users consider using a new technology product.

2.2. Utilization of Smartphones and Intention to Use for Tasks

People use IT devices, such as smartphones, both for communication and for improving their job efficiency. Thus, users' acceptance of and the motivation to use these devices also involves their use for job-related tasks. Motivation is the tendency for connections to consequences to control the direction and selectivity of behavior and the tendency of this behavior to persist until a goal is achieved (Alderman, 1974). Therefore, motivation, whether internal or external, is a drive that compels action because human behavior is directed toward some goal (Petri, 1996).

There are two kinds of motivation: intrinsic (internal) motivation, which is based on personal interests, desires, and need for fulfillment; and extrinsic (external) motivation, which is based on rewards, praise, and promotions (Deci, 1975). The intrinsic motivation to use IT is determined by a user's emotional considerations such as interest, attention, and person satisfaction. On the other hand, extrinsic motivations to use IT are related to the user's behavior derived from external reactions such as recognition from another person or reward. Previously, using IT involved significant costs and effort, though modern IT is much more cost effective and easier to implement, and is therefore much more widespread. Consequently, users' intrinsic motivations are growing ever more important in IT acceptance in organizations.

Davis et al. (1992) explain computer use based on the above theory of motivation and assert that the perceived usefulness of IT, which refers to the technology's ability to improve performance, involves extrinsic motivation, and that the pleasure from using the technology is the intrinsic motivation. Davis et al. (1992)'s definition of pleasure as an intrinsic motivation is similar to Jordan (2002)'s definition of pleas-

ure in the customer's hierarchy of needs. The continuous pleasure derived from using technology creates a positive affect favoring the technology. The traditional theories of IS acceptance, such as the TAM, have emphasized enjoyment and playfulness as much as perceived ease of use and usefulness (Agarwal and Karahanna, 2000; Venkatesh, 2000). Users' acceptance of traditional hedonic IS, such as online gaming, online shopping, and e-learning systems, in addition to the use of PDAs, MP3 players, and other portable interactive systems, are explained by intrinsic motivation as enjoyment (Chen and Yen, 2004; Hsu and Lu, 2004; Lin et al., 2005; Saadé and Bahli, 2005; Shin, 2009).

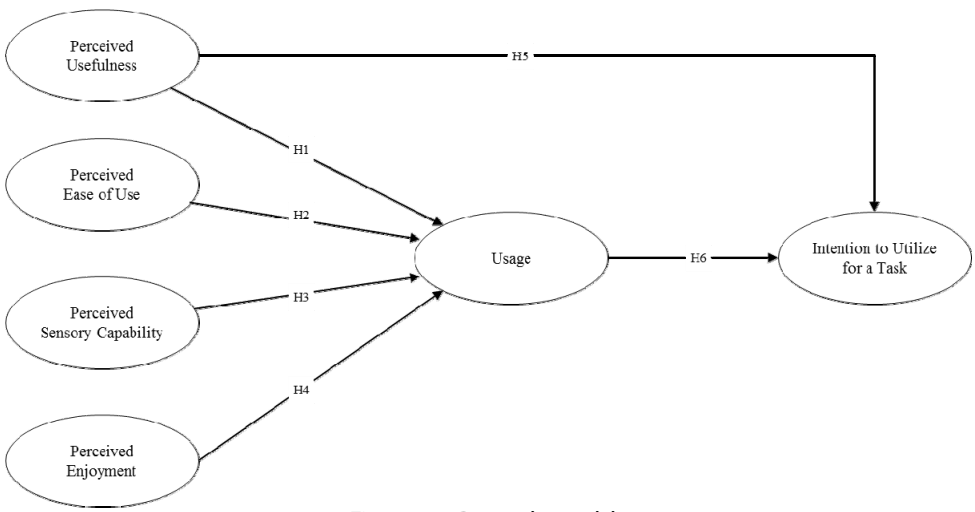
According to Hoffman and Novak (1996), uses with low levels of experience in computer-mediated environments tend to exhibit exploratory behavior, whereas highly experienced users tend to exhibit goal-oriented behaviors that may be related to their work or given tasks. Therefore, based on current theories (Hoffman and Novak, 1996) and other studies mentioned earlier, it is reasonable that a high level of smartphone could create an intention to use the smartphone for job-related tasks.

Ⅲ. Research Model and Hypotheses

Based on the TAM theories, we can predict that perceived usefulness and ease of use positively affect users' smartphone usage. Since smartphones are portable IT devices, their size and weight, as compared to PCs, make it difficult to use efficient input tools, such as keyboards and mice. Therefore, smartphones require a comfortable interface using human sensory organs. Furthermore, based on Agarwal and Karahanna (2000) and Venkatesh (2000)'s suggestions, perceived enjoyment is critical motivation for smartphone use.

As an intrinsic motivation, user's perceived usefulness of the smartphone encourages its use (Deci, 1975), during which the user tends to exhibit goal-oriented behaviors (Hoffman and Novak, 1996). We also predict that increasing smartphone use and perceived usefulness for task can create an intention to use the smartphones for their task. <Figure 1> presents the research model, and shows the causal relationships among these factors.

According to Davis (1989), perceived usefulness is the degree to which a person believes that using a particular system can enhance his/her job perform-



<Figure 1> Research model

ance, and perceived ease of use is the degree to which a person believes that using a particular system can be free of effort. Additionally, he asserts that if a user perceives an IT device as useful and easy to use, their intention to use the technology would increase, with the user eventually accepting the technology. Other studies show that perceived usefulness and ease of use are the main factors determining IT use (Igbaria et al., 1997; Mathieson, 1991; Taylor and Todd, 1995; Venkatesh and Davis, 1996; Venkatesh et al., 2003). Accordingly, we form the following hypotheses:

H1: Perceived usefulness of the smartphone is positively associated with smartphone use.

H2: Perceived ease of use of the smartphone is positively associated with smartphone use.

In addition to its telecommunication function, smartphones have information processing functions similar to PCs with a wireless network, though they cannot be operated for information processing using traditional input devices such as a keyboard and mouse, due to its small size and users' tendency to use the device while on the move. Kim and Koh (2017) empirically validated the importance of the emotional factors as well as cognitions in explaining online shopper's behaviors. Rather, smartphones are operated using sensory capabilities such as touch or voice recognition. According to Mahlke (2008), a smartphone's visual aesthetics, haptic quality, and acoustic quality related to human sensory organs are positively associated with use behavior for an interactive product. Thus, we propose the following hypothesis:

H3: The smartphone's perceived sensory capability is positively associated with smartphone use.

Davis et al. (1992) considered perceived enjoyment as an intrinsic motivation to use the PC. Similarly, Igbaria et al. (1997) asserted that perceived enjoyment is an intrinsic motivation for system use. Moon and Kim (2001) suggested that playfulness is a strong factor to explain online user behaviors in the internet access context. Since the smartphone is also an IT device similar to a portable PC, we hypothesize that:

H4: Perceived enjoyment of the smartphone is positively associated with smartphone use.

Davis et al. (1992) explained computer use based on the above theory of motivation and argue that IT's perceived usefulness, which refers to its ability to improve performance, is related to critical motivation. In particular, smartphone users are willing to evaluate the level of usefulness, that is, such digital device's performance when they intend to use them for work rather than non-work (Zhou and Feng, 2017). Jeon and Park (2015) also validated that compatibility, perceived usefulness, and perceived ease of use significantly affected the behavioral intention to use the mobile obesity-management app system. Accordingly, we propose the following hypothesis:

H5: Perceived usefulness of a smartphone is positively associated with intention to utilize for a task.

According to Hoffman and Novak (1996), highly experienced users in computer-mediated environments tend to exhibit goal-oriented behaviors. In addition, Castañeda et al. (2007) argue that users with a high level of website experience tend to pursue performance. Thus, highly experienced smartphone users would be interested in increasing their job performance by using a smartphone for job-related tasks.

These users may be accustomed to extending its functionality to the job, since they do not perceive much effort in doing so. Accordingly, we hypothesize that

H6: Smartphone use is positively associated with intention to utilize for a task.

Ⅳ. Methodology

4.1. Measurement Items

The research model is tested with an empirical study of smartphone users in Korea. This study derives the variable's operational definitions and develops each instrument based on previous research. The variables were measured on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*). Perceived usefulness is defined as the extent to which a person believes that using a smartphone would enhance his or her job performance. Perceived ease of use is defined as the extent to which a person believes that using a smartphone would be free of effort. These instruments are adapted from Davis (1989) and Venkatesh and Davis (2000). Perceived sensory capability is defined as the degree to which a smartphone can be operated using human senses (i.e., touch or voice recognition) following Mahlke (2008) and Jin et al. (2009). Perceived enjoyment is defined as the extent to which the act of using a smartphone is perceived as enjoyable in its own right in accordance with Venkatesh (2000) and Moon and Kim (2001).

<Table 1> Measures

Variables	Measures	Source
Perceived Usefulness (PU)	1. Using the smartphone in my job enables me to accomplish tasks more quickly. 2. Using the smartphone improves my job performance. 3. Using the smartphone enhances my job effectiveness.	Davis (1989), Venkatesh and Davis (2000)
Perceived Ease of Use (PEU)	1. I find it easy to learn how to use the smartphone. 2. I find that the smartphone is easy to use. 3. Generally, I am confident using the smartphone.	Davis (1989), Venkatesh and Davis (2000)
Perceived Sensory Capabilities (PSC)	1. My smartphone is visually well-designed. 2. My smartphone is sensitive to the touch. 3. My smartphone recognizes auditory input well.	Jin et al. (2009)
Perceived Enjoyment (PEN)	1. I have fun using my smartphone. 2. Using my smartphone is pleasant. 3. Using the smartphone stimulates my curiosity.	Moon and Kim (2001); Venkatesh (2000)
Usage (USE)	1. I use my smartphone several times a day to communicate. 2. I use my smartphone a lot in a day. 3. I'm a heavy smartphone user. 4. My smartphone is scarcely ever used. 5. Overall, my degree of smartphone usage is very high.	Straub et al. (1995)
Intention to Utilize for a Task (INTU)	1. I intend to use my smartphone for job-related tasks. 2. If possible, I would like to connect my smartphone to the company's/organization's IS. 3. I think that my smartphone would be useful for my job-related tasks. 4. I am convinced that my smartphone would be a good fit for our company's/ organization's IS.	Venkatesh and Davis (2000)

Note: USE4 is a reverse-coded item of Usage. "IS" means "information system."

<Table 2> Respondents' Descriptive Statistics

Classification		Frequency	Percentage
Smart Phone's OS	iOS	205	46.4
	Android	237	53.6
Gender	Male	325	73.5
	Female	117	26.5
Age	Under 20	18	4.1
	20 to under 30	234	52.9
	30 to under 40	163	36.9
	40 to under 50	26	5.9
	50 and more than 50	1	0.2
Total		442	100

The measurement is derived from Hennig-Thurau et al. (2006). Usage is defined as smartphone use. According to Straub et al. (1995), IS use may be self-reported or computer-recorded, and suggest that other variables in the TAM may well explain self-reported measures of system usage, so we estimated smartphone usage using self-reported measures rather than using computer-recorded figures. Finally, intention to utilize for a task (i.e., intention to use the smartphone for job-related tasks) is defined as the extent to which the user is willing to use a smartphone for his or her job-related tasks, developed based on Venkatesh and Davis (2000). <Table 1> summarizes the measurements used in this study.

4.2. Data Collection

The data were collected using an online survey of smartphone users. The study instruments were modified, in part, based on previous studies. For reliability and validity, we conducted a pre-test with 30 smartphone-using university students in Korea. The questionnaire was modified in accordance with the pre-test feedback. We created the survey on the Chonnam National University Business Incubating Center's server and posted a notice about our research survey to the bulletin boards of smartphone users' online community in Naver, one of the major internet portals in Korea, for a week. Respondents were offered compensation (approximately $5). During the survey, we checked whether the respondents were smartphone or feature phone users. To prevent duplicate survey submissions, we also checked and verified each respondent's IP address and phone number. A total of 452 respondents participated in the online survey. However, we excluded 10 cases as they lacked consistency in the responses to reverse-coded items. Ultimately, 442 cases were used for analysis. The collected data were analyzed using SPSS 17 and AMOS 17. <Table 2> shows sample characteristics.

4.3. Measurement Model Assessment

Each variable was measured using multiple items in Korean. We conducted exploratory factor analyses to assess the items' dimensionality. To test the instruments' construct validity, we conducted a principal-component factor analysis with varimax rotation. As shown in <Table 3>, most of the items' factor loadings exceeded 0.5, and the dependent and independent variable factor analysis explained 76.163%

<Table 3> Factor Analysis Results and Cronbach's Alphas

	Intention to Utilize for a Task (INTU)	Perceived Enjoyment (PEN)	Usage (USE)	Perceived Sensory Capability (PSC)	Perceived Ease of Use (PEU)	Perceived Usefulness (PU)	Cronbach's Alpha
INTU3	**0.839**	0.103	0.191	0.121	0.133	0.228	0.892
INTU2	**0.832**	0.091	0.073	0.082	0.069	0.116	
INTU4	**0.808**	0.14	0.177	0.155	0.069	0.224	
INTU1	**0.768**	0.144	0.214	0.156	0.052	0.202	
PEN1	0.146	**0.827**	0.223	0.169	0.09	0.141	0.767
PEN3	0.112	**0.823**	0.19	0.147	0.127	0.244	
PEN2	0.199	**0.821**	0.171	0.106	0.067	0.19	
PEN4	0.043	**0.726**	0.189	0.085	0.165	0.06	
USE2	0.134	0.248	**0.835**	0.18	0.07	0.053	0.842
USE1	0.118	0.112	**0.783**	0.157	-0.011	0.073	
USE3	0.148	0.238	**0.776**	0.097	0.159	0.15	
USE5	0.303	0.23	**0.731**	0.138	0.201	0.145	
PSC2	0.144	0.093	0.141	**0.837**	0.114	0.07	0.886
PSC1	0.051	0.018	0.104	**0.793**	0.143	0.113	
PSC4	0.097	0.162	0.083	**0.774**	0.092	0.069	
PSC3	0.162	0.174	0.176	**0.755**	0.049	-0.014	
PEU1	0.064	0.075	0.096	0.108	**0.895**	0.064	0.874
PEU2	0.152	0.132	0.062	0.085	**0.883**	0.104	
PEU3	0.054	0.194	0.142	0.216	**0.763**	0.203	
PU3	0.25	0.199	0.103	0.091	0.134	**0.848**	0.892
PU2	0.371	0.142	0.084	0.072	0.101	**0.817**	
PU1	0.191	0.289	0.209	0.097	0.193	**0.764**	
Eigen Value	8.255	2.201	1.94	1.876	1.454	1.03	-
Cumulative %	37.521	47.526	56.346	64.872	71.482	76.163	-

Note: Principal component analysis with varimax rotation method. Converged in seven iterations.

of the total variance, each with eigenvalues greater than 1. The variables' internal consistency was evaluated using Cronbach's alpha, which ranged from 0.767 to 0.892. As these are all over 0.7, there is satisfactory internal reliability (Nunnally, 1978). The reliability and validity of the research variables were therefore all acceptable. Furthermore, the model's fit was assessed using confirmatory factor analysis (CFA), indicating that the model's goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed fit index (NFI), comparative fit index (CFI), and root mean error of approximation (RMSEA)

<Table 4> Confirmatory Factor Analysis (CFA) Results

Construct	Item	Standardized Estimate	Composite Reliability	Average Variance Extracted
Perceived Usefulness	PU5	0.89	0.904	0.759
	PU4	0.877		
	PU2	0.810		
Perceived Ease of Use	PEU4	0.763	0.887	0.725
	PEU2	0.879		
	PEU1	0.855		
Perceived Sensory Capability	PSC3	0.734	0.842	0.572
	PSC2	0.856		
	PSC1	0.73		
	PSC4	0.713		
Perceived Enjoyment	PEN3	0.838	0.925	0.757
	PEN2	0.898		
	PEN1	0.884		
	PEN4	0.747		
Usage	USE3	0.824	0.907	0.71
	USE2	0.847		
	USE5	0.848		
	USE1	0.778		
Intention to Utilize for a Task	INTU3	0.918	0.881	0.651
	INTU2	0.731		
	INTU1	0.775		
	INTU4	0.882		

are 0.910, 0.884, 0.925, 0.954, and 0.057, respectively. Thus, the model had acceptable fit.

Next, convergent validity was evaluated for the eight measurement scales using the three criteria suggested by Fornell and Larcker (1981): all indicator factor loadings (λ) should be significant and exceed 0.7, construct reliabilities should exceed 0.8, and average variance extracted (AVE) for each construct should exceed the variance to account for the construct's measurement error (i.e., AVE should exceed 0.50). All λ values in the CFA exceeded 0.7 and were significant at $p = 0.01$. The composite reliabilities ranged from 0.838 to 0.939. AVE ranged from 0.713 to 0.918, which is greater than the variance from measurement error. Hence, all three conditions for convergent validity were acceptable (see <Table 4>).

Finally, Fornell and Larcker (1981) recommend a stronger test of discriminate validity: the AVE for each construct should exceed the squared correlation between that and any other construct. The factor correlation matrix indicated that the largest correlation between any pair of constructs was 0.620

<Table 5> Correlations and Discriminant Validity

	Average	S.D.	(1)	(2)	(3)	(4)	(5)	(6)
(1) Perceived Usefulness	**3.71**	**0.87**	**0.871***					
(2) Perceived Ease of Use	3.64	0.83	0.386	**0.851***				
(3) Perceived Sensory Capability	3.64	0.83	0.302	0.347	**0.756***			
(4) Perceived Enjoyment	4.06	0.71	0.533	0.364	0.392	**0.870***		
(6) Usage	4.00	0.73	0.436	0.359	0.441	0.583	**0.842***	
(7) Intention to Utilize for a Task	3.72	0.92	0.620	0.315	0.386	0.420	0.519	**0.807***

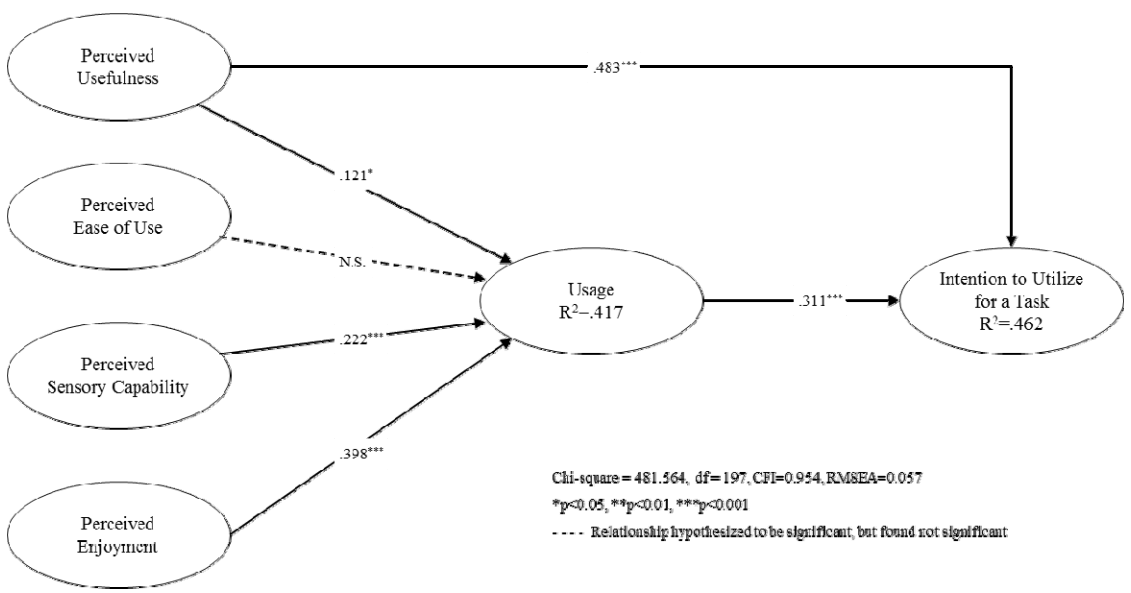
Note: *indicates the square root of AVE

(perceived usefulness and intention to use for task), while the smallest square root of AVE was 0.756. Hence, the discriminant validity test was also acceptable (see <Table 5>).

Ⅴ. Results

The structural model's goodness-of-fit was comparable to the previous CFA model. In this model, the relative chi-square (χ^2/d.f.) was 2.444 (χ^2 = 481.564; d.f. = 197), GFI was 0.910, AGFI was 0.884, NFI was 0.925, CFI was 0.954, and RMSEA was 0.057. These indexes indicate an acceptable goodness-of-fit between the hypothesized model and the observed data. <Figure 2> illustrates the results of our hypotheses testing.

The results show that smartphones' perceived usefulness had a significant positive relationship smartphone use (0.121, $p < 0.05$), supporting H1. However, the results show that perceived ease of use was not significantly related to usage, so H2 was not supported.



<Figure 2> Analytical Results

Additionally, perceived sensory capability had a significant positive relationship with usage (0.222, $p < 0.001$), thereby supporting H3. Moreover, the results show that perceived enjoyment had a strong relationship with use (0.398, $p < 0.001$), supporting H4.

The results indicate that perceived usefulness had a significant positive relationship with intentions to apply to a task (0.483; $p < 0.001$) and that usage has a significant positive relationship with intentions to apply to a task (0.311; $p < 0.001$). Thus, both H5 and H6 were supported.

VI. Discussion and Implications

This study identified factors affecting smartphone use and the intention to use a smartphone for job-related tasks. We also examined the relationships among the identified factors. First, perceived usefulness was significantly associated with usage. This may be because perceived usefulness was related to the user's goals for using a smartphone and its functionality. In addition, perceived sensory quality and perceived enjoyment were significantly associated with usage. Since a smartphone is often used as a portable information processing device, it should be light and small enough to use as a handheld device. In place of traditional input devices like the keyboards and mice, smartphones are operated using touch and voice recognition. These smartphone features affect smartphone usage—the higher the perceived sensory capability of the smartphone, the more the user's enjoyment of the smartphone. The smartphone also could have various game software installed, so users could spend their spare time with single- or multi-user games. Hence, perceived enjoyment was also found to be significantly associated with use. However, to effectively use a smartphone, users must familiarize themselves with its basic operations as well as with the purchasing and installing applications. Since the degree of ease of use varies with smartphone OS, perceived ease of use was not significantly associated with smartphone use. These results comprehensively imply that the TAM is not powerful enough to explain smartphone use. That is, ease of use did not significantly affect usage, while the effect of perceived usefulness was slightly significant. On the possible reason the effect of ease of use on usage is not significant, we interpret the relationship between ease of use and usage may be mediated by the intention to use, not showing the direct effect. In the smartphone context, sensory or emotionally stimulating factors, such as sensory capability or enjoyment could be more important than the TAM's factors, such as ease of use. From the practical perspective, when implementing IS to enhance competitiveness, firms should consider employees' enjoyment and sensory capabilities for these systems and devices, as well as IT usefulness.

We also found that perceived usefulness and smartphone use were significantly associated with users' intention to use the smartphone for job-related tasks. Since smartphones have comparable functionality to a PC, a user can use the device to accomplish various job-related tasks. Therefore, as suggested by Deci (1975), perceived usefulness serves as extrinsic motivation to use a smartphone for job-related tasks. Furthermore, the more the smartphone is used, the more a user exhibits goal-oriented behavior (i.e., the more they use a smartphone for job-related tasks). Hence, a user with high levels of smartphone usage or higher perceived usefulness of a smartphone is likely to use the device for job-related tasks. This could be because users perceive a smartphone as a work-related tool as well as an entertainment device,

introducing the concept of a product expanding or transferring value. This phenomenon may suggest the need for new theory building in terms of value conversion (or shift) in a use of a product from entertainment to work, or value convergence in a hybrid use of a product in the smartphone usage context. On the result that the impact of perceived usefulness on work-related smartphone use was found to be stronger than that of the smartphone usage on the work-related usage, we interpret that work-related smartphone utilization can be substantially increased by users' perception of usefulness for work since we measured the variable of usefulness with work-related survey items. We also guess that some of users may independently use smartphones for day-to-day work practices owing to smartphone's utility for work.

Furthermore, the result that both sensory capability and enjoyment are powerful factors to explain the usage of smartphones implies the importance of the emotional or hedonic features of them even in the work context since a smartphone can be regarded as a citizen's symbolic commodity in his or her everyday life.

Ⅶ. Conclusions and Study Limitations

This study aimed to understand the role of sensory factors and enjoyment in smartphone use and to explore the effect of smartphone use on users' intention to use their smartphone for work. We found that perceived usefulness, perceived sensory capability, and perceived enjoyment significantly affect smartphone usage. Among these factors, perceived sensory capability and enjoyment were the most significant compared to perceived usefulness, implying that the TAM may not be valid or have limitations in explaining smartphone use. Thus, some emotional or hedonic features such as sensory capability and enjoyment should be highlighted even in the work-related usage context of the mobile devices or smartphones. Furthermore, both perceived usefulness and smartphone use were significantly associated with users' intention to use the smartphone for their job-related tasks. This result hints at the possibility of a cross-over utilization of smartphones for both work and non-work.

Despite of its useful implications, this study has several limitations that could be addressed in future research. First, the survey respondents were mainly in their 20s and 30s. Hence, future studies can extend surveys to respondents from other age groups to obtain more generalizable results. Second, the cross-sectional data may have also limited our findings. For example, it would be useful to check the time frame for smartphone use and its application to a task. That is, future research need to consider a longitudinal study design. Third, any survey respondents who do not play any game via smartphones could not have put any relevant questionnaire answer on the variable of perceived enjoyment. Finally, although we examined the relationships between some major factors, it was not possible to account for all possible factors and relationships. For example, this study excluded the direct impacts of ease of use, sensory capability, enjoyment on work-related smartphone usage that might be available. Therefore, future studies should include these possible relationships or extend the smartphone acceptance model to include factors such as social influence and user characteristics.

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