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Motivational Factors Affecting the Acceptance of Smartwatch in Korea : Social Image, Enjoyment, and Health Information Orientation

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This study aims to examine the factors influencing the intention to accept smartwatch through the extended technology acceptance model (TAM), which incorporates consumer-oriented external factors that correspond to the unique characteristics of the smartwatch: social image, perceived enjoyment, and health information orientation. Online survey data of 1,500 Koreans were analyzed using structural equation modeling (SEM). The results show the intention to use smartwatch is influenced by social image and perceived enjoyment through the mediation effect of TAM. In addition, health information motivation is found to affect the intention to use a smartwatch. This paper suggests that practitioners in the smartwatch industry emphasize healthcare functions of the devices and promote its compatibility with mobile health applications. The noteworthy finding is to verify how the healthcare functions of smartwatch have a significant impact on the acceptance. This study is contributed to understanding the social motivation and health-related function affecting the acceptance of smartwatch.

Keywords: Smartwatch, Technology Acceptance Model (TAM), Structural Equation Modeling (SEM), Social Image, Perceived Enjoyment, Health Information Orientation

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Introduction

In modern society, interest in health has increased rapidly with the growth in average life expectancy and the discovery of various physical and mental illnesses. Furthermore, the development of information technology (IT) has enabled people to self-manage their health and seek information related to health from online sources. Notably, a new approach to health management, known as mobile health, has been introduced with the advent of personal mobile devices that allow users to collect and monitor their health-related data (Bakker, Kazantzis, Rickwood, & Rickard, 2016). Individuals cannot only generate and manage their health-related data but also search for information that could aid them in formulating tentative diagnoses.

Wearable devices, which are electronic/computerized devices that can be attached to or worn on one's body (Buenaflor & Kim, 2013), have received considerable attention as a critical means of collecting personal health-related information. One such device, the smartwatch, is an integrated watch-shaped device that is worn on the user's wrist, can be connected to other devices via the Internet, and collects and stores personal health-related data via sensors. Smartwatches have been recognized for their potential as next-generation devices that could change people's everyday lives, as they are convergent mobile devices that integrate the information and communications technology (ICT) and horology industries. Also, they function not only as wristwatches but also as healthcare, fitness, and ICT tools (Cecchinato, Cox, & Bird, 2015).

Most studies examining smartwatches have focused on the objectives of use, with an emphasis on technological, rather than user-centered, factors (Chan, Estève, Fourniols, Escriba, & Campo, 2012). However, during the early stages of the introduction of new technology to the market, when consumers' needs have not been determined in full, it is crucial to measure their perception of the technology and behavioral use intention (Cecchinato et al., 2015). Therefore, it is necessary to examine user-centered motivational factors affecting consumers' intention to use a smartwatch.

Previous studies have adopted various theoretical perspectives, including

behavioral intention models, originated from social psychology, to identify determinants of the acceptance and continued use of IT (e.g., Davis, 1989; Chau & Hu, 2001; Davis, Bagozzi, & Warshaw, 1989). One research model examining users' behavioral intention is the technology acceptance model (TAM) initially suggested by Davis (1989). The TAM is grounded on the theory of planned behavior (TPB) developed by Ajzen (1991) and has been considerably influential as a means of identifying antecedent factors influencing the acceptance of new technology. Mainly, the TAM has been used widely to foresee acceptance of new technology by the incorporation of various types of factors (e.g., Chau & Hu, 2001; Gefen & Straub, 2000; Gefen, Karahanna, & Straub, 2003).

However, the TAM has several theoretical issues. Although it is universally applicable in diverse situations involving the prediction of technology use, the model has a limitation in that it does not provide detailed or specific information of particular technology use (Ryan & Bock, 1990). For instance, the TAM does not take into consideration the function of social determinants in technology use, as it does not involve subjective norms, which are included as a social factor in the theory of reasoned action (TRA; Mathieson, 1991). The model also overlooks external antecedents to relevant fundamental cognitive factors (Mathieson, 1991; Venkatesh & Davis, 2000). Therefore, various researchers have posited that the TAM is more useful when combined with additional theories rather than used as a standalone model (Bagozzi, 2007; Benbasat & Barki, 2007; Chuttur, 2009).

In a line of these issues, this study aimed to establish the possibility of generalization of the TAM by including factors involving social influence and intrinsic/extrinsic motivation as relevant antecedents.

Literature Review

Technology acceptance model (TAM)

The TAM has been used as a theoretical framework in various studies examining the acceptance of ICT (e.g., Chau & Hu, 2001; Davis, Bagozzi, & Warshaw, 1989; Gefen & Straub, 2000; Igbaria, Guimaraes, & Davis, 1995; Szajna,

1994;). The TAM was designed to predict usage intention and derived from the theoretical framework of TRA. In the TAM, people decide whether to accept certain types of technology according to their voluntary behavioral intention, which acts on both attitudes toward the technology, influenced by their beliefs regarding its perceived usefulness, and perceived ease of use (Davis, 1989).

Perceived usefulness is defined as "the extent to which potential users believe that the use of a certain type of technology will enhance their work performance." Early research focused on perceived usefulness regarding task performance in organizational situations (e.g., Davis, 1989), but subsequent studies have gradually broadened the application of the concept of perceived usefulness to include various non-organizational situations (e.g., Cho et al., 2014; Park & Kim, 2013; Yang et al., 2016). Meanwhile, perceived ease of use refers to "subjective beliefs regarding the lack of difficulty, concerning physical or mental effort, related to the use of a certain type of technology" (Venkatesh & Davis, 2000). The TAM states that beliefs regarding a particular type of technology underlie attitudes toward and influence behavioral intention to use.

The TAM posits that higher levels of perceived usefulness and ease of use lead to a stronger behavioral intention to accept technology (Davis, 1989). Namely, users tend to be accepting of a new type of technology when it is considered beneficial to their work performance or easy to use. Moreover, perceived usefulness mediates perceived ease of use and intention to use newly introduced technology (Venkatesh & Davis, 2000). When all other environmental conditions being equal, users tend to perceive technology that is easier to use as helpful. Therefore, depending on the characteristics of certain types of technology and the contexts in which they are used, perceived ease of use could exert an indirect effect on behavioral intention via perceived usefulness.

The TAM is limited by its neglect of antecedent factors that could influence perceived usefulness and ease of use because of its firm theoretical foundations and conciseness (Mathieson, 1991; Venkatesh & Davis, 2000). Earlier applications of the TAM failed to recognize that users' conceptualization of perceived usefulness and ease of use could differ according to the technology's unique characteristics or usage

context. Therefore, situation-based antecedent factors have to be taken into account in the examination of intention to use newly introduced technology (Venkatesh & Davis, 1996).

The TAM has been applied as a theoretical framework in examining mobile health and wearable devices in the healthcare industry. Investigating the continued use of mobile health applications, Cho (2016) found that both perceived usefulness and ease of use exerted significant influences on the intention to continue using the technology. In addition, examining the intention to use mobile healthcare systems, Wu et al. (2005) reported that perceived usefulness and ease of use exerted direct effects on behavioral intention to use the technology, and the impact of perceived ease of use on intention to use the technology was mediated by perceived usefulness. Besides, the effects of the two cognitive factors in the TAM have been found after modifications in accordance with the characteristics of unique technology. Cho and colleagues (2014) concluded that the perceived usefulness of mobile health applications exerted a direct effect on behavioral intention to use the technology. Moreover, Park and Kim (2013) reported that perceived usefulness exerted a direct influence on intention to use a mobile cloud service. In case of smartwatch acceptance, Wu et al. (2016) demonstrated the effect of relative advantage, which plays a role similar to that of perceived usefulness in innovation diffusion theory (Moore & Benbasat, 1991), on intention to use a smartwatch via attitudes. Yang and colleagues (2016) cound perceived usefulness affected intention to use a smartwatch via perceived value. Based on the findings of these earlier studies, we expected that perceived usefulness would have an influence on the intention to use smartwatches and established the following hypothesis:

H1: Perceived usefulness is related to intention to use smartwatches.

Sun et al. (2013) presented evidence of the direct effect of perceived ease of use on behavioral intention. In addition, perceived ease of use affected the intention to use a smartwatch via perceived usefulness or attitudes (Chuah et al., 2016; Kim & Shin, 2015). On the basis of the findings of previous studies, we expected perceived ease of use to affect behavioral intention in the context of the acceptance of

smartwatches and established the following hypotheses:

H2: Perceived ease of use is related to intention to use smartwatches.

H3: Perceived ease of use is related to perceived usefulness of smartwatches.

Social image as social influence

According to social influence theory, which explains the relationship between technology acceptance and social influence, when accepting a new type of technology or service, people have a tendency to be affected by social norms or the views of their peers, in addition to the objective functions of the technology (Fulk, 1993; Schmitz & Fulk, 1991). As regards ICT, social factors have been proven to influence intention to use. For example, Svenning (1982) reported that prospective users' perceptions regarding acceptance of teleconferencing systems tended to be influenced by the opinions of their peers and superiors. Steinfield (1986) showed that individuals' intention to use e-mail services tended to be influenced by the extent of their coworkers' e-mail use. Kling and Gerson (1977) also considered the social features of computers to examine the use of personal computers and found that people used computers because of their network-like characteristics, via which they could establish connections with others.

Venkatesh and Davis (2000) suggested an extended TAM which includes factors involving social influence such as social image and subjective norms. People tend to accede to normative social influences to form or maintain favorable images of themselves within groups (Kelman, 1958). Based on innovation diffusion theory, Moore and Benbasat (1991) defined an image as "the extent to which the use of innovative technology contributes to the enhancement of individuals' social status." Venkatesh and Davis (2000) indicated the acceptance of certain types of technology could improve an individual's image, which could exert a positive effect on his or her social status. Therefore, individuals come to recognize using technology could exert direct or indirect positive effects on their work performance by reinforcing their images. In other words, complying with subjective norms in the form of identification enhances individuals' social images, which increases the perceived

usefulness of newly introduced technology in situations involving both voluntary and mandatory acceptance of the technology.

According to a study involving early adapters of the smartwatch, individual innovativeness and social perception were crucial determinants of smartwatch use (Cecchinato et al., 2015). However, the study was conducted when the use of smartwatches was in its infancy, and the findings were limited as the study was exploratory in nature. Choi and Kim (2016) defined the "need for uniqueness" as a trait involving the purchase of goods to differentiate oneself from others and enhance one's self- or social image. This factor was shown to influence the intention to use smartwatches, via perceived enjoyment. The image conveyed by smartwatch use has been identified as an important motivational factor. Although Choi and Kim (2016) emphasized social influences regarding users' desire to seek approval of their appreciation of a device's aesthetic function and social features, they did not consider the social function of smartwatch use in terms of externally influenced subjective norms. Therefore, the present study found the smartwatch to be characterized by its role as a luxury fashion item, similar to a wristwatch and focused on examining how subjective norms, in the form of identification, influenced perceived usefulness and intention to use smartwatches by enhancing social image. From the perspective of social influence, we expected the enhancement of social image by smartwatch use would influence the perceived usefulness of it and established the following hypothesis:

H4: Social image is related to perceived usefulness of smartwatches.

Intrinsic and extrinsic motivation

Motivation can be classified into two types. First, Extrinsic motivation refers to "motivation that drives actions based on goals or reward," whereas intrinsic motivation refers to "motivation that arises from enjoyment of the act itself, without the expectation of receiving anything in return" (Ryan & Deci, 2000). Although the TAM provides a comprehensive explanation regarding extrinsic motivation through perceived usefulness, this is not the case for intrinsic motivation. Therefore,

to settle the problems associated with the parsimony of the TAM, intrinsic and extrinsic motivational factors should be examined as external antecedents of the TAM factors (Venkatesh & Davis, 1996).

Perceived enjoyment

The extended TAM involving "perceived enjoyment" as an intrinsic motivational factor was proposed (Davis, Bagozzi, & Warshaw, 1992). Perceived enjoyment refers to "the extent to which users believe that they will enjoy and derive fun from the use of a certain type of technology, aside from the expected advantages" (Davis et al., 1992). Previous studies examining information systems have verified that perceived enjoyment significantly influence intention and attitudes toward using technology (Davis et al., 1992; Moon & Kim, 2001; Venkatesh, 1999). Perceived enjoyment has also been shown to exert significant influences on both perceived usefulness and ease of use. Vankatesh (2000) showed that system-specific perceived enjoyment and the general entertainment derived from computers were antecedent factors that exerted significant effects on perceived ease of use. The finding indicates the extent to which users perceive to be able to overcome the burden or effort involved in using technology differs according to the level of perceived enjoyment about using the technology.

Besides, Liu and Li's (2011) finding that perceived enjoyment in the use of mobile applications exerted a positive effect on perceived usefulness. Technology considered more enjoyable to use is thought to be more useful, which could be interpreted to indicate the fulfillment of intrinsic motivation exerts a positive impact on the fulfillment of extrinsic motivation. Therefore, it is feasible that perceived enjoyment could be an antecedent of the TAM factors and influence the intention to use technology in various ways.

According to consumer behavior studies, consumer goods are primarily classified as either utilitarian or hedonic, according to their characteristics (Hirschman & Holbrook, 1982). Utilitarian systems provide utilitarian values such as work efficiency or performance improvement. In contrast, hedonic systems provide users with the value of self-fulfillment and experiential enjoyment

associated with the use of such products. Van der Heijden (2004) reported that the effect of intrinsic motivation on the intention to use hedonic IT systems was stronger relative to that of extrinsic motivation, and this finding implies that the characteristics of a product influence prospective consumers' intention to purchase technology (Babin, Darden, & Griffin, 1994; Holt, 1995).

Wu et al. (2016) suggested that smartwatches should be studied regarding their hedonic characteristics as well as their technical features. Hong, Lin, and Hsieh (2016) included both utilitarian and hedonic values to predict the intention to continue using smartwatches, and the results showed that both values influenced the intention to use smartwatches. However, these previous studies did not examine the effect of hedonic values on the cognitive factors in the TAM. Therefore, this study aims to explore the impact of perceived enjoyment on TAM's key elements and intention to use a smartwatch. By the abovementioned findings, we established the following hypotheses:

H5: Perceived enjoyment is related to perceived usefulness of smartwatches.
H6: Perceived enjoyment is related to perceived ease of use of smartwatches.
H7: Perceived enjoyment is related to intention to use smartwatches.

Health information orientation

Although the TAM considers perceived usefulness a form of extrinsic motivation, the explanatory power of the model is limited by the general and ambiguous concept of perceived usefulness. Moreover, the objects to be measured by the TAM were not concretized as well (Ryan & Bock, 1990).

A smartwatch is regarded as mobile health devices since it can be connected wirelessly to smartphones to assist in health maintenance (Istepanian & Lacal, 2003). The device assists in the provision of various health-related applications that measure or track physical activity by providing access to personal health information (Kalantarian & Sarrafzadeh, 2015). Several researchers have supported the efficacy of mobile health in improving diverse health conditions including alcoholism, intellectual disability, and mental illness (Bernhardt et al., 2009;

DePompei et al., 2008; Depp et al., 2010). As a wearable device that provides possible functions to enhance user's health, the smartwatch can be characterized as a utilitarian system.

Dutta-Bergman (2004a) provided definitions for the following health-related concepts. First, health orientation refers to "the extent of one's will to manage one's health." Health-oriented people have been shown to be interested in acquiring health information and make a direct effort to manage their health (Ruppel & Rains, 2012). Next, health information orientation refers to "the behavior involved in seeking health-related information." Basu and Dutta (2008) reported that people who were strongly health information-oriented incline to search for health information via various channels. Also, people who were strongly oriented toward health information tended to become health oriented.

The acquisition of health information is essential since it improves the efficiency of health management and facilitates the prevention of diseases. With the advancement of the Internet and explosive growth in the availability of personal mobile devices, people come to have abilities to search for and access health-related information freely. For instance, 52% of smartphone users were found to acquire health information with personal mobile devices (Fox & Duggan, 2012). Moreover, there is an increasing trend in the acquisition of health information on the Internet (Fox & Duggan, 2013).

Cho and colleagues (2014) showed that health information orientation had a significant impact on the perceived usefulness of health-related applications. This finding conclusively demonstrated that people who were more interested in health information tended to perceive media with health-related features to be more useful and were more strongly inclined to use such media, relative to those without this interest. Based on this result, it can be assumed that users' propensity for health information orientation could affect the perceived usefulness of a smartwatch, which provides personal health information. In other words, people who are more strongly oriented toward health information are expected to be more likely to perceive the health-related features of smartwatches as useful. Therefore, this study established the following hypothesis:

H8: Health information orientation is related to perceived usefulness of smartwatches.

Methods

Research design

This study used structural equation modeling (SEM) to develop and assess an acceptance model that indicated the relationships between six latent variables: social image (SI), perceived enjoyment (PEJ), health information orientation (HIO), perceived usefulness (PU), perceived ease of use (PEOU), and intention to use (INT). Figure 1 shows the research model.

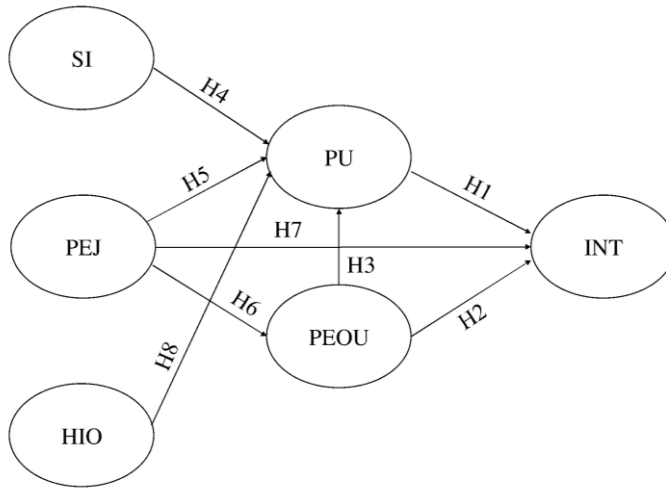

Figure 1. Research Model

Data collection

The data analyzed in the study were collected as part of a larger study that examined Korean individuals' perceptions and behavior in terms of their knowledge and attitudes toward ICT. An online survey was conducted to determine the psychological and cognitive factors that influenced the behavioral intention to use a smartwatch and verify their effects. The data were collected in cooperation

with *Macromill Embrain*, one of the largest survey companies in South Korea, which engaged about 1,160,000 panelists at the time of our survey. The company randomly selected 10,465 people listed on the panel and sent them an invitation e-mail to participate in the study. If they agree to participate in the survey, they were directed to move on the survey webpage. After that, the participants were directed to answer the questions regarding the perception of smartwatch use. Of the 2,581 eligible individuals, 1,500 respondents (58.1%) completed the survey.

Sample

The subjects were selected from a Korean population aged between 20 and 59 years, using stratified sampling based on three demographic variables: sex, age, and area of residence. The sample consisted of 767 (51.1%) men and 733 (49.9%) women, and the participants' mean age was 40.23 years (SD = 11.01). Table 1 shows the descriptive statistics for the sample.

Table 1. Descriptive Statistics (N = 1,500)

Measures	Items	*n*	%
Sex	Male	767	51.1
	Female	733	49.9
Age	20–29	319	21.3
(M = 40.23)	30–39	362	24.1
	40–49	419	27.9
	50–59	400	26.7
Educational level	Below high school	11	7
	High school	368	24.5
	Undergraduate	1,007	67.1
	Graduate	144	7.6
Income	<2,000	475	31.7
(US dollars)	2,000–2,999	339	22.6
	3,000–3,999	288	19.2
	4,000–4,999	198	13.2
	≥5,000	200	13.3

Measures

Multi-item scales adopted from relevant previous studies were used to measure the conceptual constructs in the study. The original questionnaires were modified slightly to reflect the context of smartwatch use. All responses were provided using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Social image. Social image was adopted from studies conducted by Moore and Benbasat (1991) and Venkatesh and Davis (2000). Respondents were asked to indicate how much they believe that they can improve their social image by using a smartwatch with the following statements: 1) "Having a smartwatch is a status symbol", 2) "If I were to adopt smartwatch use, I would have more prestige than people who have not yet adopted it", and 3) "Because of my use of a smartwatch, others see me as a more valuable person."

Perceived enjoyment. Perceived enjoyment was taken from studies conducted by Moon and Kim (2001) and Davis et al. (1992). Respondents were asked to indicate how much they perceive using a smartwatch is enjoyable with the following statements: 1) "Using a smartwatch is enjoyable for me", 2) "I find using a smartwatch enjoyable", and 3) "I have fun using my smartwatch."

Health information orientation. Health information orientation was adopted from a study conducted by Dutta-Bergman (2004b). Respondents were asked to indicate how much they are oriented to health information with the following statements: 1) "I make a point of reading and watching stories about health", 2) "I need to know about health issues, so that I can keep myself and my family healthy", 3) "Before making a decision about my health, I find out everything I can about the issue", and 4) "The amount of health information available today makes it easier for me to take care of my health."

Perceived usefulness. The items for the core variables in the TAM (i.e., perceived usefulness, perceived ease of use, and intention to use) were adopted mainly from studies conducted by Davis (1989) and Moore and Benbasat (1991). Perceived usefulness was measured to ask respondents how much they recognize that using a smartwatch can improve their work performance with the following four items: 1) "I

would find using a smartwatch useful in my job", 2) "Using a smartwatch would enhance my effectiveness at work", 3) "Using a smartwatch would increase my productivity", and 4) "Information obtained from a smartwatch would be helpful."

Perceived ease of use. Perceived ease of use was measured to ask respondents how much they recognize that using a smartwatch is easy with following three items: 1) "It would be easy for me to become skillful at using a smartwatch", 2) "Learning to use a smartwatch is easy for me", and 3) "My interaction with a smartwatch would be clear and understandable."

Intention to use. Intention to use was measured with three items. Respondents were asked to indicate how much they are likely to use a smartwatch in the future with following statements: 1) "I intend to use a smartwatch in the near future", 2) "I intend to use a smartwatch later in my life the future", and 3) "I will make an effort to use a smartwatch."

Data Analysis

Construct validity and model fit were assessed by confirmatory factor analysis (CFA) and SEM with maximum likelihood estimation, using AMOS 22. The reliability and validity of the measurements were evaluated using CFA, and the strength and direction of the proposed paths in the research model were analyzed using SEM. To ensure a multivariate normal distribution of the data, Kline (2015) recommended the indices of skewness and kurtosis for each variable should not exceed |3| and |10|, respectively. Skewness ranged from -0.36 to 0.05, and kurtosis ranged from -0.50 to 0.81, which were within Kline's (2015) thresholds. Therefore, multivariate normal distribution of the data was verified.

As there is no consensus regarding the best fit index for the SEM, it is necessary to assess model validity using various fit indices. Therefore, we used the following fit indices: ratio of χ^2 to the degrees of freedom (χ^2/df), standard root mean residual (SRMR), goodness-of-fit index (GFI), normed fit index, Tucker-Lewis index (TLI), comparative fit index (CFI), and root mean square error of approximation (RMSEA).

Results

Measurement model

The values for the measurement model fit indices were as follows: $\chi^2/df = 5.36$, SRMR = .03, GFI = .94, NFI = .97, TLI = .97, CFI = .98, and RMSEA = .05. Table 2 shows the results for the analysis of the measurement model. These results showed that the model demonstrated excellent fit. The model also demonstrated internal reliability, as Cronbach's αs for all variables exceeded .70. In addition, the model demonstrated convergent validity; the factor loadings for each questionnaire item and average variance extracted exceeded .70 and .50, respectively.

Table 2. Results for the Analysis of Measurement Model

	Items	Factor Loadings	AVE	α
Social Image	SI1	.90	.88	.95
	SI2	.96		
	SI3	.93		
Perceived Enjoyment	PEJ1	.88	.90	.95
	PEJ2	.96		
	PEJ3	.95		
Health Information Orientation	HIO1	.77	.71	.85
	HIO2	.78		
	HIO3	.77		
	HIO4	.78		
Perceived Usefulness	PU1	.90	.82	.94
	PU2	.93		
	PU3	.88		
	PU4	.84		
Perceived Ease of Use	PEOU1	.90	.88	.94
	PEOU2	.95		
	PEOU3	.93		
Intention to Use	INT1	.90	.83	.93
	INT2	.96		
	INT3	.87		

Note. AVE = average variance extracted

Discriminant validity was also confirmed based on Fornell and Larcker's (1981) recommendation. Table 3 shows the results for the analysis of discriminant validity. The results showed that the square roots of the average variance extracted values for all observed variables were higher relative to the coefficients for the correlations between the variables. Therefore, the latent variables in the study demonstrated adequate discriminant validity.

Table 3. Results for the Analysis of Discriminant Validity

	SI	PEJ	HIO	PU	PEOU	INT
SI	**.94**					
PEJ	.52	**.95**				
HIO	.17	.31	**.84**			
PU	.52	.70	.32	**.90**		
PEOU	.26	.51	.28	.64	**.94**	
INT	.47	.74	.28	.74	.51	**.91**

Note. Boldfaced diagonal elements are the square roots of the average variance extracted; to demonstrate discriminant validity, boldfaced values should be higher relative to the correlation coefficients in the same row and column; AVE = average variance extracted, HIO = health information orientation, INT = intention to use, PEJ = perceived enjoyment, PEOU = perceived ease of use, PU = perceived usefulness, SI = social image

Structural model and hypothesis testing

Based on a The SEM results indicated that the structural model demonstrated satisfactory fit: $\chi^2/df = 5.40$, SRMR = .04, GFI = .94, NFI = .97, TLI = .97, CFI = .98, and RMSEA = 0.05. Table 4 and Figure 2 show the results of hypothesis testing. All hypotheses other than H2 (i.e., the path from PEOU to INT) were supported by the data. Specifically, PU exerted a significant influence on INT (H1: $\beta = 0.43$, $t = 14.08$, $p < .001$), which supported H1. H2 was rejected, as PEOU did not affect INT (H2: $\beta = 0.01$, $t = 0.44$, $p = .659$). However, PEOU exerted a significant effect on PU (H3: $\beta = 0.38$, $t = 17.42$, $p < .001$), which supported H3. In addition, H4, represented by the path from SI to PU (H4: $\beta = 0.22$, $t = 10.30$, $p < .001$) was supported. Furthermore, PEJ exerted significant effects on PU (H5: $\beta = 0.37$, $t = 15.02$, $p < .001$), PEOU (H6: $\beta = 0.51$, $t = 20.93$, $p < .001$), and INT (H7: $\beta = 0.43$, $t = 16.48$, $p < .001$), which supported H5, H6, and H7. Finally, HIO exerted a significant effect on PU (H8: $\beta = 0.06$, $t = 3.06$, $p = .002$), which supported H8.

Table 4. Results of Hypothesis Testing

Hypothesis				Path Coefficient	*t*-value	*p*	Results
H1	PU	→	INT	.43	14.08	***	Supported
H2	PEOU	→	INT	.01	0.44	.659	Rejected
H3	PEOU	→	PU	.38	17.42	***	Supported
H4	SI	→	PU	.22	10.30	***	Supported
H5	PEJ	→	PU	.37	15.02	***	Supported
H6	PEJ	→	PEOU	.51	20.93	***	Supported
H7	PEJ	→	INT	.43	16.48	***	Supported
H8	HIO	→	PU	.06	3.06	*	Supported

Note. Boldfaced HIO = health information orientation, INT = intention to use, PEJ = perceived enjoyment, PEOU = perceived ease of use, PU = perceived usefulness, SI = social image
*$p < .01$. ***$p < .001$

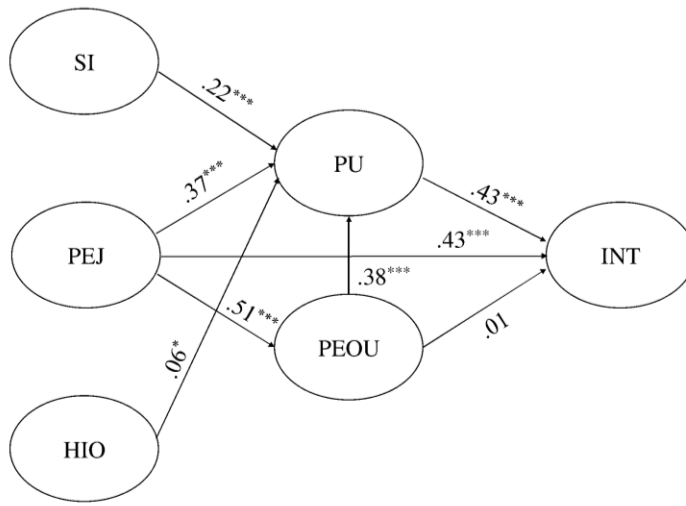

Figure 2. Results of Research Model

Discussion

The study elaborated a systematic examination of the effects of consumer-related factors on the intention to use a smartwatch. The theoretical basis of the study was based on the extended TAM, which included antecedent factors that

corresponded to the characteristics of the smartwatch; the research model was verified using SEM. The study integrated social influence factors and motivational factors into the TAM, to ascertain whether they explained the intention to use a smartwatch.

As one of the most widely used models in explaining the intention to use new technology, the TAM has been used to examine the intention to use a smartwatch in numerous studies (Choi & Kim, 2016; Kim & Shin, 2015; Wu et al., 2016). However, the TAM showed limited explanatory power for the intention to use a smartwatch, as it is better suited to the explanation of the intention to use new technologies in organizational settings. Contrary to that of the technology used in corporate environments, a smartwatch is driven to use mainly by users' personal needs or motivation. Unlike original TAM, the results of this study are consistent with those of other studies indicating the perceived ease of use did not affect intention to use the mobile health services (e.g., Choi & Kim, 2016; Rauschnabel et al., 2016; Wu, Li, & Fu, 2011). As smartwatches are small devices that present no obstacles to activity in daily life, perceived ease of use also exerts a limited effect on intention to use a smartwatch (Wu et al., 2016). This finding also could be attributed to the fact that the market for smartwatches is still in its infancy. Current users are likely to be early adopters with higher levels of efficacy in the use of technology relative to those of the wider population; therefore, perceived ease of use does not currently play an important role as a predictive factor for smartwatch use (Kim & Shin, 2015). In addition, because of the technological advantages of smartwatches, users are likely to be willing to overcome difficulties associated with their use, even if they do not consider the product easy to use. Given this, we assumed that the technological advantage that differentiates the smartwatch from other devices is its healthcare-related functionality. Therefore, this study sought to ascertain whether people who were strongly oriented toward health information were more likely to perceive the smartwatch as useful, relative to those without this orientation. We adopted this approach to overcome the limitation of the generality of the TAM while simultaneously determining whether the healthcare-related function in the smartwatch was a key factor in consumers' decisions to purchase smartwatches. The

results could apply to the intention to use not only the smartwatch but also other wearable devices that provide health-related functions.

The verification of effects of social factors within the context of smartwatch use is another significant aspect of the study. Previous studies have demonstrated the social functions of smartwatches by examining various social factors such as vanity, self-expression, the need for uniqueness (Choi & Kim, 2016), social influence (Wu et al., 2016), and social perception (Cecchinato et al., 2015). However, the present study examined the social factors that pertained to the unique characteristics of the smartwatch, as the use of smartwatch is driven mainly by voluntary motivation and personal need. Social image was defined as a more specific social factor, relative to the concept of subjective norms in the TPB. In the present study, this factor was differentiated from the general notion of subjective norms, which applies to organizational settings or situations involving mandatory use as well as voluntary use. The results showed that as the strength of users' belief that using a smartwatch would enhance their social image increased, the likelihood that they would perceive smartwatches as useful increased, which increased their willingness to use them.

In addition, the study examined the role of intrinsic and extrinsic factors in determining intention to use a smartwatch. As described earlier, the extrinsic motivational factor was captured by health information orientation, whereas perceived enjoyment was included as an intrinsic motivational factor that could affect behavioral intention to use a smartwatch. The findings indicated that users were amused by the new technology and usage methods provided by the smartwatch, encouraging them to use the smartwatch for entertainment rather than the expected utility. Therefore, intrinsic motivation, whereby users derived enjoyment from the act of using the smartwatch, influenced intention to use a smartwatch.

The factors of health information orientation (i.e., extrinsic motivation) and perceived enjoyment (i.e., intrinsic motivation) were based on motivational theory. Intrinsic motivation was initially distinguished from extrinsic motivation (Deci & Ryan, 1980); however, extrinsic motivation could be transformed into intrinsic motivation via internalization (Deci & Ryan, 1985). In the present study, there was

no connecting link between intrinsic and extrinsic motivation; therefore, it was difficult to elucidate the internalization process via which intention to use a smartwatch was influenced. Future studies should involve sophisticated modeling of intrinsic and extrinsic motivation and examine all types of motivation that could affect the intention to use a smartwatch in depth.

The health information factors examined in the study have considerable implications for the smartwatch-related industry. The functionality that is genuinely unique to the smartwatch is its ability to track and store users' personal health information, allowing them to manage their health. Although this feature distinguishes the smartwatch from other mobile devices, few previous studies had examined intention to use a smartwatch from the perspective of the health-related functions. Therefore, the smartwatch industry could stimulate consumers' behavioral intention to use a smartwatch by emphasizing the device's healthcare features or promoting its usefulness or compatibility with mobile health applications to allow users to manage their health. The findings of this study are also applicable to future studies examining the intention to accept various types of wearable device from the perspective of health communication.

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