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# Use of Immersive Virtual Technology in Consumer Retailing and Its Effects to Consumer

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## Abstract

**Purpose** : Today's retailers are integrating new VR technology into their new marketing strategies. Thus, this research aims to understand the role of virtual experiences in the circumstance of sales channels. **Research design, data and methodology** : Our model hypothesizes that five key factors determine the consumer experience of VR in the virtual retailing context: smartness, vividness, interactivity, playfulness, escape. Information access and flow are mediating variables that connect key drivers and VR satisfaction. Information access and flow then give influence to satisfaction towards VR. Satisfaction serves as a mediator that determines changes in consumer's dual intention: intention to revisit VR and intention to visit the real site. **Results** : According to the test results, every path except the relationship between information access and satisfaction of VR is accepted as expected at the significance level of 0.05. **Conclusions** : This research emphasizes the potential importance of VR and continue VR marketing research as an advent research area. Through the dual-path model, this study found that the primary function of VR is information access and flow experience. This result shows that most VR users value emotional benefits rather than rational benefits provided by VR. Finally, the satisfaction of VR can stimulate both the intention to use the VR and the intention to visit real mall.

**Keywords** : Virtual Reality, Virtual Shopping, Virtual Mall, Immersive Technology, Virtual World.

**JEL Classification Code** : M15, M21, M50

## 1. Introduction

The increasingly unpredictable market has forced marketing practitioners to implement innovative ways to create and offer value to customers. In this regard, the use of new information technology such as smartphones, social network services, and video commerce has been a must for successful retailing. One of the critical transformations will entail harnessing the new market opportunities presented by internet and VR (virtual reality) (Boyd & Koles, 2019; Farah, Ramadan, & Harb, 2019; Hasnan, 2019).

Thus, it is no surprise that most retailers are integrating VR into their new marketing strategies. VR has the potential to convert the consumer experience by individualizing retailers' offers and enabling consumers to visualize products in modern settings (Lee, 2019). VR is

altering the ways consumers and retailers behave nowadays (Yoon, Choi, & Oh 2015; Farshid, Paschen, Eriksson, & Kietzmann, 2018; Farah et al., 2019). Gartner's report suggests that more than 100 million consumers will shop in a virtual environment by 2020 (Gartner, 2019).

VR is one of the most exciting subjects in consumer research area given its speed of diffusion and increasing number of application in various industries (Li & Mao, 2015; Huang, Backman, Backman, & Chang, 2016; Farshid et al., 2018; Kim & Hall, 2019; Lee, 2019; Loureiro, Guerreiro, Eloy, Langaro, & Panchapakesan, 2019; Pizzi, Scarpi, Pichierri, & Vannucci, 2019). Marketers now often use VR applications to let consumers to virtually explore, experience, and evaluate the marketing stimuli before their physical shopping behavior (Barnesk, 2011; Huang et al., 2016; Marasco, Buonincontri, van Niekerk, Orłowski, & Okumus, 2018; Feng, Xie, & Lou, 2019; Loureiro et al., 2019; Pizzi et al., 2019).

VR allows for the digital reconstruction of physical objects and spaces through their three-dimensional representation (Pizzi et al., 2019). Users are usually dived into the digital environment through an HMD (head mount display) device, with the implication that they need not

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physically live in the same space with the objects or the environment caused by virtual technology. Particularly with the late introduction of a new generation of mobile technology, VR is attracting attention as a killer app for telecommunication carriers. Besides, the retail price of HMD, which was one of the main barriers to market entry, has also been drastically reduced, while the performance of the HMD devices is dramatically improving. With the launch of affordable HMD devices such as Microsoft's HoloLens, MR (mixed reality) headsets, Oculus Rift, and other devices, the price huddle and technical shortcomings are increasingly phasing out, enabling a business to exploit the potential underlying this recent technology.

VR was science fiction, but it evolved into a prevalent and commercialized technology. Practitioners have paid increased attention to the use of VR by companies and consumers. According to Farshid et al. (2018), Google Art and Culture launched VR tours of more than 1,200 museums and exhibitions. Carmakers such as BMW, Mercedes-Benz, and Hyundai have adopted virtual videos to promote their newest vehicles by allowing the customers to engage in a VR ride (Feng et al., 2019).

VR technology and its cutting-edge applications are removing the obstacles of distance to potential customers to gaining information and understanding of a product before their decision making, transforming the ways people purchase and experience a place (Kim & Hall, 2019). Marketing researchers have recently realized the need for research on VR, and the increasing importance of VR in marketing has been a significant issue in recent publications. In particular, extant research shows how and why consumers interact with VR, how VR drives consumer attitude, key factors that influence consumer decision making.

However, empirical studies based on user data have not yet explored how VR can affect attitudes and behavioral intentions toward the digital marketing efforts of retailers. Given the clear gap exist in the area, this research aims to understand the role of virtual experiences in the selection of sales channels. Thus, this study proposes an empirical model where the characteristics of VR serve as the focal antecedents. More specifically, this study proposes that smartness and vividness have an influence on information access and affect satisfaction. Also, interactivity, escape, playfulness escape give the influence to flow, and flow affects satisfaction. Satisfaction is then proposed to give direct influence to two kinds of behavioral intentions, which are the intention to revisit VR and intention to visit the real site. We model satisfaction toward VR as a mediating variable for the relationships between the VR experience variables such as information access, flow in the model and the outcome variables.

## 2. Theoretical Background

### 2.1. Conceptual Definition

The term 'virtual reality' was first made in the mid-1970s as a way to explain human-computer interaction (Williams & Hobson, 1995). According to the earlier definition by Steuer (1992), VR is a simulated environment in which a user experience telepresence. However, his definition is somewhat ambiguous, and it is necessary to understand the world of VR separately from the real world. Burdea & Coiffet (2003) insist that VR is a world made by a computer-generated 3D technology and refers to 3D virtual representations of the actual world or of objects within it (Farshid et al., 2018). For example, virtual tours of the South Pole invite people to visit faraway. Farah et al. (2019) also propose that VR is a multi-sensory experience with real-time inducing graphics, complemented by a display technology that provides a user with model integration.

In this research, we adopt the definition of VR proposed by Burdea and Coiffet (2003) and Farshid et al. (2018). Thus, we define that VR is an artificially created world by reconstructing the real world in three dimensions in an immersive way. According to our definition, VR may or may not resemble the real world, but it does not require this similarity as a requirement. Regardless of the specific definitions, including ours, they imply that VR technology provides consumers with a highly unique experience and promotes their behaviors. The importance is why VR is worth taking serious attention as a research topic in the retailing area.

### 2.2. Type of Technology

From the broad spectrum of the reality-virtuality continuum, three types of technological solutions are being presented to users (Loureiro et al., 2019): 1) VR (virtual reality), 2) AR (augmented reality), and 3) SAR (spatial-augmented reality). According to this research, each concept is similar but somewhat different. Among them, the realm of VR is the most extensive.

**Table 1:** Technology Type

Type	Description
VR	A completely synthetic world that may or may not mimic the real world and in which the user is immersed
AR	A combined world that relates purely virtual environments to a purely real world
SAR	A type of AR that can be used in areas where traditional AR is not possible.

We also need to be clear about the conceptual differences from VR to the virtual world. The virtual world is similar to VR, but the concepts are somewhat different. It is more than 20 years since Hoffman and Novak (1996) conceptualized the 'hypermedia environment,' and the so-called virtual world combines the power of social network services with the technology of online games and mobile shopping. The virtual world is defined as persistent virtual environments in which people meet others as being there with them and where they interact with them (Huang, Backamm, & Backam, 2012). The difference between VR and virtual world is that the latter refers to persistent online social relationships while the former does not ask necessarily to form social relationships (Marasco et al., 2018). In other words, if the virtual world is limited to online games and social media services that require the formation of social relations, VR is a more comprehensive concept that can be applied to all virtual environments.

Previous researches also classify VR into two categories (Suh & Lee, 2005; Yoon et al., 2015; Rosa, Morais, Gamito, Oliveira, & Saraiva, 2016): immersive type and non-immersive type. In the former, users are surrounded by enclosed virtual environments by wearing HMDs or room-sized screen which provide full 3D experience. On the other hand, the latter makes a user experience virtual experiences by a standard computer screen. The VR experiences by a screen are limited to 2D screen monitors.

This research focuses on immersive VR interfaces because the immersive VR is closer to human perception and provides multimodal information channels compared to the non-immersive mode and other related technologies (Rosa et al., 2016). Newly developed innovations in VR are mostly based on the various HMD devices, and this research topic is entirely new and vital to discuss the future that VR could bring to marketing. Pizzi et al. (2019) also insist that the most distinctive feature of VR is immersion and telepresence. Immersion refers to the extent to which users are stimulated by the virtual environment, and telepresence refers to the sense of being in a virtual world rather than the physical world. Mainly, immersed VR based on HMDs have extensively been selected by reputable brands in various industries such as Samsung, Volvo, Nike, Mercedes, Adidas, and Quatas (Farah et al., 2019).

### **2.3. VR in Retailing Marketing**

In the context of marketing, new technologies have affected innovation, new product development, service process, and overall management process. Innovative technologies have also changed how marketers create customer value and offer experiences, and VR is no exception. VR allows consumers to be involved in both real and virtual experiences. These unique characteristics of VR

occur during all stages of consumer behavior: need recognition, information search, evaluation of alternatives, purchase decision, and post-purchase behavior.

Jung, Lee, Chung, and Dieck (2018) propose that VR can be used in many realms effectively, including education, esthetics, entertainment, escape, and social presence. VR is also a new possibility for marketers. VR can provide a new customer touchpoint throughout marketing, and this experience does not require a customer's actual visit and experience. The possibilities for utilizing advanced VR technology in marketing are very high and innovative. For example, salespeople who record a VR video of the stores allow potential buyers to virtually visit the place and get a realistic impression without ever visiting the site in person. VR technology can also be useful in the development process of new products. VR simulations for a prototype product offers new perspectives and experiences to the users virtually, and indirectly allows them to experience the concept of the product. The experimental results can then be used to improve the completeness of new products.

Research on the relationship between new virtual technology and brand is a new interest. Rauschnabel, Felix, and Hinsch (2019) argue that a positive consumer experience of virtual technology can increase inspiration for the brand, which in turn can favorably alter brand attitudes. There are other business applications for VR. Business education, training, and immerse marketing campaigns through VR simulation are another field in which VR seems to provide new opportunities (Farshid et al., 2018).

The first argument on the possibility that VR could be a useful retailing tool was raised by Needel (1998). He insists on the role of VR for retailers as a tool to effectively test and simulate shelf layouts. The retailers could get results faster, better control, and more flexibility in the manipulation of shelf layout via VR technology. This initial insight suggests that VR technology has a high potential for future retailing research. Since then, the influence of VR experience in retailing is a fast-growing issue of interest, given the possible marketing opportunities available from offering potential consumers a 'try-before-you-buy' experience (Graham, 2016). Retailing effectiveness based on VR is becoming more visible. The effect of advertising activities based on VR videos on performance is also presented positively. Compared to traditional methods, 360-degree advertising, which is a part of VR videos, drive 7% higher purchase intention in the store (IPG Media Lab, 2018).

### **2.4. Motivation of VR**

Farah et al. (2019) insist that VR is changing the shopping journey and retail environment. Engaging consumers in VR experience require an understanding of

consumer motivations. Motivations are mental processes that stimulate and direct behavior and are of great importance in explaining human behavior. Researchers identify two major consumer motivation dimensions which values co-exist: utilitarian motivation and hedonic motivation. Utilitarian orientation is the goal-oriented side, and hedonic orientation is the experience-oriented side of shopping (Burke, 2002; Wolfenbarger & Gilly, 2001). The former relates to the functionality, while the latter is defined as consumer's enjoyment of the experience (Babin, Darden, & Griffin, 1994; Wolfenbarger & Gilly, 2001; Burke, 2002; Anderson, Knight, Pookukangara, & Josiasm, 2014).

The motivation theories have been widely used in marketing studies (Li & Chen, 2019). This dichotomy has been supported by many studies to be useful in understanding users' technology adoption and use behavior. Scholars have found that VR usage behavior is affected by both extrinsic and intrinsic motivation (Li & Chen, 2019). In previous studies, utilitarian values such as usefulness and ease of use of technology are generally viewed as the extrinsic motivation, while hedonic values such as enjoyment and playfulness are viewed as the intrinsic motivation (Huang et al., 2016; Li & Chen, 2019; Pizzi et al., 2019). The overall evaluation of VR store simulation reflects both the utilitarian and hedonic side of the shopping experience (Hassouneh & Brengman, 2015). Spreer & Kallweit (2014) also figure out that virtual shopping experience could give impacts to both hedonic and utilitarian value.

According to the previous research, VR is believed to have a utilitarian factor satisfying consumers' unmet needs and expectations (Farah et al., 2019). The utilitarian motivation stem from the desire for practical, rational, and task-oriented efforts relevant to consumer decision making (Anderson et al., 2014). For example, In the context of shopping centers, consumers associate virtual shopping environments with cognitive benefits. Olsson, Lagerstam, Karkkainen, and Vaananen-Vainio-Mattila (2013) studied virtual shopping applications and found meaningful relationships between the virtual experience and consumer's cognitive benefits, such as consumer knowledge. Boyd and Koles (2019) insisted that VR's rational value in B2B markets is quite optimistic, and proper use of VR in B2B marketing can enhance the buyer-supplier relationship. According to their suggestions, a construction company that is building a hospital can provide healthcare professionals with the opportunity to walk through a hospital before construction even starts. As a result, hospital professionals can explain their needs in more detail, and the construction company will be able to build buildings that meet customer needs.

The hedonic motivation also has been found to have a positive relationship prevalent in determining the adoption of new technologies (Kim & Hall, 2019). Notably, according to the marketing research results related to VR, it is known that hedonic motivation has a stronger influence on the intention to use technology than utilitarian motivation (Kim & Forsythe, 2007; Hamari, 2015). Among the diverse hedonic experiences, flow is one of the most potent hedonic experiences a user can experience is a basic hedonic theoretical framework in examining user behavior in accepting technology. Flow has been applied to diverse information technologies and services to understand internet use, smartphone, and mobile application use, social network services, online shopping. Recently, the concept of flow has begun to be applied to VR research. Flow has been identified as a significant mediator between involvement and intention to visit (Huang et al., 2012). Kim and Hall (2019) suggest that flow state is a mediator on associations among perceived easiness, perceived usefulness, perceived enjoyment, and outcome variables such as subjective well-being and continued use in the context of virtual tourism.

### 3. Hypothesis

Our model hypothesizes that five key factors determine the consumer experience of VR in the virtual retailing context: smartness, vividness, interactivity, playfulness, escape. Information access and flow are mediating variables that connect key drivers and VR satisfaction. Information access and flow then give influence to satisfaction towards VR. Satisfaction serves as a mediator that determines changes in consumer's dual intention: intention to revisit VR and intention to visit the real site. In the following pages, we discuss each hypothesis in detail.

#### 3.1. Drivers of VR Experience

A product with high intelligence and interactivity is known as a smart product, and VR is a smart product on the bases. The smartness of a product positively influences innovation attribution (Rijsdijk & Hultink, 2009; Lee & Shin, 2018). Critical characteristics of smart products such as autonomy, adaptability, reactivity, and multi-functionality make it easier to gather information (Rijsdijk & Hultink, 2009). Notably, a smart product can achieve a common goal, and higher levels of ability to cooperate are associated with higher information value (Lee & Shin, 2018). The VR device can be interacted with in various ways, and thus more information can be obtained. Thus, based on the previous findings above, we hypothesized the following:

**H1:** Smartness of VR has a positive effect on information access.

Due to VR's vivid nature, such as rich imagery and sound, VR provides users with impressive experience. More vivid information brought by VR could enhance users' knowledge because VR is presented by different shapes and angles (Yoon et al., 2015). VR devices capture three-dimensional spaces that enable vivid and multi-sensory experiences within rich media settings (Whyte, 2003). These features serve more of a background role to allow VR applications to provide more information to users. Rauschnabel et al. (2019) also insist that inspiration is not generated without a proper level of realism when people are using augmented reality programs. That is, a more realistic virtual experience increases the extent to which users can understand and visualize something they do not experience actually. VR increases sensory depth as it can transmit more detailed information in 3D images and provide high levels of representational quality and volume of content (Suh & Lee, 2005). Thus, based on the previous findings above, we hypothesized the following:

**H2:** Vividness of VR has a positive effect on information access.

Interactivity offers a high level of control over virtual environments in terms of users' ability to be active (Suh & Lee, 2005). Thus, Novak, Hoffman, & Young (2000) insist that greater interactivity corresponds to the more significant flow experience. Also, highly interactive VR contents endow users with a high level of control and increase the sense of presence (Feng et al., 2019). In other words, a sense of presence refers to the state in which a user fails to acknowledge the reality and is immersed in a given stimulus. Telepresence is the sense of being in a virtual world and is a subjective feeling (Pizzi et al., 2019). If this virtual feeling is subjective, flow experience depends on a VR system's ability to provide high-quality interactions to the user's sense (Gutiérrez, Vexo, & Thalmann, 2008). Thus, based on the previous findings above, we hypothesized the following:

**H3:** Interactivity of VR has a positive effect on flow.

Huizingh and Hoekstra (2003) identify that affection and conation are strictly related to the level of flow that consumers experience during their internet site visits. Hedonic benefits like experiential and enjoyment related variables have strong relationships with consumer attitude (Shim & Kim, 2012). Rauschnabel et al. (2019) show that hedonic benefits have a positive effect on attitude toward AR. Yim, Chu, and Sauer (2017) show that enjoyment as a

hedonic motivation resulted in a more positive attitude toward the virtual media. In the context of virtual games, perceived enjoyment has a vital role as an antecedent of flow. Lowry, Gaskin, Twyman, Hammer, Roberts (2013) insist that joy has a substantial impact on game immersion, which in turn influences behavioral intention to continue VR games. Thus, based on the previous findings above, we hypothesized the following:

**H4:** Playfulness of VR has a positive effect on flow.

Hedonic motivation can include a desire for escapism (Anderson et al., 2014), and virtual technology enhances an individual's imagination, and it permits them to create and visualize a new reality (Hilken, de Ruyter, Chylinski, Mahr, & Keeling, 2017). As a result, the individual's desire to escape the reality can be satisfied by VR and VR will guide users to flow experience. Thus, based on the previous findings above, we hypothesized the following:

**H5:** Escape has a positive effect on flow.

### 3.2. User Satisfaction

The utility of the experiences by VR lies in the ability of users to evaluate the value of the simulated experience more accurately (Cho, Wang, & Fesenmaier, 2002). As a result, the high level of knowledge accumulated due to VR can be expected to have a positive impact on satisfaction with VR. Information access is related positively to satisfactory consumer experiences, such as time-saving and positive evaluation toward the product (Mikalef, Glannakos, & Pateli, 2013; Anderson et al., 2014). Thus, based on the previous findings above, we hypothesized the following:

**H6:** Information access has a positive effect on the satisfaction of VR.

According to recent VR studies in tourism, hedonic motivation has an important role. For example, a user's happiness as a form of satisfaction is a crucial experience that makes people participate in VR activities (Huang et al., 2016). They also identify that flow experience has a significant influence on VR user's positive intentions. Kim and Hall (2019) identify the relationship between flow and subjective well-being. According to their research result, users who perceive flow in a preferred activity, which then leads to higher subjective well-being. For the maximum satisfaction with a VR experience, users should be immersed (Rosa et al., 2016). In general, positive emotion evoked by 3D product presentation is known to positively influence the user responses toward a website (Huang et al.,

2012). Thus, based on the previous findings above, we hypothesized the following:

**H7:** Flow has a positive effect on the satisfaction of VR.

### 3.3. Behavioral Intention

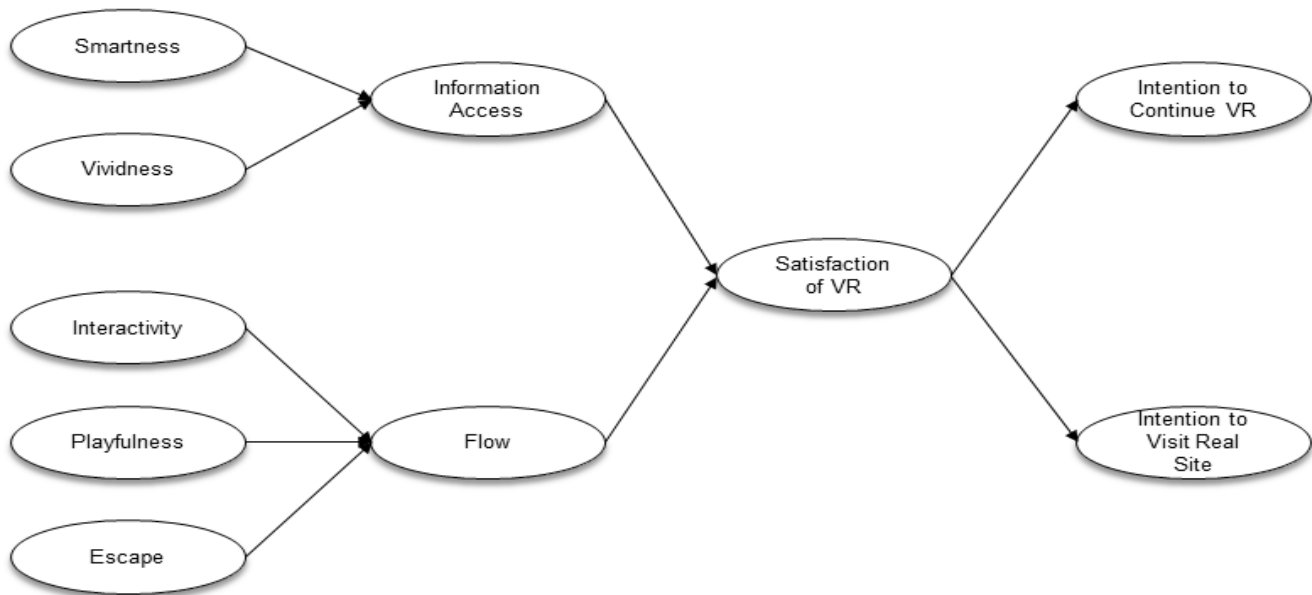
Satisfaction is a consumer attitude that can be developed even in VR experiences (Verhagen, Feldberg, van den Hooff, Meents, & Meikivi, 2012; Pizzi et al., 2019). However, what remained unanswered is the relationship between VR-based satisfaction and consumers' behavioral intention to visit a real store. To understand the research topic in terms of alternative forms of reality, we pay attention to the view of Deleuze (1962), who is a French philosopher. He divides our world into real constructs and possible constructs. Real constructs are the actual world we can touch, while possible constructs are like the real except that they do not exist. If these two worlds exist individually, then it is difficult to be sure that experience in the virtual world will always be a window into the real world. Regarding the relationships between VR satisfaction and behavioral intention to continued use of VR is supported by

the literature. Marasco et al. (2018) identify that satisfactory VR experience had positive effects on the three-dimensional user's attitude change and visit intention. Huang et al. (2016) insist that a user's positive feelings, such as happiness, are antecedents that drive people to participate in the actual VR activities. Thus, based on the previous findings above, we hypothesized the following:

**H8:** Satisfaction of VR has a positive effect on the intention to revisit VR.

Huang et al. (2016) confirm that satisfactory VR experience can affect a user's intention for actual visitation. Huang et al. (2012) also examine the influence of virtual experiences in 'Second Life', an online virtual game on people's intention to select the real destination, and concluded that the flow experiences in a virtual world motivate the intention to visit the same place in the real world. Thus, based on the previous findings above, we hypothesized the following:

**H9:** Satisfaction of VR has a positive effect on the intention to the real site.



**Figure 1:** Research Model

## 4. Research Procedure

### 4.1. Measurement Item

This research adopts previously validated multi items to overcome the possible disadvantages of using single measurement items (Churchill, 1979). The online survey included 35 items for nine constructs. The constructs consist of smartness, interactivity, vividness, enjoyment, escape, information access, flow, satisfaction of VR, intention to continue VR, and intention to visit the real site.

**Table 2:** Construct and Item

Construct	Item	Source
Smartness	a1. VR shopping works smart a2. VR shopping works intelligent a3. VR shopping works acutely	Lee & Shin (2018)
Interactivity	a4. VR shopping enables two-way communication a5. VR shopping is an interactive experience a6. Interacting with VR shopping keeps attention a7. Interacting with VR shopping is quick	Novak et al. (2000), McMillan & Hwang (2002)
Vividness	a8. VR shopping imagery which occurred, is vivid a9. VR shopping imagery which occurred, is sharp a10. VR shopping imagery which occurred, is well-defined a11. VR shopping imagery which occurred, is detailed	Miller & Mark (1992)
Enjoyment	a12. Using VR shopping activity is enjoyable for me a13. Using VR shopping activity is pleasurable for me a14. Using VR shopping activity is fun for me a15. Using VR shopping activity keeps me playful	Kim & Hall (2019)
Escape	a16. Using VR shopping is an escape for me a17. VR shopping helps me forget about the day's problem a18. If I am in a bad mood, using VR shopping puts me in a better mood	Mathwick & Rigdon (2004), Russel. Norman, & Heckler (2004)
Information Access	b1. I learn a lot about the mall using the VR shopping b2. VR shopping gives me quick and easy access to a lot of information b3. VR shopping makes it easy for me to acquire information	Anderson et al. (2014)
Flow	b4. I felt like I was totally absorbed by this VR shopping b5. While using VR shopping, time seemed to go by very quickly. b6. While using VR shopping, I forgot about my immediate surroundings. b7. While using VR shopping, I was not aware of how long I had been there. b8. I was completely immersed in the content while experiencing VR shopping	Huizingh & Hoekstra (2003)
Satisfaction of VR	b9. I am satisfied with this VR shopping b10. VR shopping is a successful experience b11. VR shopping has met expectation	Lin & Wang (2006)
Intention to continue VR	b12. I will continue to use VR shopping in the future b13. I will update the VR shopping in the future b14. I will continue to use VR shopping in the future	Kim & Hall (2019)

**4.2. Data Collection and Sample**

The original survey instrument was generated in English and then translated into Korean by marketing academics. Two marketing professors who know the research topic well evaluated the face validity of the translated survey questions. As a next step, which is a pilot test, 25 actual users of VR devices were asked to answer the questionnaire whether the questions properly evaluate VR user behavior. The procedure resulted in the repeated revision of measurement items, and the modified questionnaire was then used for the final online survey.

Established multi-item questions used five-point Likert scales where high scores indicate a high level of agreement. Respondents first were asked general questions about their prior VR experience and device platforms. In the next step, the respondents answered the questions about measurement items. An online survey was considered appropriate for data collection in this research because VR heavy users mostly stay on the online site for a long time. A Google online survey site was generated to collect data. The online survey

was administrated from June to July 2019. Every participant is offered free drink coupons in return for participating in the research.

As a result of an empirical survey, we recruited 198 actual users of VR retailing from online communities in Korea. The target of the survey were the active members of the online VR communities, and email invitations were sent randomly to invite them to participate in the survey. The survey process adheres to sample selection to ensure data quality. For example, the respondents have at least more than one-time experiences within the last six months that enjoy shopping information created by VR technologies such as 360-degree cameras and virtual contents. Respondents who were not qualified by the screening questions were asked to quit answering the questions. They are asked to give exact information about their VR device information and were also asked to present the name of the VR content that they had recently experienced. Their age ranges from 20 to 53 years old, and the average is 33.5 years old.

## 5. Analysis

### 5.1. Reliability and Validity

It is vital to test the reliability and validity of the measures before we perform the hypothesis test. Cronbach's alpha and other coefficients, such as composite reliability and AVE (average variance extracted) could be used to measure internal consistency. In the test, Cronbach's alpha and composite reliability should be higher than 0.7, while AVE should be above 0.5. In the test, every coefficient is all above the required criteria.

**Table 3:** Reliability Test

Construct	Alpha (*<0.7)	Composite Reliability(*<0.7)	AVE (*<0.5)
Smartness	0.849*	0.909*	0.769*
Vividness	0.870*	0.920*	0.794*
Interactivity	0.838*	0.891*	0.670*
Playfulness	0.883*	0.919*	0.740*
Escape	0.860*	0.905*	0.705*
Information Access	0.799*	0.882*	0.715*
Flow	0.889*	0.918*	0.693*
Satisfaction of VR	0.846*	0.907*	0.764*
Intention to Continue VR	0.868*	0.919*	0.791*
Intention to Visit the Real	0.862*	0.916*	0.783*

As a next step, factor analysis is implemented to test the validity of the exogenous variable. The analysis uses the PCA (principal component analysis) option and adopts the VARIMAX rotation. As a result, five factors explaining 74.4% of total variance were extracted as expected.

**Table 4:** Factor Analysis

Item	Playfulness	Interactivity	Escape	Vividness	Smartness
a13	<b>0.794</b>	0.080	0.302	0.230	0.126
a14	<b>0.784</b>	0.199	0.164	0.240	0.141
a11	<b>0.736</b>	0.114	0.356	0.176	0.113
a12	<b>0.619</b>	0.163	0.257	0.409	0.204
a9	0.009	<b>0.821</b>	0.086	0.104	0.173
a7	0.247	<b>0.811</b>	0.076	-0.039	0.115
a8	0.087	<b>0.742</b>	0.254	0.213	0.138
a10	0.144	<b>0.723</b>	0.098	0.237	0.186
a17	0.250	0.135	<b>0.794</b>	0.236	0.170
a16	0.198	0.121	<b>0.782</b>	0.259	0.200
a18	0.297	0.183	<b>0.673</b>	0.292	0.130
a15	0.430	0.173	<b>0.628</b>	0.042	0.167
a5	0.303	0.123	0.192	<b>0.820</b>	0.108
a6	0.148	0.209	0.271	<b>0.785</b>	0.101
a4	0.323	0.133	0.208	<b>0.731</b>	0.232
a2	0.115	0.160	0.112	0.148	<b>0.870</b>
a3	0.063	0.309	0.196	0.292	<b>0.782</b>
a1	0.315	0.195	0.262	0.007	<b>0.731</b>
eigen value	2.969	2.821	2.761	2.564	2.278
Variance(%)	16.495%	15.672%	15.339%	14.242%	12.656%
Total(%)	74.41%				

Besides, the Fornell-Larcker test is performed to check discriminant validity. Fornell and Larcker (1981) suggest that the square root of AVE could be used for evaluating discriminant validity when the calculated value is more significant than other correlation values among the latent variables. For example, the square root of Interactivity (INT) is 0.819, and this number is more significant than the correlations in the column of INT (0.416 ~ 0.449), also more significant than in the row of INT (0.384 ~ 0.526). Similar outcomes are also made for other constructs, showing the discriminant validity is well established.

**Table 5:** Fornell-Larcker Test

	ESC	FLO	INF	CVR	VRS	INT	PLY	SAT	SMT	VVD
ESC	0.840									
FLO	0.728	0.832								
INF	0.406	0.466	0.846							
CVR	0.680	0.714	0.456	0.889						
VRS	0.502	0.605	0.459	0.673	0.885					
INT	0.439	0.526	0.384	0.489	0.464	0.819				
PLY	0.699	0.710	0.479	0.666	0.552	0.416	0.86			
SAT	0.666	0.781	0.441	0.669	0.624	0.444	0.715	0.874		
SMT	0.519	0.549	0.432	0.502	0.481	0.499	0.469	0.476	0.877	
VVD	0.600	0.623	0.493	0.599	0.457	0.421	0.625	0.624	0.460	0.891

### 5.2. Hypothesis Test

Having established the reliability and validity of constructs, we moved to the hypothesis test phase to test the model. For the research model test, PLS-SEM (partial least squares structural equation modeling) analysis method was employed by using SmartPLS (version 3.0). PLS-SEM is an emerging analysis method that can test causal models (Lee, Hong, & Min, 2018).

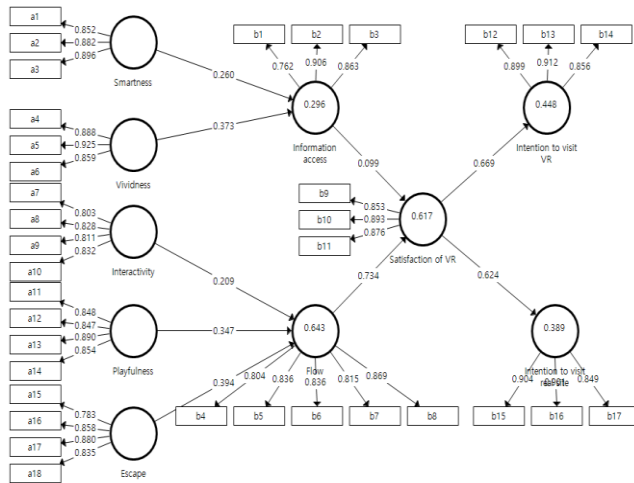
Common method variance might bring a potential analysis issue since respondents were asked to evaluate all questions at once (Conway & Lance, 2010). To prevent a possible common method variance issue, we selected research respondents who had had enough VR experiences during the past six months, and their subjective VR use frequencies were also evaluated by using a five-point Likert scale. Besides, the instruction part of the survey explained the purpose of the survey and illustrated there were no right or wrong answers to each question. According to the test results, every path except H6 is accepted as expected at the significance level of 0.05. H6 is not accepted at the level of 0.05 but is accepted at a generous level of 0.1. An examination of the  $r^2$  value shows that the  $r^2$  values are high (i.e., INF=0.296, FLO=0.643, SAT=0.617, CVR=0.448,



VRS=0.389), illustrating the research model explains a substantial amount of the variance.

**Table 6:** Hypothesis Test

No	Hypothesis	Path coefficient	S.D	T-Values	P Values (**<0.05, *<0.1)
H1	SMT → INF	0.260	0.071	3.645	0.000**
H2	VVD → INF	0.373	0.079	4.705	0.000**
H3	INT → FLO	0.209	0.049	4.228	0.000**
H4	PLY → FLO	0.347	0.065	5.384	0.000**
H5	ESC → FLO	0.394	0.066	5.939	0.000**
H6	INF → SAT	0.099	0.054	1.843	0.066**
H7	FLO → SAT	0.734	0.043	17.038	0.000**
H8	SAT → CVR	0.669	0.045	14.753	0.000**



**Figure 2:** Test Output

## 6. Conclusions

### 6.1. Research Implication

This research performs the empirical test of the factors affecting consumer satisfaction and behavioral intentions after experiencing the virtual store. A dual-path model is developed to find mediated influences of information access and flow on the satisfaction of VR in marketing (Suh & Prophet, 2018).

Moreover, recent radical technological progress in the VR sector over the last few years has made even the smallest research achievements of the past lose their managerial implications, at the same time asking new marketing researches based on the up-to-date VR technology and use (Farshid et al., 2018). For example, findings from earlier studies have been conducted on VR

implemented on 2-dimensional PC screens (i. e. Second Life), but recent VR provides more immersive experiences by wearing HMD equipment, which provides full 3D experience. Understanding virtual technology is a very vital task. For marketers, virtual technology not only provides a new frontier to engage with future consumers but also allows us to reflect on research practices and marketing theories (Saren, 2013).

Since VR’s consumer impact and its possibilities as a new marketing tool is a novel research field, this research addresses several gaps in the literature. In other words, the difference between the existing studies and the present study is as follows. First, this research emphasizes the potential importance of VR and continue VR marketing research as an advent research area. The research model of this study integrated key drivers, mediators, and outcome variables through VR technology. The mediators consisted of variables connected to satisfaction through dual paths, and the outcome variables integrated the effects on virtual space and real space.

Second, through the dual-path model, this study found that the primary function of VR is information access and flow experience. VR can be used as a tool to make the shopping experience fun, as well as a practical purpose for retailers to provide information about their products.

Third, however, the effect of information access on the satisfaction of VR was not significant. This result shows that most

VR users value emotional benefits rather than rational benefits provided by VR. The result may indicate that the current VR device's performance for the purpose of providing sufficient information is still limited, and consequently, the need to highlight more entertainment aspects.

Fourth, the empirical fact that the satisfaction of VR can stimulate both the intention to use the VR and the intention to visit real mall answers the question of existing researchers on the practicality of VR. Lee and Leonas (2018) are concerned about the possibility that consumers can recognize the gap between what they expect and what they actually get as VR technology is not mature. However, our findings show that even the current levels of VR technology can be an essential marketing tool.

### 6.2. Limitation

This research has limitations to be improved in future research. Firstly, the sample size needs to be improved. Even if the user of virtual technology lacks, for now, the sample size can cause difficulty in generalizing the research result. When the technology and device enter into the mature stage, it will be necessary to collect more respondents. Secondly, the gender difference in using VR

could be a vital topic for further research. Several researchers predict significant differences between males and females in spatial perception ability and immersive experiences in VR (Yoon et al., 2015). Future research should be directed toward improving the constraints and suggesting the research challenges.

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