

THE EFFECT OF USER EXPERIENCE AND PERCEIVED SIMILARITY OF SMARTPHONE ON ACCEPTANCE INTENTION FOR SMARTWATCH

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Received December 2015; accepted March 2016

ABSTRACT. *The smartwatch has been recognized as a typical wearable device and an innovative product to overcome the stagnation of the smartphone market. In this paper, we consider the smartwatch as a continuous innovation product of the smartphone. The effects of user experience and perceived similarity of the smartphone on acceptance intention for smartwatch are analyzed. The results show that user experience of the smartphone has a positive effect on perceived usefulness and perceived ease-of-use of the smartwatch. The perceived similarity of the smartphone has a positive effect on perceived usefulness, perceived ease-of-use, and perceived aesthetics of the smartwatch. Perceived usefulness and perceived aesthetics have a positive effect on acceptance intention of the smartwatch. It means that useful functions and design are important factors for the smartwatches to be accepted to the users.*

Keywords: User experience, Perceived similarity, Perceived aesthetics, Acceptance intention, Smartphone, Smartwatch, Wearable device

1. Introduction. Recently, as the spread of smartphones reaches saturation, the smartphone market becomes more competitive and the desires for the new product are also required. A variety of wearable devices has been launched to overcome the stagnation of the smartphone market as innovative products [1]. Smartwatches have been recognized as the most typical wearable device.

It is important to understand customers' perception for the smartwatch to spread the smartwatches into the markets easily. In this paper, we consider the smartwatch as a continuous innovative product of the smartphone.

The continuous innovation product is an enhanced product by adding new innovative functions to the existing products. Therefore, the functions of the continuous innovation product are highly improved by technological advances and the consumption pattern of the customer does not have a significant effect [2].

As the perceived similarity between the existing product and new products becomes higher, the attitude and the image of existing products easily transfer to the new product. The user experience of existing products affects the acceptance of the new product [3]. The user experience is the main factor to increase user satisfaction and loyalty to the product and to affect acceptance intention for new innovative products [4]. In this paper,

we discuss effects of the user experience and perceived similarity of the smartphone on acceptance intention for the smartwatch. This paper is organized as follows. Section 2 presents literature reviews to identify this study. Section 3 presents the research models and the hypotheses. Section 4 presents the method for data collection and analysis. In Section 5, we describe results and discussions. The conclusion of this study is described in Section 6.

2. Literature Review.

2.1. User experience. User experience is an emotion (experience of usage) felt by using the whole function of a certain product in our daily life. It is a broad concept covering a physical, psychological reaction or behavior of the user before, while, and after using a product. Ning and Kim [5] investigated the continuous usage intention of the smartphone by dividing the user experience in functional and social experience and insisted that the user's experience has an effect on continuous usage intention through perceived utility or enjoyment.

2.2. Perceived similarity. Perceived similarity means the degree of similarity or coincidence of general quality between the existing product and the expanded product. This determines the quality perception of the consumers for brand formed by the use of existing products [6]. Choi and Lee verified that the perception of simplicity in the smartphone interface strongly influences positive user satisfaction [7]. The continuous innovation, classified by Robertson [2] is an innovation where an innovative product changes the consumer's pattern of consumption very little. In this study, the smartwatches are considered a continuous innovation product of the smartphone. In other words, the smartwatch is regarded as a similar product that is more innovative.

2.3. Smartwatch. A smartwatch is a form of a wristwatch, a wearable device that enables various multimedia functions such as the internet through the small monitor. The 2014 smartwatch ownership rate among smartphone owners in S. Korea was no more than 1% [8]. Even though the smartwatch is recognized as a continuing similar product of the smartphone, the will to purchase smartwatches in the future is low. Therefore, it is required to capture the acceptance factors of a smartwatch for the proliferation of smartwatch. We use the three acceptance factors for the smartwatch which are perceived aesthetics, perceived usefulness and perceived ease-of-use.

2.3.1. Perceived aesthetics. The aesthetics of a product gives lots of information and attracts cognitive attention and triggers the emotions of the consumer which has meaningful influences on the pattern of consumption [9]. Therefore, we assume that the perceived aesthetics of the smartphone will affect the acceptance intention of the smartwatch.

2.3.2. Perceived usefulness, perceived ease-of-use. We use the perceived usefulness and the perceived ease-of-use used in the Technology Acceptance Model as acceptance intention factors for a smartwatch. The perceived usefulness is defined as the degree people feel that their business outcome will increase by using the system. The perceived ease-of-use is defined as the degree people feel that using the system is without any special effort [10].

3. Research Model and Hypotheses.

3.1. Research model. The purpose of this study is to analyze how the user's experience and the perceived similarity to the smartphone influence the acceptance of smartwatches. The research model is shown in Figure 1.

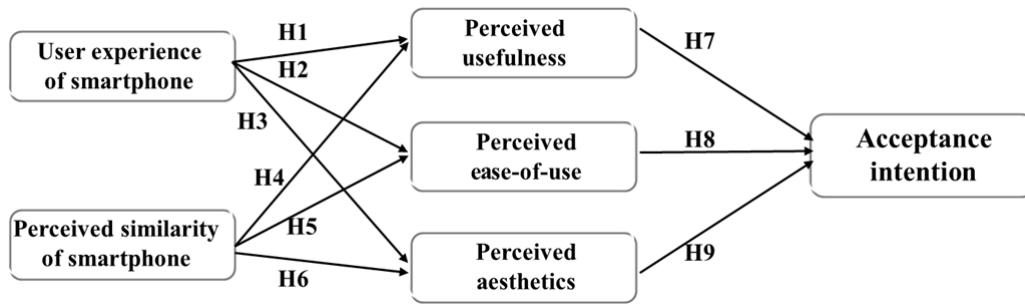


FIGURE 1. Research model

3.2. Research hypothesis. Ajzen and Fishbein [11] noted that previous experiences will influence various beliefs and, consequently, future behavioral performance. In this research, the user experience is defined as a positive experience using a smartphone and establishes the following hypotheses.

H1: User experience of the smartphone will have a positive effect on perceived usefulness of the smartwatch.

H2: User experience of the smartphone will have a positive effect on perceived ease-of-use of the smartwatch.

Jung [12] noted that user experience will influence the intent to purchase under the level design aesthetics of mobile shopping malls. The more positive satisfactory experience, the more it will create positive images which the products give eventually influencing the product's aesthetics. Jordan [13] defined aesthetics influence as a moderating factor in a positive and satisfactory experience.

H3: User experience of the smartphone will have a positive effect on perceived aesthetics of the smartwatch.

It is believed that the higher the perceived similarity of smartwatches and smartphones, the easier it will be to use, which influences the perceived usefulness. Also, as the perceived similarity gets higher, the attitude towards the usefulness will easily become an expanded product which will influence the perceived usefulness. Al-Natour et al. [14] proved that perceived similarity influences the perceived usefulness and the perceived ease-of-use of online shopping. Therefore, the hypotheses are presented as the following.

H4: Perceived similarity of the smartphone will have a positive effect on perceived usefulness of the smartwatch.

H5: Perceived similarity of the smartphone will have a positive effect on perceived ease-of-use of the smartwatch.

When evaluating the expanded products, the higher the perceived similarity is, the higher people regard the expanded products and the original products in a similar category. Also, the quality or the images of the original product will easily be spread to the expanded product [15]. In other words, the higher the perceived similarity is, the more consumers will easily accommodate to the expanded products and as the positive images and the attitudes about the original products spread to the expanded products, it will influence the aesthetics. Therefore, we hypothesize as follows.

H6: Perceived similarity of the smartphone will have a positive effect on perceived aesthetics of the smartwatch.

In this study, we use perceived usefulness, perceived ease-of-use and acceptance intention variables used in the Technology Acceptance Model defined by Davis [10].

Kim [16] proved that perceived usefulness and perceived ease-of-use have a positive effect on behavioral intention to use a smartphone. Shin et al. [17] showed that perceived usefulness and perceived ease-of-use have a positive correlation to continuing intention of smartphone learning usage. Jeong et al. [18] proved that effort expectancy and performance expectancy have a positive effect to acceptance intention of ubiquitous services.

Perceived usefulness is defined as the degree believed to be how the smartwatch is used in our daily life is easy and convenient. Perceived ease-of-use is also defined as the degree believed the use of smartwatch is definite and easily used. Acceptance intentions influenced by two kinds of belief variables were defined as the degree of possibility and the intention to accept the smartwatch. Therefore, we hypothesize as follows.

H7: Perceived usefulness of the smartwatch will have a positive effect on acceptance intention for the smartwatch.

H8: Perceived ease-of-use of the smartwatch will have a positive effect on acceptance intention for the smartwatch.

Kwak et al. [19] proved that aesthetics has a higher influence on purchase intention than usability in cell phone products. Sonderegger and Sauer [20] noted that the visual aesthetics of the phone has a positive effect on user performance and user usability. Therefore, this study established the hypothesis as follows. We defined perceived aesthetics as the degree of perception that the design of the smartwatch is believed to be visually luxurious and established the hypothesis as follows:

H9: Perceived aesthetics of the smartwatch will have a positive effect on acceptance intention for the smartwatch.

4. Methodology. A total of 355 responses were collected from smartphone users in Korea. Of the 355 responses collected during one month of May 2015, the 326 responses were valid. The demographics of the sample are shown in Table 1.

The measurement scales in the survey used a seven-point Likert scale ranging from (1) strongly disagree to (7) strongly agree. The hypotheses were analyzed by the structural model using AMOS 22.0.

TABLE 1. Demographics of sample data

Age Group	Man	Woman	Total (%)
Under 20	4	3	7 (2.1%)
20-29	151	162	313 (96.1%)
Over 30	3	3	6 (1.8%)
Total (%)	158 (48.5%)	168 (51.5%)	326 (100%)

TABLE 2. Reliability and validation test results

Variables	Cronbach's α	AVE	CR	Loading Factor Mean
User Experience of Smartphone (UE)	0.809	0.625	0.829	0.779
Perceived Similarity of Smartphone (PS)	0.892	0.673	0.891	0.818
Perceived Usefulness (PU)	0.904	0.703	0.904	0.838
Perceived Ease of Use (PEU)	0.919	0.739	0.919	0.859
Perceived Aesthetics (PA)	0.901	0.767	0.907	0.873
Acceptance Intention (AI)	0.770	0.550	0.782	0.733

Fornell and Larcker suggested a value of AVE above 0.5, CR (composite reliability) above 0.7, and Cronbach's α above 0.7 as the acceptable reliability of the instruments [21]. As shown in Table 3, all of the constructs exceeded the reference values. Convergent validity is required as a loading factor mean above 0.7. The loading factor means of all variables are between 0.733 and 0.873, the convergent validity is accepted.

For discriminant validity, the square root of the AVE for each variable should be greater than the correlation values between any two variables. The inter-variable correlation

TABLE 3. Correlations of variables and square root of AVE

	UE	PS	PU	PEU	PA	AI
UE	0.791					
PS	0.127	0.820				
PU	0.203	0.338	0.838			
PEU	0.139	0.285	0.174	0.860		
PA	0.060	0.271	0.266	0.102	0.876	
AI	0.153	0.310	0.527	0.213	0.411	0.742

Note: Square roots of the AVE are the bolded diagonal value.

TABLE 4. Structural model fit analysis

Fit Measure	Value	Recommended Value
χ^2/df	1.720	< 3
RMSEA	0.047	< 0.05
GFI	0.918	> 0.9
AGFI	0.895	> 0.8
NFI	0.930	> 0.9
TLI	0.964	> 0.9
CFI	0.969	> 0.9

matrix (see Table 3) shows that all values satisfied these recommendations for discriminant validity.

The results of the evaluation of the structural model fits are as follows: $\chi^2/df = 1.682$, RMSEA = 0.047, GFI = 0.918, AGFI = 0.895, NFI = 0.930, TLI = 0.964, CFI = 0.969. The overall fit measures show a good fit of the model as shown in Table 4.

5. **Results and Discussions.** The results of the structural model analysis are shown in Figure 2. Seven of the nine hypothesized associations are significant at $p < 0.05$ or $p < 0.01$ or $p < 0.001$, whereas two other hypotheses are not significant.

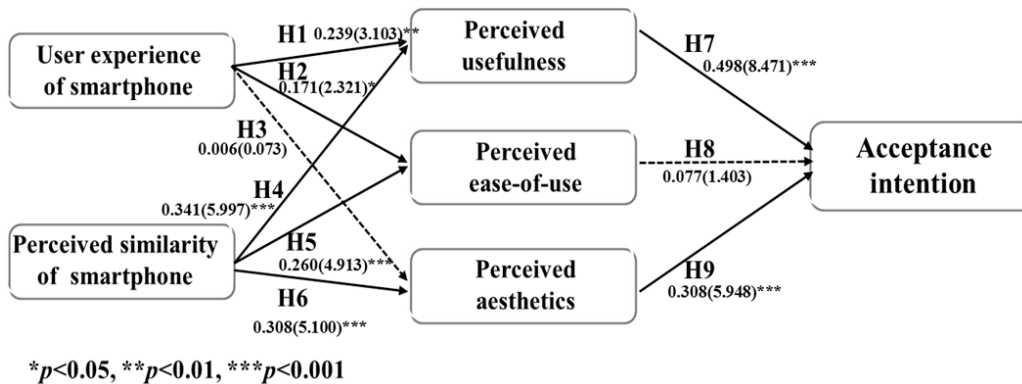


FIGURE 2. Results of structural model analysis

User experience of the smartphone has significant effects on perceived usefulness ($\beta = 0.239$, t -value = 3.103) at $p < 0.01$ and user experience of the smartphone has significant effects on perceived ease of use ($\beta = 0.171$, t -value = 2.321) at $p < 0.05$, therefore supporting H1 and H2. These results show that a positive user experience perceived by using the smartphone has a positive effect on the usefulness and ease-of-use of the smartwatch. The association between user experience of the smartphone and perceived aesthetics is

insignificant; hence H3 is not supported. This result shows that user experience of the smartphone does not affect the perceived aesthetics of the smartwatch.

Perceived similarity to the smartwatch has significant effects on perceived usefulness ($\beta = 0.341$, t -value = 5.997, $p < 0.001$), perceived ease-of-use ($\beta = 0.260$, t -value = 4.913, $p < 0.001$) and perceived aesthetics of the smartwatch ($\beta = 0.308$, t -value = 5.100, $p < 0.001$), therefore supporting H4, H5 and H6. These results indicate that the more people think smartphones and smartwatches are similar, the more they consider smartwatches as useful and easy to use and have a positive recognition on aesthetics.

Perceived usefulness ($\beta = 0.498$, t -value = 8.471, $p < 0.001$) and perceived aesthetics ($\beta = 0.308$, t -value = 5.948, $p < 0.001$) have a significant effect on the acceptance intention for the smartwatch, therefore supporting H7 and H9. The result that perceived usefulness has positive effects on the acceptance intention corresponds with the research result of Davis [10]. The result also indicates that perceived aesthetics has a positive effect on the acceptance intention. It can be seen that if the designs of the smartwatches seem luxurious to the consumers, it might have positive influences on acceptance intention.

Perceived ease-of-use has an insignificant effect on acceptance intention, hence H8 is not supported. Many previous [10,16-18] studies have noted that ease-of-use has a positive effect on acceptance intention; however, it did not have an effect in this study. This result is believed to be due to the age of respondents concentrated in the age of 20s. People aged in the 20s tend to be familiar with the use of smart devices which leads to the result that they are not affected by the ease-of-use.

6. Conclusion. This study analyzed the acceptance factors to the smartwatch, the implications are as follows.

First, it shows that user experience of the smartphone has a positive effect on perceived usefulness and perceived ease-of-use. These results show that positive user experience of the smartphone makes people think that using smartwatches is easy and useful in real life. Also, the higher the user experience is, the bigger the effect on perceived usefulness is than perceived ease-of-use.

Second, it has been deduced that perceived similarity has a positive effect on perceived usefulness, perceived ease-of-use, and perceived aesthetics. Among these three factors, the biggest effect was on perceived usefulness. These results can confirm that the more people perceive that smartphones and smartwatches are similar, the more they consider the smartwatches are useful and easy-to-use and have positive aesthetic perception.

Third, it has been deduced that perceived usefulness has a positive effect on acceptance intention while perceived ease-of-use did not have any effect on acceptance intention. These results can be interpreted as useful function developments required in smartwatches, but using smartwatches is easy to anyone without any difficulty. The result that perceived aesthetics has a positive effect on acceptance intention means that the design is an important factor for the smartwatches to be accepted by the users.

Acknowledgment. This work was supported by Dong-Eui University Foundation Grant (2015).

REFERENCES

- [1] DIGIECO, The mobile trends in Korea at the first half of 2015, *DIGIECO Issue & Trend*, 2015.
- [2] T. S. Robertson, The process of innovation and the diffusion of innovation, *Journal of Marketing*, vol.31, no.1, pp.14-19, 1967.
- [3] D. C. Smith and C. W. Park, The effects of brand extensions on market share and advertising efficiency, *Journal of Marketing Research*, vol.29, pp.296-313, 1992.
- [4] J. Yoon, *The Influences of Emotional Consumption Value and Smartphone User Experience on Product Satisfaction and Acceptance*, Ph.D. Thesis, Konkuk University, Korea, 2014.

- [5] X. Ning and K. S. Kim, An empirical study of user experience (UX) factors affecting continued usage intention of smartphone, *The Journal of Eurasian Studies*, vol.9, no.4, pp.91-118, 2012.
- [6] D. A. Aaker and K. L. Keller, Consumer evaluations of brand extensions, *Journal of Marketing*, vol.54, no.1, pp.27-41, 1990.
- [7] J. H. Choi and H. Lee, Facets of simplicity for the smartphone interface: A structural model, *Int. J. Human-Computer Studies*, vol.70, pp.129-142, 2012.
- [8] Marketing Insight Co., *The Survey Report of the 19th Mobile Telecommunication Market in Korea*, 2014.
- [9] V. P. Rindova and A. P. Petkova, When is a new thing a good thing? Technological change, product form design, and perceptions of value for product innovations, *Organization Science*, vol.18, no.2, pp.217-232, 2007.
- [10] F. D. Davis, Perceived usefulness, perceived ease of use and user acceptance of information technology, *MIS Quarterly*, vol.13, no.3, pp.319-340, 1989.
- [11] I. Ajzen and M. Fishbein, The influence of attitudes on behavior, in *Handbook of Attitudes*, D. Albarracín, B. T. Johnson and M. P. Zanna (eds.), Erlbaum, NJ, Mahwah, 2005.
- [12] J. Jung, The effects of visual aesthetic design of mobile shopping malls on customers' buying intentions, *Korean Journal of Business Administration*, vol.25, no.7, pp.2977-2998, 2012.
- [13] P. W. Jordan, Human factors for pleasure in product use, *Applied Ergonomics*, vol.29, no.1, pp.25-33, 1998.
- [14] S. Al-Natour, I. Benbasat and R. Cenfetelli, The adoption of online shopping assistants: Perceived similarity as an antecedent to evaluative beliefs, *Journal of the Association for Information Systems*, vol.12, no.5, pp.347-374, 2011.
- [15] K. L. Keller, Conceptualizing, measuring and managing customer-based brand equity, *Journal of Marketing*, vol.57, no.1, pp.1-22, 1993.
- [16] S. H. Kim, Moderating effects of job relevance and experience on mobile wireless technology acceptance: Adoption of a smartphone by individuals, *Information and Management*, vol.45, no.6, pp.387-393, 2008.
- [17] D. H. Shin, Y. J. Shin, H. Choo and K. Beom, Smartphones as smart pedagogical tools: Implications for smartphones as *u*-learning devices, *Computers in Human Behavior*, vol.27, no.6, pp.2207-2214, 2011.
- [18] Y.-J. Jeong, C.-W. Kim and S.-C. Jeong, The citizens' acceptance factors to the ubiquitous services of U-city project, *ICIC Express Letters, Part B: Applications*, vol.6, no.3, pp.791-796, 2015.
- [19] H. L. Kwak, B. M. Kim and Y. W. Sohn, Aesthetics versus usability: Cultural difference in product choice, *Korean Journal of the Science of Emotion & Sensibility*, vol.14, no.3, pp.361-370, 2011.
- [20] A. Sonderegger and J. Sauer, The influence of design aesthetics in usability testing: Effects on user performance and perceived usability, *Applied Ergonomics*, vol.41, pp.403-410, 2010.
- [21] C. R. Fornell and D. F. Lacker, Structural equation models with unobservable variables and measurement error, *Journal of Marketing Research*, vol.18, no.2, pp.39-50, 1981.