ATTITUDE CONFIDENCE AND USER RESISTANCE FOR PURCHASING WEARABLE DEVICES ON VR: VR HEADSET PERSPECTIVE

[1]BONGJIN SOHN, [2]HYUNA LIM, [3]JAEWON CHOI

Soonchunhyang University, Korea
E-mail: [1]thshqd1719@sch.ac.kr, [2]limha3027@sch.ac.kr, [3]jaewonchoi@sch.ac.kr

Abstract - The Virtual Reality (VR) has been issued by IT business of the 21st century. There has been a quick diffusion of smart devices and applying various industrial sites. However, there is a lack of innovation resistance studies influencing new technology's adoption & diffusion including VR. The research questions follow. First, do attitude confidence and innovativeness resistance affect consumer intention to use? Next, what factors affect to among brand, contents and the above variable like attitude confidence? Finally, are there different factors as functional characteristics in VR? This study collected data from respondents who have prior experiences taking VR headset in Korea. The result of this study explained that user innovation resistance (-) and attitude confidence (+) directly-opposed influence consumer intention to use VR headset. Especially, seeing that attitude confidence is highly strong effect to the intention of behavior. Thus, high-belied of attitude improve behavior intention in the innovative product.

Index Terms - Virtual Reality, Wearable Device, User Resistance, Attitude Confidence

I. INTRODUCTION

Recently, the Information and Communication Technology(ICT) business development keeps going and going, because of making that device. Especially, Virtual Reality(VR) has been in the spotlight in various fields. VR technology has experienced real world through using smartphones and VR devices. By providing a three-dimensional virtual space, users have just felt like as real world due to interaction dominated five senses like sight and hearing. The research company "TrendForce" forecastedthat VR market increase from US$ 6.7 billion in 2016 to jump to US$70 billion in 2020. On the other hand, another research company "Statista" predicted that VR headset expects to make worldwide US$ 27.3 million in 2020[36]. The business group such as Facebook, Google, Samsung, LG, and Sony have interested active support in VR platform development and investment.

In related antecedent studies, VR was primarily studied in relation to specific phobia treatment and therapy in the medical field. the researchers explained how to solve the treatment of phobia or diseases. In other studies, VR was introduced about learning tools such as education of disaster prevention [6] and using VR in learning [31]. Above this, VR has studied the application of tourism, electronic game. Furthermore, VR's research was valuable to the simulation driver accident [37].However, there have been few empirical studies on the consumption behavior of VR devices. In addition, there are studies on the consumption environment in the virtual world [9], but research on the consumption environment using the virtual reality headset is insufficient. In this study, we addressed customer behavior environment in the virtual reality headset.

Despite many research and development, innovative acceptance is difficult for consumers. There is the best example is the smart TV. Smart TV forecast to decrease by 2018 because most people usually use the internet and smartphone. Therefore, they don't want to watch TV than a smart phone. Clearly, smartTV is an innovative product, but plenty of customers don't want to usesmartTV. There are many reasons for not doing so, but one of them is not the acceptance to slow development and innovation [33].Unconditional technological development does not bring consumer's desire to purchase. The "Chasm" can be easy to explain this situation such as failure to 3D TV. The early adopters accept the high-tech goods, but the group of majorities does not want to accept as well. Because they need to include practicability when they accept the high-tech goods. Despite using in many fields, consumer's attitude has not been easily changed and VR device's position is at an early stage in "Adoption & Diffusion". Thus, plenty of customers have not purchased the VR headset. Acceptance is important to success in high-tech product like VR device in the market. Resistance also is important because of the trade-offs relation two concepts. This study is focused on user acceptance and resistance for overcoming Chasm in the VR headset[15].

The antecedent studies in VR, there are primarily acceptance models like Technology Acceptance Model (TAM) and Unified Theory of Acceptance e and Use of Technology (UTAUT) [6, 31]. While the study of innovative resistance is insufficient in VR device. The innovative resistance is one of the responses to the customer. Some people don't want to change the present environment [28]. Moreover, when resistance increase, people refuse to purchase. Thus,resistance is an important thing when does the customer buy the high-tech device. this study is focused on user acceptance and resistance based on innovative things. Consumer behavior research, consumer's attitude explained the key to understanding consumer behavior

[10]. Furthermore, the belief of attitude reinforces motivation to behavior intention. Consumer's intention can be confirmed by the certainty of individual attitude[16]. This study focuses on the confidence in consumer attitude. User confidence (or belief) is following forecasting about using the VR device. Additionally, to find out the factors for the customer's purchase, we add the factors about VR device characteristics that are "Aesthetic Exterior", "Contents", "Projection quality" and "Brand".

This study is focused on the correlation among use intention, user innovative acceptance, resistance and certainty of attitude from device characteristics in VR headset. In order to, study innovative resistance and attitude confidence based on Management of Innovation Resistant (MIR) and UTUAT2. The research questions are followed: First, do attitude confidence and innovativeness resistance affect consumer intention to use? Next, what factors affect to among brand, contents and the above variable like attitude confidence? Finally, are there different factors as functional characteristics in VR?

II. LITERATURE REVIEW

A. Relationship between Technology Acceptance & Resistance

"TAM & UTAUT 2"

The antecedent research in information systemhas explained the reason why the customer use and adoption of the innovativeness product [9]. there were primarily acceptance of VR technology theory using acceptance model like "TAM" and "UTAUT". Technology Acceptance Model (TAM) has a contribution to understanding communication, technology, application, web-based collaboration system and innovativeness goods. The study of the Virtual world, perceived ease of use (PEOU) was a positive effect on behavioral intention to use. Furthermore, the study identified the key of acceptance factor in the virtual world like community [9].

The technology acceptance model played an important role in using VR in learning research. The study identified the importance of UTAUT in Virtual Reality Headset(VRH) by proving 4 factors: performance expectancy, effort expectancy, social influence, and facilitating condition (Shen et al. 2017). "Unified Theory of Acceptance and Use of Technology (UTAUT)" is applicable to various situations. UTAUT2 is added to the above theory, including 3 variables of the consumer's situation. The 3 consumer's situation variables are "Hedonic Motivation", "Price Value" and "Habit". UTAUT2 also is applied to diverse contexts and provided with the power of explanation by 70% in another study. Thus, UTAUT2 has an impact to plan marketing and training strategy for acceptance promotion [38].

"Model of Innovation Resistance"

On the other hand, the theory of Innovation resistance has not been studied related VR technology. Innovation makes a change in the consumer,but resistance to change is a common customer reaction. Innovation resistance is not opposite perspectives against adoption. Innovation resistance precedes innovation adoption [28].Therefore, we have to deeply consider innovation resistance as well as adoption.Based on Management Innovation Resistance (MIR), the 3 sets of factors are perceived innovation characteristic, consumer characteristic and propagation mechanism. The main concepts of MIR are "Relative Advantage", "Compatibility", "Complexity", "trialability", "Communicability", "Perceived Risk", "Personality" and "Propagation Mechanism"[28]. In order to the success of innovation in the market like VR, the company has to revise for decreasing resistance.Thereby, many customers take steps to choose whether to accommodate innovation or not. The steps proceed with "Knowledge", "Persuasion", "Decision", "Playing" and "Confirmation" in sequence. Persuasion has stepped makes a well-disposed attitude or not [29]. Consumer needs to understand innovation resistance in order to know the process of decision step due to accompanying change attitude and opposing new one.

Another innovation resistance study explains that there are two factors which evaluate innovation resistance are habit toward previous practice and perceived risk related to innovation. By overcoming innovation resistance, the customer remake habit about innovation goods. Therefore, reducing innovation resistance is important to the company[32].

While confirming antecedent study, we found many research of innovation acceptance, but the concepts of innovation resistance didn't attempt the studies. In this study, we investigated the concept of innovative resistance, which factors influenced innovation goods, especially, VR headset due to innovation resistance precedes adoption. Furthermore, we tried to clarify the correlation between resistance and intention to use.

B. Attitude Confidence

Attitude is one of the important factors in consumer behavior research. Therefore, many researchers studied about attitude, correlation of attitude-behavior and consumer's belief. An attitude is defined as the affective dimension regarding action, event or some object. An attitude also involved consumers common feeling of likes and dislike toward some stimulation [10].Because consumer's individual attitudes are different, consumers determined their attitude by their significant belief linking to diversity attribute and their evaluations of any event. In addition to study related to attitude and behavior intention, the study identified a correlation of attitude with the intention.

After making individual attitude interest in this study is attitude confidence. "Attitude Confidence(AC)" is defined as the level of certainty to a personal attitude, reflecting the degree of assurance with belief represent[16]. The study of attitude confidence plays a crucial role in employing attitude-intention

relationship. attitude confidence means that it does not change easily from a high-level confidence. Strongly tenable attitude also provided the more high-level confidence, the factors that reinforced attitude confidence include "Repeated exposure", "Repeated Behavior", "Self-confidence in the Decision"[4].

Thus, the attitude confidence research substantially is worth studying due to playing a very important role in understanding intentions in the virtual world [30]. The stronger consumer belief of attitude, the easier change consumer behavior.

III. RESEARCH MODEL

This study considered to antecedents related to an explaining effect relationship that influence attitude confidence, innovation resistance and intention to use VR device. We developed the research model as by developing the relationships among factors based on previous studies. This research totally analyzed factors of attitude confidence, innovation resistance and intention to behavior [13,16]. In order to know VR devices characteristic, we added the factors that are "Aesthetic Exterior", "Contents", "Projection quality" and "Brand".

This study investigated what factors effect on innovation-acceptance resistance depending on consumer attitude for VR device. By decreasing resistance and increasing attitude, that also suggests a behavior model of connecting unified perception structure [13,16]. This study carefully considered multi-dimensional constructs related to attitude confidence and innovation resistance. Thus, the hypothesis of this research is made up of two large groups are attitude confidence and user innovation resistance factors including some parameters.

C. Sampling and Collection

This research conducted online surveys targeted potential consumers of purchase VR headset. After questionnaires checked missing data and error. A total of 156 valid forms was obtained. A demographic factor, the male is conducted 86(55.1%), the female is conducted 70(44.9%). There are relatively more what the age group of 20~25 was 75 (48.1%). Most respondents knew VR headset like Galaxy VR (80.8%). Furthermore, having experienced VR headset, there are 48 examinees (30.8%). The question of experience VR headset is conducted by "Yes" assigned 48(30.8%). The question of awareness VR headset is conducted by "Yes" assigned 126(80.8%).

D. Convergent and Discriminant Validity

We carried out Exploratory Factor Analysis (EFA) to confirm the validity proposed variables like innovation acceptance resistance, attitude confidence and use intention. The result of EFA, some factors eliminated PQ1 of projection quality, BA3 of brand awareness, QNC3 of quantity of contents, PP1 of perceived price and UI3 of Use Intention due to inadaptability. Except above factors, the remainder loaded valid factors like Table 3. The result of reliability analysis, Cronbach's alpha coefficient employed from 0.679 to 0.896. Thus, this research's variable gets reliable.

After confirmation EFA, we carried out Confirmatory Factor Analysis (CFA) to analyze structural equation modeling. CFA is conducted to confirm the convergent validity and discriminant validity. For using validity factors, construct reliability should gain more 0.8. Moreover, Average Variance Extracted (AVE) should get more 0.5 [11]. In accordance with the foregoing standard, the construct reliability of each factor gained from 0.858 to 0.948. AVE of each factor got from 0.714 to 0.901. Thus, all of the factors gained validity in this study.

Discriminant Validity means each structure concept can distinguish unrelated factors. The correlation coefficient of each factor should be less than the square root of AVE. All ofthe values are greater than correlation coefficients. Thus, the results of CFA are suitable to use structural equation modeling.

IV. RESEARCH METHODOLOGY

"Perceived Price (PP)" is defined as "Customer's cognitive tradeoff between the perceived benefits of VR headgear and the monetary cost for using VR headgear"[38]. When customers purchase high-cost, psychological resistance increase. The higher perceived cost, the more uncomfortable. Thus, the perceived price has a positive effect on innovation resistance. The more cost, the more emotional burden [23].

Aesthetic exterior is also a factor influencing the perceived price. **"Aesthetic Exterior (AE)"** is defined as "The degree to exterior image of the customer's thinking". In antecedent study, aesthetic exterior has a positive impact on intention to purchase and trust [27]. Aesthetic exterior means the real image beyond occupied customer's mind. The factor comes into the positive or negative image. Recognition of image influence perceiving price. Aesthetic exterior brings about a positive result in smart devices. Perceived price is a parameter of the perceived price and aesthetic exterior.

H1: Perceived Price is positively related to User Innovation Resistance.

H2: Aesthetic Exterior is positively related to Perceived Price.

"Perceived Enjoyment (PE)" is defined as "The degree of enjoyment about perceived using the product". When customer enjoys using the products, the intention to behavior has a positive effect to them (Jia 2012). Enjoyed experience is decreased psychological resistance and give a sense of pride.

For measurement, what factors influence perceived enjoyment, we prepare 2 parameters about qualities. First, "Quality of Contents (QC)" is defined as "The degree to quality of providing content". The better previous providing content the quality is great, the

better customers are happy [1,22].

"Projection Quality (PQ)" is defined as "The degree of projection quality for real used things"[24]. That was variable about "Perceived Information Quality (PIQ)", VR has also been electronic image devices. Thus, projection quality is equal to product information quality. Projection is positioned in the core parts of VR devices. Therefore, projection quality is very important variable [7,24]. The better devices' projection is great, the more perceived enjoyment is strong.

H3: Perceived Enjoyment is negatively related to User Innovation Resistance.

H4: Quality of Contents is positively related to Perceived Enjoyment.

H5: Projection Quality is positively related to Perceived Enjoyment.

Quantity of Contents (QOC) is defined as "The degree to quantity of providing content". In previous research mentioned that quantity didn't influence rather than quality of the general products. However, innovative products need to plenty of content because of lack of amount. The more contents' amount, the less psychological resistance. If innovative products' amount gets more, the consumer feels familiar [3].

H6: Quantity of Contents is negatively related to User Innovation Resistance.

Brand Awareness (BA) is defined as "The degree for customer to know about brand identity". BA is what to perceive the brand among the specific goods. Depending on level of awareness, customers are influenced by the positive effect during purchase [12]. Thus, improvement of awareness lets customer attitude reinforce and has an impact on the intention to behavior because of increasing self-confidence. However, the customer doesn't use the VR device despite brand awareness in that VR, we need to know why customer doesn't use that. Thus, this study proposes factors of the brand.

H7: Brand Awareness is positively related to Attitude Confidence.

Perceived Ease of Use (PEU) is defined as "The degree to ease using the new system". That factor used TAM and UTAUT theory, the better degree of use has a positive effect on the performance like purchase [38]. If the consumer is aware of simple, resistance is decreased. On the other hand, the intention of accepting is increasing. The more easy to use, the better confidence of attitude [8].

H8: Perceived Ease to Use is positively related to Attitude Confidence.

"Use Innovativeness (UI)" is defined as "The degree to use innovative things or information". Pioneer tends to positively accommodate uncertain risk. Thus, innovation consumers make an exploratory purchase. On the other hand, laggards prefer common goods. Thus, the better innovativeness is reinforced by using a new one. Innovative consumer attitude quickly increases innovation acceptation and self-confidence [18,28].

H9: Use Innovativeness is positively related to Attitude Confidence.

In existing research, attitude confidence played an important role in making attitude. Attitude confidence studied core variable by means of the decision to behavior intention. If self-confidence happens due to the intention of attitude, use intention has a positive effect [4,16,23].

H10: Attitude Confidence is positively related to Use Intention.

User Innovation Resistance used in the research of innovativeness resistance decrease use intention. The more psychological resistance, the more negative attitude. Thus, user innovation resistance has a negative impact on the intention of use [38].

H11: User Innovation Resistance is negatively related to Use Intention.

V. RESULTS

After confirming the convergent and discriminant validity, we tested hypotheses with Partial Least Squares (PLS) based on SmartPLS. The results of hypothesis tests with the PLS analysis were explained in Figure 1. The result of path coefficient between brand awareness and attitude confidence rejected hypothesis since the path coefficient was 0.088 ($p<0.05$). The result of path coefficient between the quality of contents and perceived enjoyment also rejected hypothesis since the path coefficient was 0.099 ($p<0.05$).

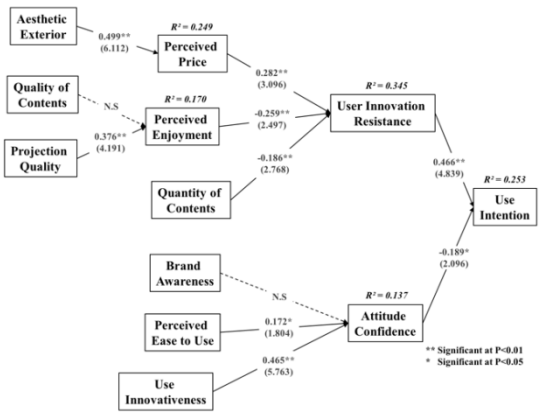

Fig.1. Result of Hypothesis Tests

Except above two hypotheses, the results show that attitude confidence and user innovation resistance significantly influence use intention. The parameter of user innovation resistance that aesthetic exterior and perceived price, Hypothesis 1 ($p<0.01$) and Hypothesis 2 ($p<0.01$) were supported. The parameter of user innovation resistance that perceived enjoyment and projection quality, Hypothesis 3 ($p<0.01$) and Hypothesis 5 ($p<0.01$) were supported. Hypothesis 6 ($p<0.01$) was supported by the section of user innovation resistance. Hypothesis 8 ($p<0.05$) and Hypothesis 9 ($p<0.01$) were supported by the section of attitude confidence. For use intention, attitude confidence and user innovation resistance significantly

influence use intention, thus, Hypothesis 10 ($p<0.01$) and Hypothesis 11 ($p<0.01$) were supported. Especially, there is a strong path coefficient between attitude confidence and use intention. Thus, attitude confidence seems to be an important factor by using VR headset.

CONCLUSION

This study examines whether a correlation between innovation acceptance & resistance, the degree of beliefthat customer determines, that is, attitude confidence and behavior intentionin VR headset. Therefore, we consist of hypothesis two possible determinants user innovation resistance and attitude confidence affecting intention to use and subfactors VR device's characteristic like projection quality. The result of the analysis identifies a correlation of user innovation and intention to use and attitude confidence and intention to use. Attitude confidence has a great influence on intention to use (path-coefficient is 0.466).

Most of the hypotheses are supported, but 2 hypotheses are not supported as H4 (Quality of Contents → Perceived Enjoyment) and H7 (Brand Awareness → Attitude confidence). Since VR devices were electronic image devices, customer enjoyed established the limited protected contents at the VR headset. However, because of lack of enabling contents such as the game like Pokémon Go, education and architecture, this study did not fully find out what other important aspects exist in the VR headset market considering all kinds of VR headset brands. Not that we anticipated to making the correlation with attitude confidence through brand awareness, but that the result was not associated with the information technology marketplace. Since the VR market is the early market, most customers' perception was low. Therefore, most people concentrate on product quality like projection quality and aesthetic exterior than product brand.

There is next contribution to this study. The academic implications of this studies are as follows. First, that is the lack of the innovation resistance research in VR devices. There are many study of acceptance, but resistance precedes adoption. Therefore, consumers do not use the VR headset if it has resistance, or if the attitude is formed.The innovation resistance research is important due to difficult changing prior attitude. Second, through correlation between attitude confidence and intention to use, if customer belief of self-attitude is strong, intention to use innovative product like the VR headset is improved. Thus, attitude study is important with grasping consumer behavior but, behavior intention changes when consumers are strong enough to believe in their attitudes. Finally, the VR headset market is early market explaining chasm theory. To overcome the chasm, innovation resistance should be reduced and attitude confidence should be reinforced in order to increase behavior change like use and purchase products.

The practical implications of this study are as follows. First, projection quality is important in VR headset. Because VR technology projected through VR headset, most of quality can say projection quality. To increase use and purchase, the projection quality in VR headset is improved than before. Second, there are lack of usable contents in VR market. Most people said that they didn't want to use the VR headset due to no contents to enjoy. Therefore, the development of contents is more important than the existing ones. Finally, among the consumers who know the VR headset, few know VR device brand well. One of this study results deduced lack of brand awareness. Thus, VR Headset Company need to precede improving brand exposure to the potential customer.

The limitations of This study are as follows. First, the VR headset is early marketplace. Thus, it is difficult that customer who doesn't know device like how to use and why use this. Because there are not many VR headset users in Korea, it is difficult to conduct the survey into primarily potential customer or early adapters. Second, we were not able to conduct an experimental study. In follow research, research is needed based on actual experience of the VR headset after using the VR headset. Nevertheless, this study testifies correlation between user innovation resistance and behavior intention, attitude confidence and behavior intention. Thus, we identified consumer behavior reinforcement factors and VR product characteristic.

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