UX Analysis based on TR and UTAUT of Sports Smart Wearable Devices

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Abstract

The main purpose of this research is to investigate relationships between the significant control factors on acceptance intention to User Experience (UX) sports smart wearable devices by applying Technology Readiness (TR) and Unified Theory of Technology (UTAUT). Research survey targeted on users of golf smart devices in Seoul. A total 534 questionnaires were collected and used for testing hypotheses. Methods to analyze the data included frequency analysis, reliability analysis, confirmatory factor analysis, correlation analysis, and structural equation modeling in accordance with the purpose of the study by using SPSS and AMOS. The results are as follows; First, positive TR had a significantly positive effect on social influence, effort expectancy, facilitating conditions, perceived enjoyment, performance expectancy. Second, negative TR had a significant negative effect on performance expectancy, social influence, facilitating conditions, perceived enjoyment. Third, TR had a no significantly effect on behavioral intention. Fourth, performance expectancy, perceived enjoyment and facilitating conditions had a significantly positive effect on behavioral intention. Fifth, behavioral intention had a significantly positive effect on use behavior. Thus it became crucial to identify the difference in acceptance intention models per each products are as follows. Positive TR of golf-related mobile application users has a positive effect on both technology acceptance belief and acceptance intention, whereas negative TR has no statistically significant effect on technology acceptance belief nor acceptance intention.

***Keywords*:** sport smart wearable devices, user experience, technology readiness, unified theory of acceptance and use of technology

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1. Introduction

Due to the advancement of Information and Communication Technology (ICT), not only modern society has been transitioning rapidly but also convergence effect has created significant consequences on the worldwide society. Convergence means a motion with reference to direction of more than two components, a phenomenon of concurring components, or any other socio-economic factors that follow this aspect. In other words, various research fields of medicine, economy, administration, education, and culture are integrating with Information Technology (IT) industry through the convergence effect to create innovation. Despite the global trend however, research and development of IT industry in South Korea is mostly focused on engineering concepts, and studies of behavioral science and physical education are yet insufficient [1]. Therefore, a research that will narrow down the gap between studies of behavioral science and engineering concepts is crucial and according to research on User Experience (UX) is necessary.

Kang [2] explained that the sports-related field has progressed a lot in enhancing the sports-derived network value, and that the development of innovative technology has vitalized various industries, including sports. Among the game of sports, golf has introduced a lots of products that are incorporated with IT, and the typical examples would be Screen Golf and the GPS-integrated distance measurement. Screen Golf uses internet and virtual reality that allows people to play golf without visiting the actual golf course. As it offers cheaper pricing, has more accessibility, and is not restricted by time or weather in comparison to the real golf course, Screen Golf has become a popular sports activity taking up to 39% of golf course industry. In addition, the GPS-based distance measurement is a product that allows people to check the distance left ahead of them without getting the assistance of caddies. Recently, there has been a new brand smart mobile application developed that pre-shows the map of golf courses by using the augmented reality [3]. During the first implementation of the Screen Golf and distance measurement however, number of people actively using those products was low since they did not have a full comprehension of how to use them. This indicates the importance of understanding users in advance of bringing out new smart devices in order to maintain competency in the market. Lack of understanding in users' intention to adopt can be a challenge for providing convenience for people, and it can even cause more confusion to people; in order for the IT industry to offer smart wearable devices convenience, thorough investigation of UX and practical theories is crucial.

There has been an active progress in the studies of business and IT industry about predicting the acceptance process of consumers in technology. Although Technology Acceptance Model (TAM) developed by Davis [4] is known as the simplest research model that can be modified applied and extended for other various research purposes, it still has a few limitations. First, it overlooks the fact that purpose of use is subject to change with various factors such as individual capability, time, environment, organizational restriction, and unconscious habit, which influences people's behavior. Second, Davis did not explicitly consider the suitability of his model; the original intention of TAM to study versatile programs such as word process and spreadsheet means that there is a lack of suitability for various users who may wish to use the model for different purposes [5]. Venkatesh et al. [6] also pointed out this limitation and introduced Unified Theory of Acceptance and Use of Technology (UTAUT), which aggregated a diverse set of models and theories of IT industry. In comparison to the existing eight models Theory of Reasoned Action (TRA), Theory of

Planned Behavior (TPB), Technology Acceptance Model (TAM), Combined TAM and TPB (C-TAM-TPB), Motivational Model (MM), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT), the theory of UTAUT entails better logic, flexibility, suitability, and explanatory potential [7-8]. Therefore, this research is to investigate relationships between the significant control factors on acceptance intention and intention to UX sports smart wearable devices by applying TR and UTAUT.

The technological innovation of sport products has been developed by the differentiation strategy of enhancing competency and fulfilling the ever-growing diversity of consumer needs by creating innovative modifications to the existing products. Yet, innovation products may cause an impression of uncertainty in their functionality and evaluation [9], while products that do not fulfill the specific consumer needs have a risk of be perceived as odd products [10]. Thus, a clear understanding of how to inform consumers about the benefits of using innovation products is significant. According to Liljjander et al. [11], purpose of use depends on the reasons and circumstances in which consumers decide to use innovation products. However, even if consumers have a clear understanding of how and why they decided to accept the innovation products, they find it challenging to follow the rapid growth of innovation technology and those who fail to adapt to the accelerated advancement tend to end up ignoring or completely rejecting the innovation products. Based on this interpretation, Parasuraman [12] pointed out the importance of encouraging consumers' willingness to accept the innovation technology beforehand. In order to measure the preparedness of releasing an innovation product, Parasuraman [12] introduced Technology Readiness Index (TRI). TR generally indicates the level of trust that consumers have in technology, which measures their behavioral tendency to adapt to technology rather than their ability to utilize [13-15]. Under these circumstances, TAM is applied to analyze consumer acceptance of ″Talking Shoes″. This product is one of the sports wearable products that was converged with ICT but never been commercialized by Google in 2013. As a result, significant results have been found. According to this information, TAM had considered as a versatility-oriented model that requires consumers' high level of willingness to participate; but it has a limitation in grasping enough information about consumers' acceptance behavior. In order to understand consumers' original intention to use the sport innovative products, this research employed the actual golf participants to determine their purposes and methods of using the innovation products by consolidating UTAUT and TR models. This study will add a measure of "perceived enjoyment" as a new variable to assess consumers' acceptance to new technology, since it was found out to have a significant impact on how consumers accept and use IT [16-19].

Many researchers in the field of social science have applied diverse types of theories to analyzed UX for smart wearable devices and IT. Yet, more extensive and practical research is necessary to apply TR and UTAUT related to consumer acceptance. Despite the increasing trend of using sport innovation products, not enough research on UX has been conducted at present; this study could deliver valuable results for the future academic studies. In the macroscopic perspective, product developers could use this study as a reference to develop strategic marketing plans. On the microscopic side, this study could provide instructions for the actual consumers to determine a suitable sport innovation product. Therefore, in the increasing market trend of sport innovation products, this research demonstrates a significant value and reference in assessing consumers' acceptance intention. Therefore, the primary purpose of this research is to investigate relationships between the significant control factors on acceptance intention to UX sports smart wearable devices by applying TR and UTAUT.

2. Literature Review

According to Parasuraman [12] TR implies to people′s tendency to accept and try out new technologies in their daily life. The TAM, technology paradoxes, computer anxiety and technology anxiety are existing examples of TR-related research and embracement of new technologies with human-technology interactions. Davis et al. [20] also established the TAM which mirrors possible facets in drivers of technology acceptance.

Mick and Fournier [21] classified eight technology paradoxes that consumers would deal with: control/chaos, freedom/enslavement, new/obsolete, competence/incompetence, efficiency/inefficiency, fulfills/creates needs, assimilation/isolation and engaging/disengaging.

Parasuraman [14] also formatted a scale named the TRI to measure preparedness of consumers for technology. TRI can indicate both positive and negative measures of consumers' opinions on technology and show which side is stronger. TRI can be catalogued into four sides: Optimism, Innovativeness, Discomfort and Insecurity. Optimism and innovativeness are the good sides of TR. It can evoke consumers to try out and give good impressions on new products and services. On the other hand, discomfort and insecurity are the opposite; making consumers unwilling to use technology. Yen [22] discovered that all consumers can not accept technological services at the same time. Parasuraman and Colby [23] also evidenced that consumer with different TR profiles can differ in means of internet-related behaviors.

UTAUT model had developed by combining all 32 concepts introduced by the eight different models (TRA, TPB, TAM, C-TAM-TPB, MM, MPCU, IDT, SCT) of innovation technology acceptance and taking into account the core 4 factors of gender, age, experience, and voluntariness [6].

UTAUT model approved its validity with various experiments carried out by four different industries including entertainment, telecommunication, finance, and public administration service. In comparison to TAM which can explain only 50% of the intention to use or use behavior of consumers, UTAUT provides 20-30% additional information to be explained. UTAUT also suggested that the four variables of gender, age, experience, and voluntariness of use can cause the regulation effect [41]. Therefore in this research, a research model will be formed on the basis of the integrated model of UTAUT.

2.1 Sport Smart Wearable Device UX Analysis based Research Hypotheses

According to the studies done by Parasuraman and Colby [23], consumers with a higher TR are more likely to purchase products online than those with a lower TR on average. In Lin and Hsieh's [24] research study, TR had a significantly positive effect on the level of satisfaction and behavior intention for self-skills. However, TR can be divided into two categories of positive TR (optimism and innovativeness) and negative TR (insecurity and discomfort), which means that considering TR as a single factor would lead to an inaccurate result [25]. Based on the preceding research, this study established a hypothesis that positive TR is assumed to have a significantly positive effect on the technology acceptance while negative TR is predicted to have a significantly negative effect on the technology acceptance.

H1: TR will have a significant effect on URAUT

Introducing Technology Readiness Acceptance Model (TRAM), Lin et al. [26] showed that TR alone does not have a significant impact on consumers' intention to use, but when technology acceptance is intermediated with TR, there is a significant change on the intention to use. However, research done by Yang and Park [27] claim that optimism and innovativeness of TR have a direct effect on intention to use as well, and Liljader et al. [11] also drew a similar conclusion that optimism and innovativeness alone have a significant impact on behavioral intention and evaluation. Furthermore, research study done by Zhu et al. [28] showed that levels of anxiety and discomfort do not a significant effect on behavioral intention and assessment. For analyzing these relationships, this research therefore draws the following hypothesis about the effect of TR on acceptance intention.

H2: TR will have a significant effect on behavioral intention

Venkatesh et al. [6] found out that performance expectancy and effort expectancy and social influence show a positive impact on intention to use, as well as acceleration condition. Comparing acceptance intention of online banking and MP3 player between South Korea and the United States, Im et al. [29] drew the same conclusion that expectation and effort of achieving outcome and social effect exert a positive effect on acceptance intention, which in turn show a positive effect on acceptance. Based on these preceding research [27][30], the united technology is predicted to show a positive impact on acceptance intention. On the basis of the existing research content that taking pleasure into account will provide a better explanation [16-18][31], this research paper has implemented "perceived enjoyment" as a new variable. The effect of united technology belief on acceptance intention has hypothesized as the following.

H3: UTAUT will have a significantly positive effect on behavioral intention

Davis et al. [20] claimed that acceptance intention has a significant effect on acceptance, and Venkatesh et al. [6] showed the positive effect of acceptance intention of information technology on acceptance. Based on this research content, the following is a hypothesis about the effects of acceptance intention and behavioral acceptance on the innovative golf product users.

H4: Behavioral intention of golf technology innovation will have a significantly positive effect on use behavior of golf technology innovation

This study intends to further analyzed acceptance intention by golf-related mobile application user. The reason for classifying the products is that diverse devices of golf innovation products have recently been released to the market due to the fusion of golf and development of IT. Thus it became crucial to identify the difference in acceptance intention models product to the UX.

H5: There will be variance in the effects of technology acceptance belief and TR that form acceptance intention of golf-related mobile application user.

2.2 Sport Smart Wearable Devices UX Analysis based Research Model

Towards this goal, a type of research model was designed as follow (see **Fig. 1**).

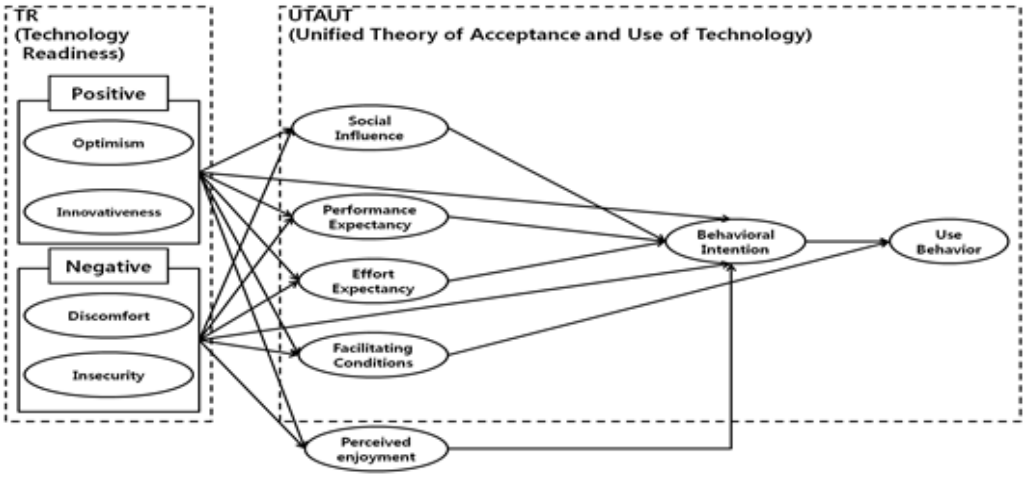

Fig. 1. Research Model

3. Sport Smart Wearable Devices UX Analysis based Method

3.1 Samples

Subject of this research consists of golf smart wearable devices users in Seoul in 2014. In order to draw an appropriate sample size, convenience sampling method is selected from the non-probability sampling methods. Instructions for completing the questionnaires were provided, and participants were asked to respond according to self-administration method. The total number of questionnaires collected was 550, excluding the ones with invalid responses. Statistical result of 534 valid responses there were assessed from the survey is shown in **Table 1**.

3.2 Research instrument

Parasurman [12] took the positive and negative effects of new technology products into account to develop TRI. On the basis of TR which was also used by Lam et al. [25], Oh et al. [18], this research paper has modified the content in a way that applies to the corresponding research intention. Survey of UTAUT was derived from the questionnaires used by Venkatesh, et al. [6]. Survey of Perceived Enjoyment was derived from Moon and Kim [31] questionnaires and was modified from Lee's [19] survey content (see **Table 2**). Each questionnaire counts for 7 points of Likert-type scale.

Table 1. Characteristics of Golf Smart Wearable Devices Users

Concepts		N	%
Gender	Male	353	66.1
	Female	181	33.9
Age	20-29	116	21.7

	30-39	144	27.0
	40-49	150	28.1
	50-59	84	15.7
	over 60	40	7.5
Career	1 year or shorter	118	22.1
	1-3 years or shorter	127	23.8
	3-6 years or shorter	120	22.5
	More than 6 years	169	31.6
Frequency	Less than 1 time	163	30.5
	2-4 times or shorter	180	33.7
	4-6 times or shorter	97	18.5
	More than 6 times	77	14.4
	Not use	17	3.1
User Experience	Screen Golf	174	32.6
	Range Finder	169	31.6
	Golf-Related Mobile Application	174	32.6
	Not use	17	3.2
Total		534	100

Table 2. Summary of the Scales Used

Scale	Item	Number of Question
TR	Innovativeness(5) Optimism(5) Discomfort(5) Insecurity(5)	20
UTAUT	Performance Expectancy(4) Effort Expectancy(4) Social Influence(4) Facilitating Conditions(4) Perceived Enjoyment(3) Behavior Intention(7) Use Behavior(4)	30
Demo Graphics	Gender, Age, Career, Frequency, User Experience	5
Total		55

3.3 Reliability and Validity Tests

To test the reliability of this study, the content of questionnaires was verified by several professors and acknowledged experts in the field of IT, and Cronbach's α coefficient was used (see **Table 3**). To verify the construct validity, confirmatory factor analysis was conducted as well (see **Table 4**). The goodness of fit test for the model was evaluated by using CFI (>.90), TLI (>.90), RMSEA (<.10) as these measures are not susceptible to different samples [32-34].

Table 3. Reliability Coefficient of Each Factors

Factor	Items	Cronbach'α
TR	Optimism	.820
	Innovativeness	.861
	Discomfort	.794
	Insecurity	.814
UTAUT	Performance Expectancy	.811
	Effort Expectancy	.890
	Social Influence	.801
	Facilitating Conditions	.836
	Perceived Enjoyment	.866
	Behavior Intention	.935
	Use Behavior	.934

Table 4. The Results of Confirmatory Factor Analysis

Items	X^2	*df*	TLI	CFI	RMSEA
TR	319.8	157	.907	.923	.070
UTAUT	356.2	136	.901	.922	.088
Behavior Intention[a)]	-	-	-	-	-
Use Intention[a)]	-	-	-	-	-

[a)] saturated model

3.4 Data analysis procedure

Data was analyzed by frequency analysis, reliability analysis, confirmatory factor analysis, correlation analysis, and structural equation modeling in accordance with the purpose of study by using SPSS 18.0 and AMOS 18.0 program.

4. Results

4.1 Multicollinearity

Rockwell [35] recommended that researchers should consider relationships among variables if a correlation coefficient of variables exceeds .80. To examine such muticollinearity, Pearson's product-moment correlation coefficient was determined. According to the table, range of correlation was from -.153 to .730, which indicates that there is no problematic interdependence among variables.

4.2 Verification of Model by Golf Smart Wearable Devices Users

Path analysis was conducted to explain causal relationships among variables in this study. The results are as shown in **Fig. 2**, **Table 5**, **Table 6**. TLI is .936, CFI is .970, and RMSEA is .087, which indicated that the indirect effect model of this study is adequate.

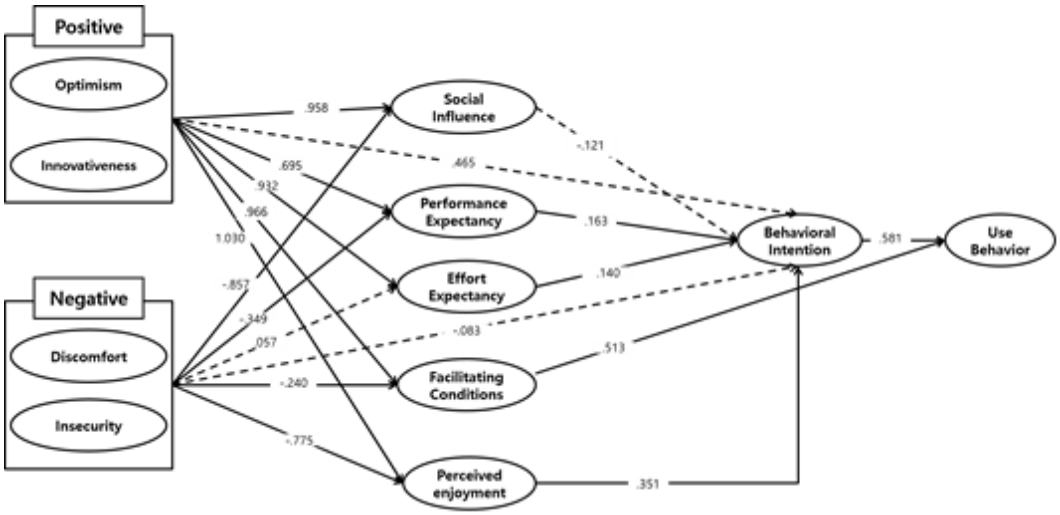

Fig. 2. The results of purposed model measurement

Table 5. The Results of Structural Model Fit Index

Model	X^2	*df*	TLI	CFI	RMSEA
Research Model	90.774	26	.936	.970	.087

Table 6. The Results of Path Analysis

Path		Estimate	S.E	C.R.	P	
H 1-1	Positive Technology Readiness → Social Influence	.958	.079	12.162	.000	Accepted
H 1-2	Positive Technology Readiness → Performance Expectancy	.695	.060	11.499	.000	Accepted
H 1-3	Positive Technology Readiness → Effort Expectancy	.932	.072	12.957	.000	Accepted
H 1-4	Positive Technology Readiness → Facilitating Conditions	.966	.069	14.003	.000	Accepted
H 1-5	Positive Technology Readiness → Perceived Enjoyment	1.030	.078	13.269	.000	Accepted
H 2-1	Negative Technology Readiness → Social Influence	-.857	.175	-4.889	.000	Accepted
H 2-2	Negative Technology Readiness → Performance Expectancy	-.349	.106	-3.292	.000	Accepted
H 2-3	Negative Technology Readiness → Effort Expectancy	.057	.112	.505	.614	Rejected
H 2-4	Negative Technology Readiness → Facilitating Conditions	-.240	.110	-2.176	.030	Accepted

H 2-5	Negative Technology Readiness → Perceived Enjoyment	-.775	.163	-4.765	.000	Accepted
H 3-1	Positive Technology Readiness → Behavioral Intention	.465	.300	1.552	.121	Rejected
H 3-2	Negative Technology Readiness → Behavioral Intention	-.083	.207	-.401	.689	Rejected
H 4-1	Social Influence → Behavioral Intention	-.121	.078	-1.553	.120	Rejected
H 4-2	Performance Expectancy → Behavioral Intention	.163	.059	2.774	.006	Accepted
H 4-3	Effort Expectancy → Behavioral Intention	.140	.047	2.398	.040	Accepted
H 4-4	Facilitating Conditions → Use Behavior	.513	.069	7.427	000	Accepted
H 4-5	Perceived Enjoyment → Behavioral Intention	.351	.156	2.247	.025	Accepted
H 5	Behavioral Intention → Use Behavior	.581	.092	6.345	000	Accepted

4.3 Verification of Model by Golf-Related Mobile Application User

Path analysis was conducted to explain causal relationships among variables for golf application user in this study. The results are as shown in **Fig. 3**, **Table 7**, **Table 8**. TLI is .934, CFI is .969, and RMSEA is .090, which indicated that the indirect effect model of this study is adequate.

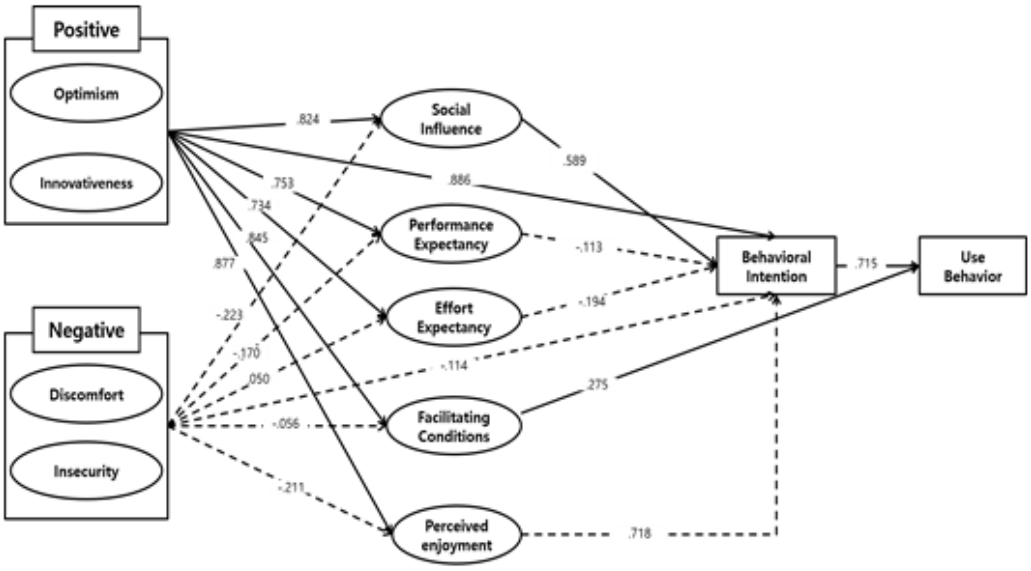

Fig. 2. The results of purposed model measurement by golf-related mobile application user

Table 7. The Results of Structural Model Fit Index by Golf-Rerated Mobile Application User(N=174)

Model	X^2	*df*	TLI	CFI	RMSEA
Research Model	62.9	24	.934	.969	.090

Table 8. The Results of Path Analysis(golf-related mobile application user)

Path		Estimate	S.E	C.R.	P	
H 1-1	Positive Technology Readiness → Social Influence	.824	.138	9.059	.000	Accepted
H 1-2	Positive Technology Readiness → Performance Expectancy	.753	.107	8.437	.000	Accepted
H 1-3	Positive Technology Readiness → Effort Expectancy	.732	.110	9.559	.000	Accepted
H 1-4	Positive Technology Readiness → Facilitating Conditions	.845	.131	9.257	.000	Accepted
H 1-5	Positive Technology Readiness → Perceived Enjoyment	.877	.136	9.383	.000	Accepted
H 2-1	Negative Technology Readiness → Social Influence	-.233	.167	-1.333	.183	Rejected
H 2-2	Negative Technology Readiness → Performance Expectancy	-.170	.105	-1.280	.200	Rejected
H 2-3	Negative Technology Readiness → Effort Expectancy	.050	.056	.852	.394	Rejected
H 2-4	Negative Technology Readiness → Facilitating Conditions	-.056	.064	-.827	.408	Rejected
H 2-5	Negative Technology Readiness → Perceived Enjoyment	-.211	.153	-1.315	.188	Rejected
H 3-1	Positive Technology Readiness → Behavioral Intention	.886	.661	2.201	.028	Accepted
H 3-2	Negative Technology Readiness → Behavioral Intention	-.114	.111	-.933	.351	Rejected
H 4-1	Social Influence → Behavioral Intention	.589	.128	4.196	.000	Accepted
H 4-2	Performance Expectancy → Behavioral Intention	-.113	.133	-.982	.326	Rejected
H 4-3	Effort Expectancy → Behavioral Intention	-.194	.143	-1.312	.189	Rejected
H 4-4	Facilitating Conditions → Use Behavior	.201	.084	2.990	.003	Accepted
H 4-5	Perceived Enjoyment → Behavioral Intention	.429	.235	1.734	.083	Rejected
H 5	Behavioral Intention → Use Behavior	.715	.109	8.516	.000	Accepted

5. Discussion

As the IT industry has been transitioning rapidly due to the acceleration of technological changes and development of new products and services, researchers from diverse backgrounds have applied the UTAUT model in their studies to assess the transformation of the industry. This study intends to discuss about the results that are derived from the application of the UTAUT and TR of golf smart wearable devices.

5.1 Relationship between TR and UTAUT of Golf Smart Wearable Devices User

First, positive TR is shown to have a positive effect on technology acceptance belief. This is supported by Walczuch et al.'s [15] assertion that positive TR has a positive influence on technology acceptance belief, and by Lin and Hsieh's [14] research result that TR shows a positive effect on satisfaction and behavioral intention of one's own skills. This indicates that having positive willingness to accept golf innovation products will allow consumers to improve their golf skills and have higher expectation of enjoying golf.

Second, negative TR is shown to have a negative effect on technology acceptance belief to a certain extent. Han et al.'s [36] study that explains how negative TR causes a negative impact on technology acceptance belief supports this point In addition, preceding research studies conducted by Oh et al. [18], Lee and Shin [37] support this point as well. Igbaria [38] explained that people with higher level of knowledge and UX about a product have lower level of anxiety and higher level of perceived usefulness than those who do not. This means that people who are willing to proactively look for information and adapt to the new golf products will not only perceive more extensive utility and usefulness but also be able to acquire positive results of using the products. This indicates that having discomfort or anxiety when using golf innovation products makes consumers feel hesitant to use them. Therefore, innovation products need to be developed in a way that they are easy for consumers to use and be able to help consumers improve their performance.

5.2 Relationship between TR and Behavioral Intention of Golf Smart Wearable Devices User

Despite the hypothesis that TR would have a direct influence on acceptance intention, it has been found out that TR exerts neither positive nor negative effect on acceptance intention. In the meanwhile, TR had a mediating effect on technology acceptance belief. Equivalent to Lin et al. [26] research result, this relationship indicates the fact that consumers do not accept innovation products without having technology acceptance belief. In other words, consumers prefer to compare functionality, convenience, and design of golf innovation products for selecting a suitable product. Therefore, it is recommended for product developers to provide consumers with an opportunity to pre-experience products such as via offering rental service or free trial versions so that they will be able to increase acceptance intention of consumers.

5.3 Relationship between UTAUT and Behavioral Intention of Golf Smart Wearable Devices User

First, social influence is shown to have no significant effect on behavioral intention. In other words, consumers' decision to accept golf innovation products originates from their personal reasons, not from their surrounding people's suggestion to use golf innovation products. In contrast, Kim and Yoon [39] claimed an opposing argument against the preceding research studies that showed positive relationship between social influence and acceptance intention. This indicates that acceptance intention is not caused by external influences but by internal aspects such as psychological factors. In other words, consumers who accept golf innovation products are not influenced by surrounding people's suggestions or expectations. In addition, they consider their personal reasons and aspects as prioritized determinants than other external factors in using golf innovation products. Therefore, product developers should build strategic marketing plans based on the specific consumer needs in order to increase their acceptance intention of golf innovation products.

Second, performance expectancy has a positive influence on behavioral intention. In other words, acceptance intention increases when consumers believe that using golf innovation products will improve their performance in playing golf. That is, achieving a goal by using innovation products leads to higher acceptance intention. This idea is supported by several different researchers [40], who found out a cause-and-effect relationship between usefulness of internet and acceptance intention, Kim and Oh [41] whose research focused on physical education students from college and verified a cause-and-effect relationship between acceptance factor and usefulness of U-sports. Therefore, diverse ways of increasing performance of golf players should be considered in developing golf innovation products.

Third, effort expectancy is shown to have a positive effect on behavioral intention, which indicates that ease of use plays a significant role in using golf innovation products. It also demonstrates the significance of having a clear understanding in using the products. This statement is also supported by preceding researchers such as Kim and Yoon [39] who investigated on consumers of airline E-services and found out that higher level of effort expectancy has a positive influence on acceptance intention, Kim and Oh [41] who also pointed out that effort expectancy shows a statistically significant effect on acceptance intention. Therefore, developing golf innovation products that are easy and simple for consumers to use is considered as a crucial part of increasing acceptance intention.

Fourth, facilitating condition is shown to have a positive effect on use behavior. Facilitating condition refers to a consumer's belief that organizational and technological environment is established when using golf innovation products. Facilitating condition can have a larger effect on consumers' use behavior during the early stage of introducing new golf products [42]. Therefore when it comes to the beginning phase of introducing golf innovation products, it is important to take the facilitating condition into account that it may exert an influence on consumers' use behavior.

Fifth, perceived enjoyment is shown to have a positive effect on behavioral intention. In other words, entertaining factors will help consumers accept golf innovation products. Lee et al.'s [43] research on learners of e-learning products also found out that enjoyment causes a positive effect on acceptance intention. Lee et al. [44] conducted research on consumers' purchase intention of using fashion T-commerce via the extended technology acceptance model, and they concluded out that enjoyment causes the most influential effect on purchase intention. They suggested that focusing on improving consumers' enjoyment should be an essential part of hosting a T-commerce environment. In addition, Kim [45] argued that

enjoyment is the key motivation factor that encourages modern people to play sports. Therefore, development of golf innovation products should certainly take enjoyment factor into account, aside from usefulness and ease of use.

5.4 Relationship between Behavioral Intention and Use Behavior of Golf Smart Wearable Devices User

Behavioral intention is shown to have a positive effect on use behavior, which indicates that consumers will continue using the products once they accept golf innovation products. Although many researchers asserted that acceptance intention has a positive effect on use intention, Kim and Yoon [39] claimed an opposing statement that UX and spontaneity of using general, popularized products are low, thus acceptance intention does not have a significant effect on use intention. This suggests that popularized products should be consistently developed and updated in order to increase acceptance intention of consumer.

5.5 Comparison of Models for Golf-Related Mobile Application User

This study found out that positive TR of golf-related mobile application users has a positive effect on both technology acceptance belief and acceptance intention, whereas negative TR has no statistically significant effect on technology acceptance belief nor acceptance intention. This suggests that golf-related application users are weighted toward positive TR; golf-related mobile application products have been widely used by an increasing number of consumers since the introduction of smart phones, which delivered advantages mobility and convenience. Moreover the result of this study is supported not only by Lee and Shin [46] who asserted that inconvenience causes negative effects in the use of smart phones but also by Lee [47] who argued that people show weaker use intention toward the internet when there is a higher risk of encountering internet threats. Additionally this finding illustrates that social influence has a positive influence on the relationship between technology acceptance belief and acceptance intention. This result indicates that acceptance intention can be influenced by the UX of golf-related mobile application and User Interface (UI) of mobile application; therefore, increasing the word-of-mouth is expected to increase acceptance intention and use intention.

In addition, the advancement of systems that allow Human Computer Interaction (HCI) has been increasing consumers' interests in the smart wearable device market; this conveys that businesses can derive positive marketing results by identifying the specific needs of consumers in this market and establishing an effective marketing strategy.

Many researchers intended to assess acceptance intention by applying technology acceptance theory. Unlike the preceding research studies in which models were established by application of the original TAM [48], this study incorporates the UTAUT and TR models, which are known to have the most explanatory adequacy at present. Conducting a survey to assess consumers' preferences also demonstrates the practical implication of this study. In addition, the collaboration of TR and UTAUT models can be used as future academic references [49].

6. Conclusions

The main purpose of this research is to investigate relationships between the significant control factors on acceptance intention to UX sports smart wearable devices by applying TR

and UTAUT. The conclusion drawn by this study on the basis this study purpose and process was as follows: First, positive TR had a significantly positive effect on social influence, effort expectancy, facilitating conditions, perceived enjoyment, performance expectancy. Second, negative TR had a significant negative effect on performance expectancy, social influence, facilitating conditions, perceived enjoyment. Third, TR had a no significantly effect on behavioral intention. Fourth, performance expectancy, perceived enjoyment and facilitating conditions had a significantly positive effect on behavioral intention. Fifth, behavioral intention had a significantly positive effect on use behavior. Thus it became crucial to identify the difference in acceptance intention models per each products are as follows. Positive TR of golf-related mobile application users has a positive effect on both technology acceptance belief and acceptance intention, whereas negative TR has no statistically significant effect on technology acceptance belief nor acceptance intention.

Based on these results, it can be concluded that even if TR does not directly influence acceptance intention, technology acceptance belief can stimulate TR to affect acceptance intention. In other words, it is important that innovation products allow consumers to UX improvement of their performances, enjoy using them, and consider them as relatively easy. In addition, due to the difference between acceptance intentions of consumers in using various innovation products, product developers could increase acceptance intention by focusing on the different characteristics of their products [49].

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