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A Longitudinal Study for Predicting Intentions to Use Augmented Reality Technology in the Fashion Shopping Context

Sunyang Park · Eun Young Kim†

Lecturer, Dept. of Clothing & Textiles, Chungbuk National University, Cheongju, South Korea

Professor, Dept. of Clothing & Textiles, Chungbuk National University, Cheongju, South Korea

Abstract This study predicted the intentions to use augmented reality (AR) technology by the changes in perceptions of visual comfort, interactivity, social influence, and facilitating condition over time in the fashion shopping context. For a longitudinal experimental study, participants were asked to participate in the repeated experiments at three different points (Time 1 in July, Time 2 in October, Time 3 in December) for 6 months. They were given a shopping task to use an AR-based virtual fitting smart mirror and then completed to answer self-administered questionnaires. Sampling was conducted for consumers in their 20s-30s and a total of 74 responses who participated in all experiments was used. Findings showed that mean scores of visual comfort, user control, responsiveness and social influence in Time 2 and Time 3 were significantly higher than those in Time 1. Regression analysis showed that the changes in perceptions of visual comfort and social influence in Time 1(initial use) and Time 3(repeated use) had significantly positive effects on the changes in the use intentions over time. This study discussed practical implications for developing fashion retail strategies, by considering technological and external factors, to expand the utilization of AR technology over time in a retail venue.

Keywords Augmented Reality, Visual comfort, Social influence, Technology acceptance, Longitudinal study

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Introduction

With the increased expectations for, non-contact, online shopping due to the COVID-19 pandemic, there is a growing demand for replacing new media with traditional offline shopping. In fact, for various consumer goods, retail sales on online channels have been increased throughout 2020 (Statistics Korea, 2020). In particular, the turnover of mobile shopping reached a record high of nearly 9 billion dollars (10 trillion won) (Statistics Korea, 2020). On the other hand, it is important that consumers evaluate the visual design and/or fitting in their senses when purchasing fashion products. Due to the limitations of online shopping, fashion item has been one of the products that are still preferred to shop offline (Sporn & Tuttle, 2018).

With the recent advancement in digital technologies, virtual reality (VR) and augmented reality (AR) technologies are developed by focusing on maximizing telepresence and reality. In a fashion shopping context, retailers began to adopt smart mirror-typed AR technology into their stores, in which users could virtually try and look at their clothes in the

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† ***Corresponding Author:*** eunykim@chungbuk.ac.kr

real world. Several researchers had examined the consumers' responses to virtual experience technologies. Particularly, perceived interactivity when using technology is being suggested as an important variable to predict consumers' satisfaction, attitude towards products, and purchase intention (Kim & Hyun, 2016; Kim et al., 2016; Yim et al., 2017). Nikhashemi et al. (2021) found that perceived pleasure and usefulness in virtual experience with AR technology had a positive effect on the intention to use the technology. Also, objective technological features, such as augmentation, responsiveness, information quality, and presence identified to be the significant predictors of the use intentions for the technology (Perannagari & Chakrabarti, 2019).

However, there is still doubt about the effectiveness of consumers via virtual experience from a long-term business perspective. Rather than using the new technology as an entertainment element in a store, it is necessary to develop specific marketing strategies based on the advantage of the technologies on a commercial stage. Since behavioral intention should be required for the diffusion of new technology, it is very important to predict the intentions to use and propose the way to facilitate technology acceptance from a user perspective. Concerning the emergence of new technologies, there have been a lot of researches on technology acceptance models, which are mainly a cross-sectional study in the earlier stage of technology introduction (Jung et al., 2021; Seo, 2018). However, few studies are focused on a longitudinal approach to examine changes in consumer response to new technology over time. Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) model as a theoretical framework that integrated elements across various models relevant to technology acceptance and empirically validated the unified model from the time of initial introduction to stages of repeated experience. Based on the UTAUT model, many researchers have predicted consumers' intention to use the technology with four core determinants, such as effort expectancy, performance expectancy, social influence, and facilitating condition (i.e., Cho & Kim, 2019; Nizar et al., 2019; Paulo et al., 2018). Recent research investigated augmented reality (AR) try-on experiences (e.g., environmental embedding and stimulated physical control) with AR service applications in consumers' shopping decisions (Song et al., 2019).

Still, little research was conducted to empirically test a longitudinal evaluation of consumer technology acceptance over repeated uses by focusing on an AR smart mirror within a store environment. The purpose of this study is to predict consumers' intention to use the technology by observing changes in consumer responses under repeated uses of augmented reality technology in a fashion shopping context. This study, as an initiative of implementing AR technology in fashion retailing, is able to theoretically contribute to expanding the unified technology acceptance model for predicting key determinants of consumer technology acceptance. In a practical, it is also helpful that marketers establish effective business strategies to improve the shopping experience in the convergence of digital technologies with store environments.

Literature Review

AR Technology in Fashion Shopping Context

As the representative technologies that are capable of virtual experience for fashion shopping, there are virtual reality and augmented reality technologies. Virtual reality (VR) refers to completely virtual presentations of a world, whereas augmented reality (AR) refers to generations of digital information mixed with the real environment (Olsson et al., 2013). In the fashion field, utilization of 'augmented reality' technology is more active because consumers are familiar with smartphone app technology which they can virtually try on products. One of the AR technologies adopted in a fashion store is a smart mirror which is capable of virtual fitting on a large-sized screen like a real mirror. By using a virtual fitting service, consumers can wear virtual 3D image clothing on their bodies, produced by computer graphics (Plotkina & Saurel, 2019). In a fashion market, AR experience is being used remarkably since the size or fit when consumers wear is important in fashion products. In addition, interactivity is possible through virtual fitting where wearers can look at a color or a silhouette virtually. There is a tendency that the rate of introducing a smart mirror into a store is increasing.

Fashion brands like Tommy Hilfiger, Gucci, Gap, Nike, Adidas, and Zara are actively using virtual fitting in their stores or via apps (Caboni & Hagberg, 2019).

In the fashion marketing field, various studies have been conducted on characteristics of AR utilization by consumers. So and Kim (2013) stated interactivity, reality, and flow as characteristics of AR fashion apps. Song et al. (2019) defined 'control' as an individual's belief about his or her capability of physically manipulating the virtual product when using AR. Kim et al. (2020) divided AR characteristics into reality, interactivity, pleasure, and convenience, and found out their significant correlations with user's flow, satisfaction, and intention to use. In addition, Lee and Ku (2020) in their meta-analysis mentioned presence (related to a sense of reality), interactivity with AR technology, and flow (related to pleasure and user satisfaction) as the main characteristics of AR experience (Lee & Ku, 2020). In the research on the relationship between AR characteristics and intention to use the technology, as advocates of the argument above, Perannagari and Chakrabarti (2019) stated the higher presence, interactivity, and flow, the more positive relations with satisfaction and intention to use. In sum, for AR technology, presence and interactivity are more important predictors of a consumer's technology acceptance than the content of the information itself.

Visual Comfort. Research on digital-based virtual environments has raised an issue of visual discomfort which decreases the presence users feel like being in reality. Steuer (1992) defined vividness as a degree that a medium delivers information to multiple sense receptors, enhancing the sense of presence. According to Tam et al. (2011)'s study on stereoscopic 3D-TV, visual discomfort refers to subjective sensation about the discomfort along with the physiological change (e.g., accommodation response, pupillary diameter, and eye movement). They discussed that visual comfort can be assessed with viewers' level of perceived visual comfort. Such visual comfort is measured by subjective evaluation of image quality in general, despite the difference in perceived image quality according to presentation methods in a virtual reality environment. The performance of visual comfort was characterized by the quality of AR contents, and highly perceived by virtual image quality to look more comfortable or natural, and information quality (Lee & Ku, 2020).

In using the AR interactive technology (ARIT), visual appeals, such as aesthetics, sense of physical space played an important role in maintaining sustainable relationship behavior to accept ARIT (Huang & Liao, 2015). According to Lee et al. (2020) AR system of architectural design was more favorably evaluated in visual presentation quality for texture, size/location, and naturalness, compared with 2D screen and VR technology. Lee and Ku (2020) showed that AR-based virtual fitting smart mirror can increase the level of users' positive experience and acceptance by communicating more effective visual images.

In particular, an AR-based smart mirror with a large screen is expected to provide excellence in visual information quality, and a feeling of visual comfort on this device, unlike to the mobile device. Although there is limited research on the visual comfort of the AR technology in the fashion field, it is assumed that visual comfort can be increased by visual information quality such as resolution and quality of graphic image, and by changes in accommodation response over repeated uses in time, ultimately leading to intentions to use the technology. Therefore, hypotheses were posited as the following:

Hypothesis 1a: Perceived visual comfort, for using AR technology in fashion shopping, will increase over time (repeated uses).

Hypothesis 1b: Change in perceived visual comfort over time (repeated uses) will affect that in the intention to use the AR technology.

Interactivity. In augmented reality, consumer response manifests in interactivity and it is about feedback between user and device or content (Wi & Kim, 2017). Steuer (1992) defined the interactivity in technical utilization as a degree to which users participate in the real-time transformation of contents in a mediated environment. As for the studies on the interactivity in the AR technology, Schlosser (2003)'s initial research showed consumers' purchase intention was higher when the interactivity was high than when it was low. In

other words, the better the interactivity is, the more positive effect it has on consumer response. In the research on the elements of interactivity, Jung and Kim (2016) defined the interactivity of mobile AR as control, individualization, and orientation. Ahn and Choi (2014) elaborated the definition of interactivity as multi-way communication, responsiveness, control, and individualization. As such, since a concept of interactivity incorporates response time, rate of interaction, and a range of attributes manipulable by a user, this research divided the interactivity into both dimensions of responsiveness and control.

Precedent studies revealed that responsiveness is a degree to which users respond to virtual experience fast and correctly. 'Perceived control' (control) is a degree to which users feel they can control the operation of virtual experience. Fashion consumers emphasize experience through interactions in a virtual store environment. Their interactive experience is expected to be increased with its accumulation as they are exposed to AR technology repeatedly. That is, it is assumed that both dimensions of the perceived interactivity will be enhanced with a learning effect as they are much exposed to a smart mirror and the following Hypotheses 2 were derived.

Hypothesis 2a. Perceived interactivity (e.g., responsiveness, control), for using AR technology in fashion shopping, will increase over time (repeated uses).

Hypothesis 2b. Change in perceived interactivity over time (repeated uses) will affect that in intentions to use the AR technology.

A Longitudinal Perspective for Consumer Technology Acceptance

Previous studies based on Davis (1989)'s TAM (Technology Acceptance Model) as a theoretical framework has identified that perceived usefulness and perceived ease of use were the strongest predictors of the intention to use new technologies. Based on TAM, Venkatesh et al. (2003) developed the UTAUT (Unified Theory of Acceptance and Use of Technology) model, referring to both the conceptual and empirical similarities across the models related to acceptance of technology. From the four main constructs of the UTAUT model, the two expectancies (performance expectancy and effort expectancy) are similar to usefulness and ease of use from the TAM model. Also, the two external factors were added to explain social influence and facilitating condition.

In particular, the UTAUT model is more useful for comparing their effects over time by considering consumer characteristics in the context of consumer usage (Venkatesh et al., 2012). Therefore, we reviewed the literature regarding users' response to external factors (e.g., social influence and facilitating condition) to ascertain diffusion of technology acceptance over time from a longitudinal perspective.

Social Influence. In general, there have been ongoing opinions that culture, norms, and social contexts affect technology acceptance (Fulk, 2017; Vakentesh et al., 2003). Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new technology (Venketesh et al., 2003). The social influence is represented as subjective norms in technology acceptance of innovation (Davis, 1989). For instance, Fulk et al. (1987) proposed the social influence model, explaining individual use of technology is influenced not only by social norms of a community but by attitudes of reference group members. It means individuals' perception toward new technology may be changed by overt comments by people in their reference group, and observations. Active social interactions had a positive effect on the intention to use the technology (Fulk, 2017; Rice & Aydin, 1991).

Cho and Kim (2019) discussed that social influence was very important to accept AR technology in a fashion retail context. They identified that social influence had a positive effect on the intention to use fashion AR apps. As such, social influence is an important factor influencing technology acceptance in an earlier stage of introduction. As increasingly exposed and accumulated use experiences over time, most people might think that they should use the technology as a subjective norm. Accordingly, compared with initial use, repeated use is more likely to increase perceived social influence toward the technology. However, in Vakentash et al. (2003)'s longitudinal study, the mean of the social influence increased at the point of second time (T2) and

decreased at the point of third time (T3) to use. Also, the social influence was the most highly correlated to technology acceptance in the first time (T1), followed by decreased over time (T2 to T3). Even if the number of repeated use is not a clear indicator of social influence, consumers' perceived social influence might be changed from the time of initial introduction to stages of repeated use experience. Therefore, hypotheses were postulated as the followings:

Hypothesis 3a. Perceived social influence, for using AR technology in fashion shopping, will be changed over time (repeated uses).

Hypothesis 3b. Change in perceived social influence over time (repeated uses) will affect that in the intention to use the AR technology.

Facilitating Condition. Facilitating condition refers to a degree to which individuals believe they have an infrastructure in terms of technologies and resources for facilitating their use of new technology (Venkatesh et al., 2003). In other words, it means knowledge and support to get rid of obstacles in using the technology. According to UTAUT, since facilitating condition is internal/external resources of a potential user, it can be a factor triggering use behavior (Venkatesh et al.,2003; Venkatesh et al., 2012). Particularly, facilitating condition is a factor to control perceived behaviors of individuals including knowledge and resources (Ajzen, 1991). Facilitating condition is related to effort expectancy (or ease of use) and possible to predict the intention to use the technology.

Several researches demonstrated facilitating conditions may have a positive influence on behavioral intention (Chung et al., 2015; Chung et al., 2019; Dieck & Jung, 2018; Saprikis et al., 2021). Meanwhile, Venkatesh et al. (2003) suggested that facilitating condition did not have a direct impact on the intention to use when putting it into the model with the variables of effort expectancy and performance expectancy. Facilitating condition had an interaction effect with experience, showing experience (repeated uses) moderates effects of facilitating conditions (Venkatesh & Davis, 2000). As shown above, facilitating conditions may be understood as an objective factor of guidance or specialized instruction needed in an environment inducing ease of use of the new technology.

Therefore, repeated use of the AR technology over time will increase users' understanding of and familiarity with the operation. Then, the following hypotheses are derived.

Hypothesis 4a. Perceived facilitating condition, for using AR technology in fashion shopping, will increase over time (repeated use).

Hypothesis 4b. Change in perceived facilitating condition over time (repeated use) will affect that in the intention to use the AR technology.

Research Methodology

Experimental Design

This study conducted a longitudinal experiment to diagnose consumer response to use of the AR technology as a new fashion retail technology with repeated uses. For the longitudinal experimental design, three repetitive experiments were conducted with the same research participants in order for them to have repeated experience as time passed. Experimental procedures/processes were conducted for 6 months from July to December, 2020 in the same manner. The first experiment (Time 1: initial use) was done for a week in July, the second (Time 2: repeated use) was conducted in October after 2 months. The third (Time 3: repeated use) was done in December and the experimental design pursued repeated use of an AR-based smart mirror installed at a lab. Before the experiment, the research participants were informed of experiment content and the consent, then, participated in the experiment only when they agreed to things above. At the lab they visited, on the assumption that they were using a smart mirror at a clothing shop, they experienced shopping freely for 10 minutes using a smart mirror under a shopping scenario and then answered a questionnaire based on their experience of use to collect data.

In the study, sampling was conducted for participants in

their 20s-30s who consented to participate in the experiment. The number of participants for Time 1 experiment was 120. However, since the same research participants had to take part in both Time 2 (n = 82) and Time 3 (n = 74) experiments, only responses from 74 persons who participated in every experiment from Time 1 to Time 3 were used for the final analysis. As for the characteristics of the sample, their age ranged from 19 to 30 (the mean; 22.69), and those who were in 19-24 accounted for the majority with 87.8% (n = 63). As for gender, the number of females was 50 (approximately 68%), occupying more than half the number compared with males (n = 24, approximately 32%).

Stimulus

A smart mirror of a 3D virtual fitting system (FX-Mirror) was selected for the AR technology in this research. As shown in <Fig.1>, FX-Mirror installed at the lab recognizes and scans a body of a user in front of a screen automatically, and shows a fitting image via 3D. It has a function to show one's image in the mirror. A smart mirror is an AR technology-based system where users can try on a lot of clothes virtually by touching a menu with a hand motion at some distance rather than touching a screen. In this research, for smart mirror contents, items were organized including 181 womenswear styles (56 overcoats, 45 tops, 46 bottoms, 34 dresses) and 105 menswear styles (37 overcoats, 34 tops, 34 pairs of pants). Participants were asked to get a virtual style fitted on their actual images and select their favorite style.

Measures

The study used a questionnaire developed based on precedent studies. In a fashion shopping context, perceived visual comfort for the AR technology was evaluated with 4 items about subjective thoughts about the visual comfort of a screen and image quality (Tam et al., 2011). The perceived interactivity was composed of 5 items which included the perceived control (Kim et al., 2016; Lee et al., 2015; Yim et al., 2017) and responsiveness (Lee et al., 2015) with revision and supplementation to align with an AR technology context in this study. Besides, from the perspective of consumers, facilitating condition (4 items), social influence (4 items), and the intention to use the technology (3 items) suggested by Venkatesh et al. (2003; 2021) were organized with revision and supplementation. Every item was measured on a 7-point Likert scale (1 point = strongly disagree - 7 points = strongly agree).

Firstly, to verify the validity and reliability of the variables, exploratory factor analysis was conducted for the final Time 3 data. As shown in <Table 1> and <Table 2>, as for the attributes of the perceived AR technology, three factors were derived including responsiveness, visual comfort, and perceived control. There were two extrinsic factors for technology acceptance including the social influence and facilitating condition. Three items for the intention to use the technology were derived as a single dimension, and factor loading was at .93~.96 (the total variance of 90.66%) with the reliability coefficient of .95. Overall, factor loading was found to be more than .50 and the

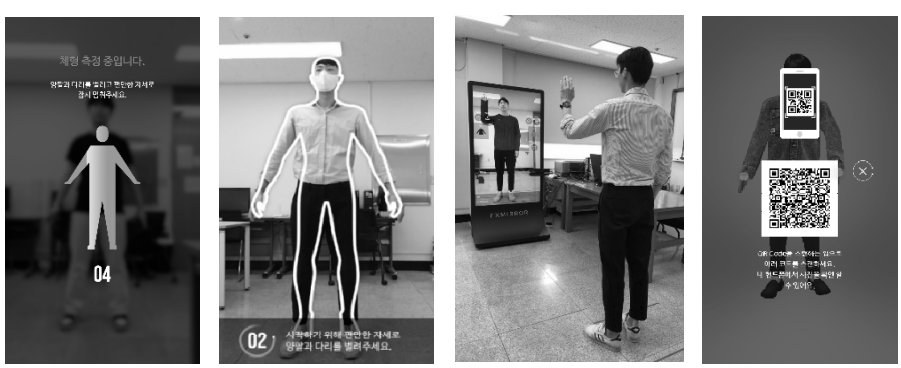

Figure 1. Augmented reality based smart mirror for virtual fitting

Table 1. Factors of perceived AR technological attributes

Factors and Item	Factor loadings	Eigen value	Variance (cum.)	Cronbach's α
Responsiveness				
This device gives relevant information with respect to my input.	.84	2.70	33.71 (33.71)	.89
This device had the ability to respond to my specific needs quickly and efficiently.	.84			
This device has no delay during operations.	.82			
Visual Comfort				
It felt visually comfortable during operations.	.92	2.47	30.82 (64.53)	.89
Overall, the quality of screen was good enough.	.88			
There was no visual discomfort when seeing images.	.66			
User Control				
I can control of the virtual objects and virtual environment.	.91	1.44	18.02 (82.55)	.69
I can freely move through this device.	.55			

Table 2. Factors of perceived external variable for technology acceptance

Factors and Item	Factor loadings	Eigen value	Variance (cum.)	Cronbach's α
Social Influence				
In general, people very close to me supported the use of the system.	.93	3.37	48.19 (48.19)	.92
I think I am more likely to use the system if my friends and family used it.	.86			
People who are important to me think that I should use the system.	.86			
People who influence my behavior think that I should use the system.	.85			
Facilitating Condition				
Guidance was available to me in the selection of the system.	.88	2.02	28.80 (76.99)	.77
I have the resources necessary to use the system.	.78			
Specialized instruction concerning the system was available to me.	.71			

reliability values were between .69~.95 enough to be accepted (Hair et al., 2010). Hence, the mean values of each factor were used for further analysis.

Result & Discussion

Changes in Users' Perceptions of AR Technology by Time (Repeated Uses)

As shown in Table 3, descriptive statistics and reliability of research variables were computed at three different points in time (Time 1, Time 2, Time 3). Overall, the mean of each variable was ranged from 4.83 to 5.68, which tends to increase over time. The reliability was within an acceptable range (.69 to .94)

Friedman test was conducted to examine the differences in mean changes of variables (e.g., visual comfort, control, responsiveness, social influence, facilitating condition) across time (repeated uses). As shown in Table 4, there were significant differences in visual comfort, user control, responsiveness, social influence, and facilitating condition across time. Wilcoxon analysis was additionally conducted to compare mean rank differences from time 1 to Time 3, indicating a significant difference in the mean changes of all variable between time.

Table 3. Descriptive statistics and reliability of variables

Variable	Time 1 (n=74)		Time 2 (n=74)		Time 3 (n=74)	
	M(SD)	*Cronbach's α*	*M(SD)*	*Cronbach's α*	*M(SD)*	*Cronbach's α*
Visual Comfort	5.31 (1.19)	.88	5.40 (0.96)	.81	5.65 (0.96)	.89
User Control	5.09 (1.06)	.69	5.49 (0.88)	.58	5.49 (0.97)	.69
Responsiveness	5.45 (1.02)	.86	5.72 (1.00)	.88	5.65 (0.95)	.89
Social Influence	4.83 (1.19)	.89	5.27 (1.13)	.90	5.41 (1.08)	.92
Facilitating Condition	5.68 (0.96)	.87	5.96 (0.91)	.87	5.57 (0.98)	.77
Use Intentions	5.65 (1.24)	.88	5.45 (1.36)	.93	5.38 (1.34)	.95

Table 4. Results of Friedman test

Variable	Mean rank			χ^2
	Time 1	Time 2	Time 3	
Visual Comfort	1.95	1.83	**2.22**	6.34*
Control	1.78	**2.14**	**2.09**	6.66*
Responsiveness	1.78	**2.20**	**2.01**	7.65*
Social Influence	1.65	**2.13**	**2.22**	16.04***
Facilitating Condition	1.97	**2.26**	1.77	10.98**

*$p < .05$, **$p < .01$, ***$p<.001$

Overall, the mean of visual comfort was increased over time (repeated use). There was no significant difference between Time 1 and Time 2 (Z = -0.98, p = .92), while there were significant differences in the change of the mean scores between Time 2 and Time 3. This implies that perceived visual comfort is likely to be increased by repeated uses of the AR technology in the context of fashion shopping, and thus hypothesis 1a was supported.

With respect to interactivity, user control and responsiveness showed a higher mean rank in Time 2 compared with those in Time 1, which means a statistically significant change. The mean score in Time 2 tended to decrease in Time 3, but there was no significant difference in the change of the mean (user control Z = -0.14, p = .89, responsiveness Z = -0.55, p = .58). Hence, Hypothesis 2a was partially supported, suggesting that the users' perception of control and responsiveness are rapidly increased by repeated uses of AR technology just in a short period.

The mean of the social influence was likely to increase as the experiments were conducted. As a result of verifying the mean differences according to Wilcoxon analysis, compared with Time 1 experiment, there was a significant difference in the average between Time 2 and Time 3 experiments but there was no significant difference between Time 2 and Time 3 experiments (social influence, Z = -1.08, p = .279). Accordingly, it showed the social influence on the AR technology acceptance increases over time so the Hypothesis 3a was supported.

As for facilitating conditions, there was no significant difference in the mean values between Time 1 and Time 3 experiments (Z = -0.10, p = .28). It showed the highest scores in Time 2 experiment but decreased in Time 3 experiment, partially supporting the Hypothesis 4a that perceived facilitating condition will increase over time. These findings may be interpreted based on Dunning-Kruger effect (Dunning, 2011; Kruger & Dunning, 1999) where people

with a high level of knowledge and experience tend to underestimate themselves. In the initial step, with the improved understanding of the technology, it is interpreted that consumers gave a favorable review of knowledge and resources for technology acceptance, or facilitating condition. However, with the accumulated experience over time, they tended to have a lower perception of various resources they needed.

Changes in the Intention to Use AR Technology Over Time

In order to predict a change in the intention to use the technology over time, as shown in Table 5, regression analysis was conducted. The changes in means of variables between Time 1 and Time 3 served as independent variables. Specifically, it showed that increases in visual comfort (β = .45, $p < .001$) and social influence (β = .47, $p < .001$) had significantly positive effects on the change in use intentions over time. Therefore, Hypotheses 1b and 3b regarding visual comfort and social influence were supported. These findings may interpret that the positive changes in perceived visual comfort and social influence increase a change in intentions to use the technology. That is, when users perceived it as visually comfortable, or as socially important to use, the intentions to accept and/or use the technology may be enhanced. Therefore, it is assured that visual comfort or social influence is a critical factor to continuous intentions to use the technologies.

On the other hand, change in user control had significantly a negative effect on the intentions to use (β = -.28, $p < .05$), and change in responsiveness did not significantly affect the use intentions. Thus, hypothesis 2b was not supported. In addition, change in the perception of facilitating condition had no significant effect on that of the intention to use, not supporting hypothesis 4b. This result may be explained based on the previous finding that subjective satisfaction and needs of consumers decrease as they have a wealth of information when using goods or services (Estes et al., 2018; Gill, 2008). In this study, for research design, smart mirror experience was done repeatedly without changes of clothing styles or devices. Therefore, it is that the higher consumers perceive control, the lower they perceive the utility of the technology, leading to decrease the intention to use the technology. In fact, the Friedman test revealed that there was no significant difference across three times in experiments, and mean scores were dropped (MeanT1 = 5.65, Mean T3 = 5.38).

Conclusions and Implications

In the fashion industry, retailers are presenting products to consumers using various virtual experience technologies. In particular, AR technology is spearheading and virtual fitting service using AR allows consumers to wear a variety of clothing styles fast and easily. Recently, in academia, there have been studies about the utilization of virtual experience for consumption from various perspectives. The empirical

Table 5. Result of regression analysis for intentions to use

Independent variables	Dependent variable: Changes in intentions		
	Standardized β	*t*	p
Change in Social Influence	.47	4.54***	.00
Change in Facilitating Condition	-.07	-.80	.92
Change in Visual Comfort	.45	3.74***	.00
Change in Control	-.28	-2.40*	.02
Change in Responsiveness	.01	.09	.42
Adjusted R^2	.42		
F	11.85***		

*$p < .05$, *** $p < .001$

research was conducted to identify what effect technical attributes have on consumer satisfaction and intention to use the technology. The precedent studies have significance in that they analyzed consumer response and demonstrated their influence but few empirical studies demonstrated longitudinal effects from repeated exposure. However, it is possible to identify significant factors constantly influencing the intention to use the technology by verifying the structure with regards to the changes of consumer response and intention as consumers are repeatedly exposed to the technology. Therefore, the researchers asked the same respondents to use a virtual fitting service using the AR technology three times in the fashion consumption context to verify the longitudinal effects of technology acceptance-related variables. Besides, this study aimed to derive implications to suggest strategies of virtual experience for efficient fashion consumption by analyzing the causal relationship among variables.

Findings and implications are discussed as follows: first, consumers' perceptions of social influence, visual comfort, user control, and responsiveness were higher in subsequent time than in the initial time. Over time, participants found people who are in their reference group became to put more importance on using the new technology and learned technical attributes as they were repeatedly exposed to use it. In other words, consumers' frequent exposure to virtual experience allows breaking a psychological barrier to technology acceptance. Therefore, it is important to give them an opportunity for AR experience through various events.

Secondly, as for facilitating condition (a degree to which users feel they are fully supported for using the virtual experience technology), the scores tended to go up in Time 2 than in Time 1 session and again went down in the last session. It means that they underestimated facilitating conditions in Time 1 session since they were ignorant of the new technology they first experienced, showing the increase in Time 2 session, and they felt support was not enough in Time 3 session where they could have a high level of understanding on the technology. Accordingly, the time when consumers are familiar with the virtual experience, it is needed to commit a lot of systematic support and resources for sufficient evaluation of facilitating conditions.

Lastly, as for causal relationships among the changes of the variables, the change of social influence and visual comfort had a positive impact on the change of the use intention. It demonstrated social influence and visual comfort are the important variables for predicting the intention to use AR technology. For consumers to use the AR technology constantly in their consumption, the level of technology acceptance by peers is an important factor for decision-making. That is, to facilitate the social pressure for technology acceptance, it is important to conduct marketing promotions to establish the use of AR technology as a trend. In terms of the technical attributes, it is needed to make efforts to improve image quality for enhancing the presence along with visual comfort. On the other hand, an increase in perceived control caused a negative impact on the intention to use. It implies that the more people can fully understand and control the technology, the less they may feel the necessity of using AR technology. To prevent the increased control over the technology, it is required to continually provide the latest updates on technical functions.

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