Asia Pacific Journal of Information Systems
Vol. 27 No. 3 (September 2017), 176-190

ISSN 2288-5404 (Print) / ISSN 2288-6818 (Online)
https://doi.org/10.14329/apjis.2017.27.3.176

Roles of Health-Oriented Personal Factors in Influencing Koreans' Perceptions about Telemedicine: Exploration of Regional Differences

Jaehee Cho[a], Ghee-Young Noh[b,*]

[a] *Associate Professor, School of Media & Communication at Chung-Ang University, Korea*
[b] *Professor, School of Media Communication and Director of Healthcare Media Research Institute at Hallym University, Korea*

ABSTRACT

This study aimed to investigate the roles of three health-oriented personal factors—health technology innovativeness (HTI), health consciousness (HC), and health information orientation (HIO)—in determining Koreans' perceptions about telemedicine. Based on an extended version of the technology acceptance model (TAM), two perceptual components—perceived usefulness (PU) and perceived ease of use (PEOU)—of telemedicine were considered for this investigation. Data from 699 usable surveys were analyzed using path analysis. The results from the path analysis indicated that while HTI and HC had no or limited effects on the PU and PEOU of telemedicine, the effects of HIO on those two perceptual components of telemedicine were statistically significant. Moreover, the results from the path analysis showed that there were significant regional differences in the effects of HTI and HC on the PU and PEOU of telemedicine. In general, these effects were greater among the metropolitan residents than they were among the rural residents.

Keywords: Telemedicine, Health Technology Innovativeness, Health Consciousness, Health Information Orientation, Regional Differences

Ⅰ. Introduction

Korea has been well known for its highly connected telecommunication networks. According to Korea Internet and Security Agency's report, in 2016, the Internet penetration rate in Korea reached approximately 100%. Moreover, the rate of smartphone ownership surpassed 85% (NIA, 2017). Therefore, given the notable improvement in telecommunication networks as well as high smartphone penetration rate, concerned parties in the field of medical services have continuously shown considerable interest in mobile health (mHealth) based on various mobile technologies. As the field of mHealth has expanded,

*Corresponding Author. E-mail: gnoh@hallym.ac.kr Tel: 82332481917

various concerned parties including the Korean government and medical service providers have endorsed controversial standpoints on telemedicine as an influential tool in facilitating mHealth (Cho et al., 2015; Gagnona et al., 2003; Kim et al, 2015; Kim, et al., 2015; Lee, et al., 2015; Oh, et al., 2011; Rho and Bae, 2013; Rho, et al., 2015). In general, while governmental agencies often address the advantages and benefits of telemedicine, medical associations oppose the implementation of telemedicine, emphasizing its potential risks (e.g., the leaking of medical information) (Lee et al., 2015). Thus, previous studies have presented various advantages and disadvantages of telemedicine in South Korea.

Nevertheless, because telemedicine is still at the beginning stage, there has been not enough research to fully comprehend the nationwide implementation of telemedicine. Previous research (Cho et al., 2015; Kim et al, 2015; Lee et al., 2015; Oh et al., 2011; Rho et al., 2015) has mostly focused on the following main issues related to the implementation of telemedicine: 1) economic costs and benefits from telemedicine services, 2) technological development for implementing and improving telemedicine service, 3) policy-making issues related to telemedicine implementation and management. Although all of those issues are critical for successful and adequate nationwide implementation of telemedicine, it is necessary for policy makers, service providers, and researchers to more thoroughly comprehend how recipients of telemedicine services would perceive and evaluate telemedicine services. Furthermore, as previous research has shown, people's personal attitudes toward health technologies are largely influenced by diverse personal factors such as personality traits, personal innovativeness, and so forth (Jackson et al., 2013; Kuo et al., 2013; Putzer and Park, 2012). Therefore, this study aimed to explore how personal factors related to health management would be associated with individuals' perceptions about telemedicine. This present research was theoretically reliant on an extended version of the technology acceptance model (TAM). The following sections will elaborate on telemedicine in Korea and the theoretical background of telemedicine and will propose multiple hypotheses.

Ⅱ. Literature Review

Scholars have taken huge effort to understand micro-mechanisms of adopting new technologies, proposing diverse theories and models including theory of uses and gratifications, theory of diffusion of innovation, technology acceptance model, and so on (Chen, 2011; Daivs et al., 1989; Joo and Sang, 2013; Kim et al., 2011; Legris et al., 2003; Rubin, 2002; Rogers, 2003). Among those theoretical models and theories, previous studies on the adoption of new technologies have largely relied on various extended versions of the technology acceptance model (TAM) (Legis et al. 2003; Venkatesh and Davis, 2000). The main strength of TAM is that it explains how individuals' perception about a new technology associated with their attitudes toward the technology, which finally lead them to adopt it (Egea and Gonzalez, 2011; Legis et al., 2003; Venkatesh and Davis, 2000). Therefore, extended versions of TAM are quite adequate for examining the effects of diverse groups of perceptual predictors on individuals' behavioral intention to adopt new technologies. In order to thoroughly comprehend the public' attitudes toward the nationwide implementation of telemedicine in Korea, this study aimed at investigating how Koreans would perceive various aspects of telemedicine and how such perceptions would impact

Koreans' attitudes toward telemedicine. Therefore, TAM is theoretically applicable to this present research. Moreover, because this study also paid attention to personal predictors' roles of determining Korean's perception about telemedicine, an extended version of TAM is well suited for this present research. The followings will elaborate the theoretical components for this study in details.

The original version of the TAM is theoretically dependent on the main arguments of the theory of reasoned action (TRA) and the theory of planned behavior (TPB) (Venkatesh and Davis, 2000). These theories focus on the micro-mechanisms that connect people's perceptions, behavioral intentions, and actual behaviors. Therefore, based on these theories, the TAM explains how people's perceptions of a new technology lead them to adopt it (Lu et al., 2005; Venkatesh and Davis, 2000). Many previous studies have found empirical evidence supporting the prediction power of the TAM (Egea and Gonzalez, 2011; Legris et al., 2003; Yarbrough and Smith, 2007; Yun and Park, 2010).

The original TAM is composed of two perceptual components and behavioral intention to adopt a new technology. These two perceptual components are perceived usefulness (PU) and perceived ease of use (PEOU) (Lu et al., 2005; Venkatesh and Davis, 2000). According to Davis, Bagozzi and Warshaw (1989), PU is proportionate to the extent to which a new technology is effective for accomplishing a given task or achieving a specific goal (Davis et al., 1989; Venkatesh and Davis, 2000). Thus, the more adequate a technology is for completing a required task in the expected way, the higher is the PU of that technology. PEOU is associated with the extent of ease with which a person can learn how to use a new technology and finally use it conveniently (Davis et al., 1989; Venkatesh and Davis, 2000). The original TAM emphasizes that PU and PEOU play positive roles in determining the behavioral intention (BI) to adopt and use a new technology (Legris et al., 2003). Moreover, based on the close relationship between PU and PEOU, previous studies have addressed the role of PU in mediating the effect of PEOU on the BI to use a new technology (Legris et al., 2003; Yun and Park, 2010). Finally, based on the findings of these previous studies, the following hypotheses were developed and tested.

H1: The PU and PEOU of telemedicine will be positively and directly associated with the BI to use it.

H2: The PU of telemedicine will mediate the effect of the PEOU of telemedicine on the BI to use it.

To improve and extend the original TAM, scholars have addressed the necessity to consider the potential antecedents of the PU and PEOU of a new technology (Venkatesh and Davis, 2000). In other words, to more thoroughly comprehend the entire process of technology adoption, it is necessary to understand how the PU and PEOU of a new technology are determined. Therefore, previous studies have proposed various theoretical models (i.e., TAM III and the unified theory of acceptance and use of technology [UTAUT]), which are extensions of the original TAM (Im et al., 2011; Legris et al., 2003; Venkatesh and Davis, 2000; Yarbrough and Smith, 2007; Zhou et al., 2010). For example, TAM II proposes that subjective norms and previous experiences are important in determining people's perceptions about a new technology (Venkatesh and Davis, 2000). Moreover, as previous studies have strongly contended, diverse personal factors are significantly associated with perceptual components of TAM (Agarwal and Prasad, 1998; Dabholkar and Bagozzi, 2002; Devaraj et al., 2008; Rauschnabel et al., 2015). For example, in-

dividuals' Big Five personality traits (e.g., openness) are often significantly associated with their perceptions about a new technology (Devaraj et al., 2008; Svendsen et al., 2013; Cho et al., 2014). Based on these arguments, this present study also pursued to investigate the role of personal predictors in influencing people's perceptions about telemedicine in Korea.

Because personal factors in regards to technology adoption are very diverse in terms of scopes and levels, it is necessary to select specific areas of personal factors to obtain internal validity of research findings. Therefore, since this present study gave the major attention to Koreans' perceptions about health-related service, it is more reasonable to focus on health-oriented personal factors. Moreover, previous studies have shown proficient evidence of supporting health-oriented predictors' significant influence on people's attitudes toward and perceptions about health-related technologies (Cho et al., 2014; Cho, Lee et al., 2015; Choi et al., 2015). For example, Cho et al.'s (2014) research found that health-oriented factors including health consciousness were significantly related to people's perceptions about health apps on smartphones. In regards to health-oriented factors, previous studies have often addressed diverse factors related to individuals' habits, knowledge, personality, and so on. This study examined the potential roles of the following three health-oriented personal factors in determining the PU and PEOU of telemedicine: 1) health technology innovativeness (HTI), 2) health consciousness (HC), and 3) health information orientation (HIO). These three specific factors were selected because individuals' health-oriented perceptions and behaviors are closely associated with their 'personality (HTI)' regarding openness to new experiences, 'cognition (HC)' of health conditions, and 'knowledge (HIO)' about health issues.

First, as elaborated above, people's attitudes toward health technologies are largely associated with personal factors (Agarwal and Prasad, 1998; Dabholkar and Bagozzi, 2002; Devaraj et al., 2008; Rauschnabel et al., 2015). In particular, previous research on technology adoption has focused on "innovativeness" as a personal factor that inherently influences one's attitudes toward a new technology (Jackson et al. 2013; Lu, 2014; Lu et al., 2005; Rakhi and Mala, 2014). For example, Lu (2014) found that personal innovativeness was still a strong determinant of behavioral intention to use mobile commerce. Regarding this issue, studies on the Big Five personality traits have also found that people with higher openness are more likely to attempt to adopt new ideas and technologies (Svendsen et al., 2013). Therefore, more innovative people tend to show positive attitudes toward a new technology and finally adopt it (Agarwal and Prasad, 1998; Hirunyawipada and Paswan, 2006). With regard to health technologies, this implies that HTI plays a positive role in shaping positive attitudes toward telemedicine as a new technology. Therefore, we developed the following hypotheses.

H3: HTI will be positively associated with the PU of telemedicine.

H4: HTI will be positively associated with the PEOU of telemedicine.

Next, previous studies have addressed the crucial role of health consciousness as a health-oriented personal factor in determining ones' health behaviors (Cho et al., 2014; Dutta-Bergman, 2004). Health consciousness is mainly conceptualized as the extent to which a person recognizes the importance of actively taking care of their own health and actually takes significant effort to maintain good health conditions (Dutta-Bergman, 2004; Ghvanidze et al., 2017; Lee et al., 2014). People who are more conscious

of their own health tend to continuously monitor their own health conditions and take various actions to stay healthy—e.g., finding health-related information and taking supplementary health food (Dutta-Bergman, 2004). For instance, Lee et al. (2014) found that people with higher level of health consciousness more strongly reacted to healthy food provision. In addition, highly health-conscious people are more likely to actively use various tools to better manage their health, showing relatively more positive attitudes toward new health technologies (Cho et al., 2014; Xiao et al., 2014). For instance, perceived health status that is a specific domain of health consciousness was significantly associated with people's online health information search (Xiao et al., 2014). Moreover, Cho et al.'s research (2014) found a positive relationship between health consciousness and people's intention to use health apps. These previous studies' main findings indicate the positive role of health consciousness in determining people's perceptions about such health technologies. Finally, based on these findings, the following hypotheses were developed.

H5: HC will positively predict the PU of telemedicine.
H6: HC will positively predict the PEOU of telemedicine.

Lastly, as health information technologies have greatly improved, HIO has become another important personal factor that is strongly associated with health behaviors (Basu and Dutta-Bergman, 2008; Bidmon and Terlutter, 2015; Hovick et al., 2014). HIO is related to individuals' proactive behaviors of seeking health information from various sources including medical service providers, influential others, Internet search engines, blogs, and so on (Basu and Dutta-Bergman, 2008). People with a higher HIO tend to thoroughly research and investigate their own medical conditions, actively using as many sources as possible and through multiple channels. Therefore, it would be plausible that these people are more likely to show positive attitudes toward new health technologies of potentially providing more health information. Consequently, the following two hypotheses were developed.

H7: HIO will positively predict the PU of telemedicine.
H8: HIO will positively predict the PEOU of telemedicine.

In order to further examine the effects of these three predictors, namely HTI, HC, and HIO, on the PU and PEOU of telemedicine, regional differences in the infrastructure of medical services were considered. As numerous studies have found, there are considerable differences between rural and urban areas in terms of access to medical services (Cho, 2013; weaver et al., 2013). Indeed, residents in rural areas are often isolated from high-quality medical services, because large general hospitals providing better medical services are concentrated in metropolitan areas (Kim et al., 2015). For instance, in Korea, in 2012, while the number of physicians per 100,000 residents in large cities was 188, it decreased to 76 in rural areas (Cho, 2013). These regional differences in medical services are very likely to be significantly associated with individuals' health management styles as well as their attitudes toward health technologies. Consequently, through the following research question, this study explored how the effects of HTI, HC, and HIO on the PU and PEOU of telemedicine would be influenced by residential area.

RQ1: How are the effects of HTI, HC, and HIO on the PU and PEOU of telemedicine moderated by residential area?

Ⅲ. Methods

3.1. Participants and Procedure

The survey method was used to collect data. A large research company, which is well known for having the largest pool of panel members, processed the survey. To collect data from more representative samples, proportionate stratified sampling, while considering gender and residential area, was used. In total, 699 questionnaires without missing data were collected. The gender portion of research participants were quite even (52.2% of males). The residential areas were also quite even (55.5% participants from metropolitan areas). The average age of participants was 39.3 years. More participants had college or higher degrees (69.6%). The median monthly income was $3,000-$4,000.

3.2. Instrumentation

All the factors were measured using 5-point Likert-type scales (e.g., 1 = Strongly Disagree, 5 = Strongly Agree). For all the composite measures, acceptable Cronbach's alpha scores (> .70) were obtained.

3.2.1. Health Technology Innovativeness (HTI)

In order to measure this variable, seven items were developed. Some examples of these items are (a) "I tend to buy new health technologies, even though they are expensive," and (b) "I enjoy learning how to use new health technologies." The reliability test revealed an acceptable Cronbach's alpha score (M = 2.31, SD = .78, α = .92) for this measure.

3.2.2. Health Consciousness (HC)

Four items developed by Dutta-Bergman (2004) were used to measure health consciousness (HC). Examples of these items are (a) "I take care of my health fairly well," and (b) "I believe I am healthy in general." The reliability test revealed an acceptable Cronbach's alpha score (M = 3.03, SD = .69, α = .72) for this measure.

3.2.3. Health Information Orientation (HIO)

To measure health information orientation (HIO), Dutta-Bergman's (2004) original scale with eight items was used. Two examples of the items are (a) "To maintain healthy conditions, it is important to be informed about health issues," and (b) "When I take a medicine, I try to gain as much information as possible about its benefits and side effects." An acceptable Cronbach's alpha score (M = 3.38, SD = .61, α = .88) was obtained for this measure.

3.2.4. Perceived Usefulness (PU)

In order to measure this variable, five items developed by Davis et al. (1989) were reworded to make them relevant to telemedicine. Two examples of these items are (a) "Telemedicine may be useful for improving the quality of medical services by providing accurate medical information," and (b) "Telemedicine may be useful for improving the quality of medical services by supporting the continuous management of symptoms." An acceptable Cronbach's alpha score (M = 3.37, SD = .79, α = .93) was obtained for this measure.

3.2.5. Perceived Ease of Use (PEOU)

To measure the PEOU of telemedicine, three items proposed by Davis et al. (1989) were reworded. Two examples of these items are (a) "It may be easy to learn how to use telemedicine," and (b) "I may find it easy to understand how to use telemedicine." An acceptable Cronbach's alpha score (M = 3.31, SD = .80, α = .94) was obtained for this measure.

3.2.6. Behavioral Intention (BI)

Three items from Davis et al.'s original scale (1989) were reworded to measure the intention to use telemedicine. Two examples of these items are (a) "Given the opportunity, I predict that I will use telemedicine in the future," and (b) "Given the opportunity, I plan to use telemedicine." The reliability of this measure was acceptable, evidenced by the Cronbach's alpha score (M = 3.34, SD = .90, α = .96).

Ⅳ. Results

For the purpose of testing the hypotheses, a path analysis was conducted. To assess the goodness of model fit, three model fit indices—comparative fit index (CFI, >.95), infinite fit index (IFI, >.95), and root mean square error of approximation (RMSEA, <.08) were reviewed. The path analysis results revealed acceptable model fit indices ($\chi 2(df = 3) = 7.7$, CFI = .99, IFI = .99, RMSEA = .05).

H1 and H2 hypothesized that HTI would have positive effects on the PU and PEOU of telemedicine. However, both these hypotheses were rejected, as the effects of HTI on the PU (β = .03, p = .30) and PEOU (β = .04, p = .37) of telemedicine were not found to be statistically significant.

H3 and H4 hypothesized that HC would play a positive role in determining the PU and PEOU of telemedicine. While HC positively and significantly predicted PEOU (β = .12, p = .007), its effect on the PU (β = .03, p = .34) of telemedicine was not significant. These results supported H4 but rejected H3.

Lastly, H5 and H6 focused on the positive effects of HIO on the PU and PEOU of telemedicine. The results from the path analysis indicated that HIO positively and significantly affected the PU (β = .10, p = .02) and PEOU (β = .22, p < .001) of telemedicine.

RQ1 explored the regional differences in the relationships between the three predictors and two perceptual dimensions of the TAM. In order to explore RQ1, two separate path analyses for each of the two different groups of research participants were conducted. As <Table 1> shows, in most cases, the effects of the three predictors on PU and PEOU were greater among the metropolitan residents than they were among the rural residents. However, an exception was the effect of HIO on PU, which was larger among the rural residents than it was among the metropolitan residents.

In order to further explore the regional differences, the default model was compared with the constrained model, corresponding to six paths from the three predictors to the PU and PEOU of telemedicine. The results indicated two statistically significant moderating effects of regional differences. First, when the effect of HTI on PEOU was constrained, the chi-square score for the constrained model significantly increased (χ^2 = 18.54)—by one degree of freedom (p < .001)—to a greater extent than did the chi-square score of the default model (χ^2 = 15.70). That is, the effect of HTI on the PEOU of telemedicine was statistically greater among the metropolitan par-

<Table 1> Regional Comparison of Regression Coefficients

	Metropolitan		Rural	
	β	P	β	P
HTI → PU	.06	.15	.02	.71
HTI → PEOU	.10	.08	-.04	.48
HC → PU	.10	.04	-.40	.46
HC → PEOU	.14	.02	.10	.13
HIO → PU	.04	.45	.16	.02
HIO → PEOU	.22	.002	.21	.01

ticipants than it was among the rural participants.

Next, with regard to the effect of HC on the PU of telemedicine, the chi-square score for the constrained model was significantly larger (χ^2 = 19.37), (p < .001)—by 3.67—than that for the default model, when the degrees of freedom increased by one. This also indicated that the effect of HC on the PU of telemedicine was statistically greater among the metropolitan residents than it was among the rural residents. In addition to the effects of HIO, HTI, and HC on the PU and PEOU of telemedicine, this study hypothesized that PU and PEOU would have direct and indirect effects on the BI of telemedicine. Fully supporting H7, the PU (β = .61, p < .001) and PEOU (β = .40, p < .001) of telemedicine strongly predicted the BI to use telemedicine. Moreover, Sobel's test indicated a strong mediating effect of PU on the relationship between the PEOU of telemedicine and the BI to use it (*Sobel's statistics* = 14.1, p < .001). This result fully supported H8.

V. Discussion

Paying attention to the increasing application of mobile technologies to medical services, the primary goal of this present study was to investigate the direct effects of three health-oriented personal factors—health technology innovativeness (HTI), health consciousness (HC), and health information orientation (HIO)—on the two perceptual components of the TAM—perceived usefulness (PU) and perceived ease of use (PEOU)—with regard to telemedicine. As the results from the path analysis indicated, while HTI did not have direct significant effects on the PU and PEOU of telemedicine, HC and HIO significantly predicted the PU and/or the PEOU of telemedicine. Moreover, the effects of these predictors were mostly greater among the metropolitan residents than they were among the rural residents. In particular, the effect of HTI on PEOU and the effect of HC on the PU of telemedicine were statistically significantly greater among the metropolitan residents than they were among the rural residents.

These results provide multiple interesting points. First, it was interesting that unlike the original prediction, HTI did not have a significant effect on the PU of telemedicine. This might have been because the "innovativeness" of telemedicine as a new technology was devalued. In other words, the exchange of medical information through mobile tools is not something that is quite so "innovative" or "novel" to Koreans, who live in a highly wired society that is largely supported by telecommunication networks.

For instance, it is not uncommon that when a patient wants to change a local hospital to a general hospital for more advanced medical examination, his/her medical information from the local hospital is electrically transitioned to the general hospital. This indicates that the general population of Korea would be less resistant to the "innovativeness" of telemedicine. Therefore, in order to develop more practically effective strategies of successfully implementing telemedicine services, policy-makers must consider the general population's higher familiarity with the digitalization of processing medical information.

Next, the strong effects of HIO on the PU and PEOU of telemedicine were also considerable. As has been elucidated above, HIO is the extent to which a person actively seeks health-related information. Thus, people with a higher HIO are more likely to proactively search for health-related information through as many channels as possible. Considering these basic characteristics of people with a higher HIO, it is reasonable to assume that people with a higher HIO would also actively use Internet-based sources to gain better health-related information. Moreover, according to channel expansion theory (Carlson and Zmud, 1999), as a person's experiences of using a specific communication channel increase, his/her perception of richness of that particular communication medium also increases. Therefore, when the user is faced with a new technology of having similar functions with the previous one, s/he is more likely to perceive higher level of media richness of the new technology and show more positive attitude toward it. Therefore, those people, who are more likely to find health information through digital media, would display more positive attitudes toward newly developed health technologies and would be less hesitant to adopt them.

Lastly, this study found two statistically significant differences in the effects of HTI, HIO, and HC on the PU and/or PEOU of telemedicine. In particular, the effect of HTI on the PEOU of telemedicine was stronger among the metropolitan residents than it was among the rural residents. The effect of HC on the PU of telemedicine also showed the same pattern. These results are presumably closely related to the fundamental differences in the infrastructure and quality of medical services. In other words, because metropolitan residents have much better access to medical services as well as digital media networks, they are more likely to show higher levels of health literacy and media literacy. Therefore, it follows that metropolitan residents would possibly be more open to new health technologies than would be their rural counterparts.

These results have the following theoretical and practical implications. First, in terms of theoretical contribution, this study's main findings were helpful for enlarging the theoretical application of TAM to more diverse research areas. Although the prediction power of TAM has been already supported by numerous studies (King and He, 2006; Schepers and Wetzels, 2007), it is still necessary to consider more organizational and social factors in order to improve the predictive ability of TAM (Legris et al., 2003). Therefore, it is theoretically meaningful that this present study explored and found the regional differences in personal health-oriented factors' effects on two perceptual components of TAM. In particular, previous research of applying extended versions of TAM to telemedicine has paid little attention to potential roles of locational factors for moderating relationships among key study variables. However, it is important to examine regional differences in telemedicine-related issues, because one of the main purposes of implementing telemedicine is to provide

people in remote areas with better medical services. Therefore, this present research's findings are helpful for enlarging theoretical variations of TAM.

In addition to such theoretical contribution, this study's findings are practically meaningful in the following ways. First, unlike previous studies that investigated the viewpoints of relevant parties—medical doctors, patients, and policy makers—on telemedicine, this study focused on the public's attitudes toward telemedicine in Korea. Therefore, the findings will be useful for building a national consensus on the nationwide implementation of telemedicine. In particular, the strong effects of HIO on the PU and PEOU of telemedicine indicate that policymakers need to consider the public's patterns of seeking health information. In other words, an appropriate analysis of health information-seeking behaviors would be helpful in designing more efficient strategies for the implementation of telemedicine. Next, regional differences in the relationships among the three predictors, PU, and PEOU of telemedicine will allow the relevant parties to more thoroughly comprehend the macro-mechanisms that lead people to have certain attitudes toward telemedicine. In other words, considering those personal factors' influence on PU and PEOU of telemedicine, it is recommended that policy-makers need to apply different strategies of introducing the implementation of telemedicine to rural and metropolitan areas. While policy-makers need to focus more on improving the literacy of health and digital media in rural areas, they are recommended to directly appeal the usefulness of telemedicine to metropolitan residents.

In spite of these theoretically and practically meaningful findings, the following points need to be considered for future research. First, it is necessary to add more personal factors as predictors into the extended TAM. In particular, it is recommended that more health-oriented factors such as health management behaviors and medical history be analyzed. Moreover, as elaborated above, Big Five personality traits are also considerable (Devaraj et al., 2008; Witt et al., 2011). For example, Devaraj et al. (2008) addressed the relationship between multiple dimensions of individuals' personality and technology acceptance. Next, it would also be beneficial for future research to compare the personal health-related factors of the general population with those of patients with chronic diseases, who require regular medical checkups. In particular, further analyses of cross-effects of residential areas and medical conditions on attitudes' toward telemedicine will be meaningful.

Ⅵ. Conclusion

This study aimed to explore how three personal health-related factors, namely HTI, HTO, and HI, would affect the public's perceptions about telemedicine. As the results from the path analysis showed, while health technology innovativeness (HTI) and health consciousness (HC) had no or limited effects on the PU and PEOU of telemedicine, health information orientation (HIO) strongly predicted these two perceptual components of the TAM. In addition, this study explored how the relationships among the three predictors and two perceptual factors would be influenced by the area in which the research participants resided. The results from the path analysis showed that there were significant regional differences in the effects of HTI and HC on the PU and PEOU of telemedicine. In general, these effects were greater among the metropolitan residents than they were among the rural residents.

Acknowledgement

This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2015S1A3A 2046760).

<References>

[1] Agarwal, R., and Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, *9*, 204-215.

[2] Basu, A., and Dutta-Bergman, M.J. (2008). The relationship between health information seeking and community participation: The roles of health information orientation and efficacy. *Health Communication*, *23*, 70-79.

[3] Bidmon, S., and Terlutter, R. (2015). Gender differences in searching for health information on the Internet and the virtual patient-physician relationship in Germany: Exploratory results on how men and women differ and why. *Journal of Medical Internet Research*, *22*, e156.

[4] Carlson, J. R., and Zmud, R. W. (1999). Channel expansion theory and the experiential nature of media richness perceptions. *Academy of Management Journal*, *42*, 153-170.

[5] Cho, H. (2013). Equity in health care: Current situation in South Korea. *Journal of Korean Medical Association*, *56*, 184-194.

[6] Chen, G. M. (2011). Tweet this: A uses and gratifications perspective on how active Twitter use gratifies a need to connect with others. *Computers in Human Behavior*, *27*, 755-762.

[7] Cho, S. J., Kwon, I. H., and Jeong, J. (2015). Application of telemedicine system to prehospital medical control. *Healthcare Informatics Research*, *21*, 196-200.

[8] Cho, J., Lee, H. E., Kim, S. J., and Park, D. (2015). Effects of body image on college students' attitudes toward diet/fitness apps on smartphones. *Cyberpsychology, Behavior, and Social Networking*, *18*, 41-45.

[9] Cho, J., Park, D., and Lee, H. E. (2014). Cognitive factors of using health apps: Systematic analysis of relationships among health consciousness, health information orientation, eHealth literacy, and health app use efficacy. *Journal of Medical Internet Research*, *16*(5), e125.

[10] Choi, J., Park, D., and Noh, G. (2015). The effect of attributes of exercise/fitness apps on app usage: a convergency perspective based on the self-determination theory. *Journal of Digital Convergence*, *13*(6), 327.

[11] Dabholkar, P. A., and Bagozzi, R. P. (2002). An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors. *Journal of the Academy of Marketing Science*, *30*, 184-201.

[12] Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*, 982-1003.

[13] Devaraj, S., Easley, R. F., and Crant, J. M. (2008). How does personality matter? Relating the five-factor model to technology acceptance and use. *Information Systems Research*, *19*, 93-105.

[14] Dutta-Bergman, M. J. (2004). Primary sources of health information: Comparisons in the domain of health attitudes, health cognitions, and health behaviors. *Health Communication*, *16*, 273-288.

[15] Gagnona, M., Godinb, G., Gagneb, C., Fortina, J., Lamothec, L., Reinharza, D., and Cloutierd, A. (2003). An adaptation of the theory of interpersonal behavior to the study of telemedicine adoption by physicians. *International Journal of Medical Informatics*, *71*, 103-115.

[16] Egea, J. M. O., and Gonzalez, M. V. R. (2011).

Explaining physicians' acceptance of EHCR systems: An extension of TAM with trust and risk factors. *Computers in Human Behavior*, *27*, 319-332.

[17] Gallup Korea Daily Opinion, "Research on smartphone use from 2012 to 2014". *Gallup Korea*.

[18] Ghvanidze, S., Velikova, N., Dodd, T., and Oldewage-Theron, W. (2017). A discrete choice experiment of the impact of consumers' environmental values, ethical concerns, and health consciousness on food choices: A cross-cultural analysis. *British Food Journal*, *119*, 863-881.

[19] Hirunyawipada, T., and Paswan, A. K. (2006). Consumer innovativeness and perceived risk: implications for high technology product adoption. *Journal of Consumer Marketing*, *23*, 182-198.

[20] Hovick, S., Liang, M. C., and Kahlor, L. (2014). Predicting cancer risk knowledge and information seeking: the role of social and cognitive factors. *Health Communication*, *29*, 656-668.

[21] Im, I., Hong, S., and Kang, M. S. (2011). An international comparison of technology adoption: Testing the UTAUT model. *Information and Management*, *48*, 1-9.

[22] Jackson, J. D., Yi, M. Y., and Park, J. S. (2013). An empirical test of three mediation models for the relationship between personal innovativeness and user acceptance of technology. *Information & Management*, *50*, 154-161.

[23] Joo, J., and Sang, Y. (2013). Exploring Koreans' smartphone usage: An integrated model of the technology acceptance model and uses and gratifications theory. *Computers in Human Behavior*, *29*, 2512-2518.

[24] Kim, H., Ahn, M., Choi, Y., Choi, E., Kim, D., Shin, S., Park, K., and Han, J. (2015). Fifteen-year experience with telemedicine services in Gangwon Province in Korea. *Healthcare Informatics Research*, *21*, 283-291.

[25] Kim, J. S., Oh, S. H., Choi, J. W., and Kim, S. Y. (2015). Current status of state telemedicine policy in the United States and policy implications for Korea. *Journal of Korean Medical Association*, *58*, 923-932.

[26] Kim, Y., Sohn, D., and Choi, S. (2011). Cultural difference in motivations for using social network sites: A comparative study of American and Korean college students. *Computers in Human Behavior, 27*, 365-372.

[27] King, W. R., and He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management*, *43*, 740-755.

[28] Korea Internet and Security Agency. Survey on the Internet usage (on-line). Available at http://isis.kisa.or.kr/board/fileDown.jsp?pageId=040000andbbsId=7anditemId=792andathSeq=1.

[29] Kuo, K. M., Liu, C. F., and Ma, C. C. (2013). An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. *BMC Medical Informatics and Decision Making*, *13*(88), 1-14.

[30] Lee, K., Conklin, M., Cranage, D. A., and Lee, S. (2014). The role of perceived corporate social responsibility on providing healthful foods and nutrition information with health-consciousness as a moderator. *International Journal of Hospitality Management*, *37*, 29-37.

[31] Lee, K., Lee, H., Yoon, J., Nam, C., Yoon, J., Kim, S., and Lee, H. (2015). *Evaluation of technical safety for telemedicine system*. Research Institute for Healthcare Policy.

[32] Lee, H.-Y., Lee, J.-S., and Kim, J. (2015). Prerequisites for effective implementation of telemedicine: Focusing on current situations in Korea. *Health Informatics Research*, *21*, 251-254.

[33] Legris, P., Ingham, J., and Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information and Management*, *40*, 191-204.

[34] Lu, J. (2014). Are personal innovativeness and social influence critical to continue with mobile commerce? *Internet Research*, *24*, 134-159.

[35] Lu, J., Yao, J. E. and Yu, C. (2005). Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology.

The Journal of Strategic Information Systems, *14*, 245-268.

[36] Oh, J., Park, Y., Jo, E., and Kim, S. (2015). Current status and progress of telemedicine in Korea and other countries. *Healthcare Informatics Research*, *21*, 239-243.

[37] Park, H., Chon, Y., Lee, J., Choi, I., and Yoon, K. (2011). Service design attributes affecting diabetic patient preferences of telemedicine in South Korea. *Telemedicine and e-Health*, *17*, 442-451.

[38] Putzer, G. J. (2012). Are physicians likely to adopt emerging mobile technologies? Attitudes and innovation factors affecting smartphone use in the Southeastern United States. *Perspectives in Health information Management*, *9*, e1-22.

[39] Rakhi, T., and Mala S. (2014). Adoption readiness, personal innovativeness, perceived risk and usage intention across customer groups for mobile payment services in India. *Internet Research*, *24*, 369-392.

[40] Rauschnabei, P. A., Brem, A., and Bjoern, S. I. (2015). Who will buy smart glasses? Empirical results of two pre-market-entry studies on the role of personality in individual awareness and intended adoption of Google Glass wearables. *Computers in Human Behavior*, *49*, 635-647.

[41] Rho, M., and Bae, J. K. (2013). The physicians' expected benefits: an empirical study of the telemedicine system acceptance. *Journal of Convergence Information Technology*, *8*, 200-207.

[42] Rho, M. J., Yoon, K. H., Kim, H., and Choi, I. Y. (2015). Users' perception on telemedicine service: a comparative study of public healthcare and private healthcare. *Multimedia Tools Applications*, *74*, 2483-2497.

[43] Rogers, E. M. (2003). *Diffusion of innovations*. (5th ed.). New York: The Free Press.

[44] Rubin, A. M. (2002). The uses and gratifications perspective of media effects. In J. Bryant & D. Zillman (Eds.), *Media effects: Advances in theory and research* (2nd ed.) (pp. 525-548). Mahwah, NJ: Erlbaum.

[45] Schepers, J., and Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information & Management*, *44*, 90-103.

[46] Svendsen, G. B., Johnsen, J. K., Almås-Sørensen, L., and Vittersø, J. (2013). Personality and technology acceptance: The influence of personality factors on the core constructs of the technology acceptance model. *Behavior and Information Technology*, *32*, 323-334.

[47] Venkatesh, V., and Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*, 186-204.

[48] Weaver, K. E., Geiger, A. M., Lu, L., and Case L. D. (2013). Rural-urban disparities in health status among US cancer survivors. *Cancer*, *119*, 1050-1057.

[49] Witt, E. A., Massman, A. J., and Jackson, L. A. (2011). Trends in youth's videogame playing, overall computer use, and communication technology use: The impact of self-esteem and the Big Five personality factors. *Computers in Human Behavior*, *27*, 763-769.

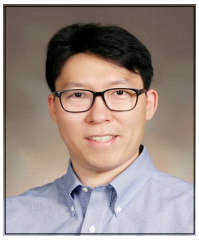
[50] Xiao, N., Sharman, R., Rao, H. R., and Upadhyaya, S. (2014). Factors influencing online health information search: An empirical analysis of a national cancer-related survey. *Decision Support Systems*, *57*, 417-427.

[51] Yarbrough, A. K., and Smith, T. B. (2007). Technology acceptance among physicians: A new take on TAM. *Medical Care Research and Review*, *64*, 650-672.

[52] Yun, E. K., and Park, H-A. (2010). Consumers' disease information-seeking behavior on the Internet in Korea. *Journal of Clinical Nursing*, *19*, 2860-2868.

[53] Zhou, T., Lu, Y., and Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, *26*, 760-767.

◆ About the Authors ◆



Dr. Jaehee Cho

Dr. Jaehee Cho is an associate Professor of School of Media & Communication at Chung-Ang University at Seoul, Korea. He earned his doctoral degree from the University of Texas at Austin in 2011. His research interests include information-sharing, adoptions of information communication technologies (ICTs), and multicultural communication in various organizational and educational settings.

Ghee-Young Noh

Ghee-Young Noh, PhD, is a distinguished professor in the School of Media Communication and Director of Healthcare Media Research Institute at Hallym University in South Korea. He received his MA from the University of Texas at Austin and Ph.D. from Michigan State University. His research focuses on health communication, communication technology, and human-computer interaction. He is leading multiple research projects focusing on community health or e-health funded by the government.

Submitted: February 23, 2017; 1st Revision: June 1, 2017; Accepted: August 9, 2017

<Appendix A> Items of Study Measurement

Factor	Items
Health Technology Innovativeness (HTI)	I tend to buy new health technologies, even though they are expensive
	I enjoy learning how to use new health technologies
	I know more about main characteristics of new health technologies
	I want to keep following new trends in health technologies
	I am more likely to replace the old health technologies with new ones, compared to others
	I tend to seek recent information about new technologies
Health Consciousness (HC)	I take care of my health fairly well
	I take care of my health better than people about the same age
	I believe I am healthy in general
	I am healthier than people about the same age
Health Information Orientation (HIO)	It is important for me to be informed about health issues.
	I make a point of reading and watching stories about health.
	I really enjoy learning about health issues.
	To be and stay healthy, it is critical to be informed about health issues.
	The amount of health information available today makes it easier for me to take care of my health.
	When I take medicine, I try to get as much information as possible about its benefits and side effects.
	I need to know about health issues so I can keep myself and my family healthy.
	Before making a decision about my health, I educate myself on the health issue.
Perceived Usefulness (PU)	Telemedicine may be useful for improving the quality of medical services by providing accurate medical information
	Telemedicine may be useful for improving the quality of medical services by supporting the continuous management of symptoms
	Telemedicine may be useful for improving the quality of medical services by providing credible medical information
	Telemedicine may be useful for improving the quality of health life
	Telemedicine may be useful for improving people's health literacy
Perceived Ease of Use (PEOU)	It may be easy to learn how to use telemedicine
	I may find it easy to understand how to use telemedicine
	It may be easy to use telemedicine
Behavioral Intention (BI)	Given the opportunity, I predict that I will use telemedicine in the future
	Given the opportunity, I plan to use telemedicine
	Given the opportunity, I may use telemedicine