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The impact of innovation and gratification on authentic experience, subjective well-being, and behavioral intention in tourism virtual reality: The moderating role of technology readiness

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ABSTRACT

Despite the increasing amount of attention paid to virtual reality (VR) tourism and the rising importance of VR tourism, a theoretically integrated model of behavior has not been developed. To fill this void, we build and test a framework based on both innovation diffusion and uses and gratifications theories to explain why people participate in VR tourism. The moderating role of VR tourists' technology readiness (optimism and innovativeness) between subjective well-being and behavioral intention is also examined. Results demonstrate that authentic experience and subjective well-being are affected by simplicity, benefit, compatibility (attributes of innovation diffusion), informativeness, social interactivity, and playfulness (uses and gratifications attributes). Behavioral intention is more positively influenced by subjective well-being than by authentic experience. The moderating role of technology readiness between subjective well-being and behavioral intention is stronger in individuals with high optimism and innovativeness than their counterparts with low optimism and innovativeness.

1. Introduction

The emerging technology of virtual reality (VR) has contributed to development of the tourism field (Hobson and Williams, 1995; Williams and Hobson, 1995) because VR provides "an interactive computer-generated medium that allows participants to create simulated experiences of both real and unreal situations" (Hobson and Williams, 1995, p. 125). VR tourists are "able to see, hear and touch real-life images which make them believe they are actually experiencing the real thing" (Williams and Hobson, 1995, p. 423). This is important because VR tourism has the potential to add value in the fields of marketing, education, accessibility, heritage preservation, and entertainment (Guttentag, 2010).

Tourists around the world have benefitted from the application of VR; for example, VR visitors have viewed such widely diverse destinations as Danish destinations (e.g., Dueholm and Smed, 2014) and Korean attractions (e.g., Chung et al., 2018). Also, consumers have enjoyed the utilization of VR technologies for entertainment in films (e.g., Ding et al., 2018) and games (e.g., Jang and Park, 2019). Although research shows that digital-free tourism can manage contemporary relationships and experiences rather than being controlled by the technologies (e.g., Li et al., 2018), travelers' experiences have been enhanced by the implementation of VR in

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museum (e.g., Recupero et al., 2019) and tourism-related activities (e.g., Kim and Hall, 2019; Kim et al., 2020). In this study, the term tourism-related VR activities refers to using VR devices for playing, enjoying, experiencing, traveling, exploring information, looking at pictures, gaming, watching 3D 360 degree videos, watching drone videos, looking at holographic images, and participating in other tourism-related activities (e.g., Kim and Hall, 2019; Kim et al., 2020).

Since the advent of VR technology, researchers have been interested in consumer behavior including perceptions of authenticity experienced by users of VR in tourism contexts (Dueholm and Smed, 2014; Guttentag, 2010; Mura et al., 2017; Yung and Khoo-Lattimore, 2019) as well as attitude change of VR tourists (Tussyadiah et al., 2018). Although VR technology is increasingly being used for tourism marketing (Huang et al., 2013, 2016), little research applying multiple integrated theories such as innovation diffusion and uses and gratifications has been conducted to identify why people use VR technology.

The theory of innovation diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1983, p. 5). Agag and El-Masry (2016) find that innovation diffusion theory has proven helpful in explaining tourists' adoption of various technologies. Also, the innovation diffusion model has been found useful in explaining VR users' behavior in terms of information technologies (Pan and Lin, 2011; Riordan et al., 2009). The theory of uses and gratifications is utilized "to explain something of the way in which individuals use communications, among other resources in their environment, to satisfy their needs and to achieve their goal" (Katz et al., 1973, p. 3). For example, the uses and gratifications theory has identified the reasons for using mobile information technologies (e.g., social network services) (Han et al., 2015; Magsamen-Conrad et al., 2015) as well as for predicting VR technology usage for gaming (Chen et al., 2010; Gallego et al., 2016). Because both diffusion of innovations and uses and gratifications theories have shown promise in explaining VR tourism behavior, we combine and extend these streams of research to identify why individuals use VR technology for tourism activities. In this paper, we develop a conceptual model, integrating theories of innovation diffusion and uses and gratifications, to predict VR tourists' behavior.

In the world of VR, consumers experience three dimensional-illusionary worlds formed by an arrangement of visual, kinetic, and audio effects (Williams and Hobson, 1995). Prior studies show that authenticity of experience largely explains why VR tourists use tourism products or services (Chung et al., 2018; Kim et al., 2017; Kim et al., 2019; Meng and Choi, 2016a,b). Authenticity is also a vital element in explaining use of VR technology in tourism settings (Dueholm and Smed, 2014; Guttentag, 2010; Kim and Hall, 2019; Mura et al., 2017; Yung and Khoo-Lattimore, 2019). Subjective well-being is a significant factor driving use of technology (Ellison et al., 2007; Kim et al., 2014a; Yoon, 2014). When people adopt a new technology, they want, ultimately, to experience subjective well-being by using the technology (Ellison et al., 2007; Yoon, 2014). Li et al. (2011) have clearly shown subjective well-being is a contributor to improving mental and physical health in the context of VR gaming.

Technology readiness (i.e., an individual's willingness and preparedness to adopt a given technology) explains why people use any given technology (Chung et al., 2015; Wang and Sparks, 2014; Wang et al., 2017a,b). In particular, the optimism and innovativeness of users moderate the acceptance of VR technology in virtual communities (Hung and Cheng, 2013). Travelers' degrees of technology readiness (e.g., optimism, innovativeness) moderate the relationships among perceived quality, satisfaction with technology-enabled services, and future behavior in the context of airlines (Wang et al., 2017a). Hence, the moderating role of technology readiness (optimism and innovativeness) in subjective well-being and behavioral intention of VR travel consumers is investigated in this study.

Although authentic experience, subjective well-being, and technology readiness have significant impacts on the acceptance of technology in the tourism market, little attention has been paid to the three concepts among VR travel consumers. To fill the gap we develop and test a theoretical model integrating innovation diffusion and uses and gratifications theories while incorporating authentic experience and subjective well-being. Additionally, the model incorporates the moderating role of technology readiness. Thus, this study helps explain consumer behavior while using VR and provides academics and practitioners with a model incorporating the two theories along with the constructs of authentic experience and subjective well-being. In addition, optimism and innovativeness moderate the impact of subjective well-being on behavioral intention, offering industry practitioners potentially useful insights into their businesses.

2. Literature review

2.1. Theoretical framework

2.1.1. Theory of innovation diffusion

Innovation diffusion theory explains why, how, and to what degree innovative technologies spread across user populations (Robertson, 1967; Rogers, 1983). The innovation diffusion theory also helps explain which characteristics of an innovation lead to the decision to adopt that particular technology (Karahanna et al., 1999). Many factors influence a person's acceptance of an innovative technology (Waheed et al., 2015). Based on innovation diffusion theory, the perceived characteristics of the innovation, as well as self-efficacy, influence the rate of acceptance of new technologies (Waheed et al., 2015). In the specific case of e-readers, for example, strong affective attachment to hardcopy books and their compatibility with reading style is negatively related to user acceptance of electronic books (Waheed et al., 2015). Simplicity, benefit, and compatibility, as attributes of specific innovations, explain why consumers use information technology (Chiang, 2013), engage in smartphone banking (Al-Jabri and Sohail, 2012), and use mobile tourism websites (Kim et al., 2019).

Ganglmair-Wooliscroft and Wooliscroft (2016) suggest that innovation diffusion theory explains adopting new ethical tourism behavior and provides a linkage between static and dynamic individual innovativeness. Innovation diffusion is a useful framework for analyzing tourists' usage of online travel agencies (Agag and El-Masry, 2016). Innovation diffusion theory is also used for showing the effects of social network structures when VR is integrated into marketing strategies (Pan and Lin, 2011). The diffusion of VR is of

practical interest because VR represents significant commercial and educational potential, so an understanding of how the use of VR spreads is important (Riordan et al., 2009). In the tourism context, research focusing on diffusion of VR is still undeveloped (Yung and Khoo-Lattimore, 2019).

2.1.2. Theory of uses and gratifications

The theory of uses and gratifications identifies why people use certain media and assumes that audiences are not passive in their selection of media (Katz et al., 1973). That is, the uses and gratifications theory seeks to clarify why consumers select one medium over another, and seeks to understand the emotional desires that drive consumers to adopt some channels while rejecting others (Cheung et al., 2011). Uses and gratifications theory helps explain how media can be used to fulfill the needs of people with differing goals (Smock et al., 2011). For example, the uses and gratifications approach is useful in explaining the continued intention to play virtual network games (Li et al., 2015). Individuals use media to satisfy their different needs as well as wants according to uses and gratifications theory (Chiang, 2013). The theory also suggests that hedonic, mobile, and integrative convenience gratifications influence users' attitudes and those attitudes then lead to users' actual usage (Ha et al., 2015) and potential travel (Kim et al., 2019).

Magsamen-Conrad et al. (2015) find that there are multiple purposes for which consumers use mobile devices, including information search, playfulness, relationship maintenance, and spending discretionary time. Gallego et al. (2016) assert that the uses and gratifications model explains the influence of gratifications on consumers' intention to use VR for learning. Involvement in a massively multiplayer online game in a VR community is related to factors derived from the uses and gratifications theory, suggesting that engagement is an important variable of popular online games (Chen et al., 2010). Therefore, we anticipate consumers participate in VR tourism activities to gratify needs for information, social interactivity, and playfulness.

2.1.3. Authentic experience

Gilmore and Pine (2007) define authenticity as "a new consumer sensibility that involves perceptions of the extent to which experiences, services, or products" are novel, real, original, exceptional, or unique (p. 2). Authenticity-related variables, such as knowledge, external information search, and perception of authenticity influence slow travel consumers' behavior (Meng and Choi, 2016b). Authenticity of perception affects the development of slow travel consumers' intentions (Meng and Choi, 2016a). Authenticity of experience affects consumer behavior among travel consumers using mobile information technology (Kim et al., 2017) and among slow life festival attendees (Chung et al., 2018).

VR tours can substitute for real tourism because of travel consumers' awareness of the authenticity of virtual experiences (Guttentag, 2010). Heritage tourist sites are implementing VR technology in innovative ways by paying attention to the perceived authenticity of virtual experiences (Dueholm and Smed, 2014). VR trips are perceived as realistic somehow, and travel consumers view physical and sensory participation as significant elements of authenticity in the VR environment (Mura et al., 2017). An adequate degree of authenticity of VR worlds can increase interest in both academia and tourism industries for VR technology (Yung and Khoo-Lattimore, 2019). Drawing on this literature, we postulate that authenticity of experience is an essential variable in understanding VR tourist behavior.

2.1.4. Subjective well-being

Subjective well-being can be defined as "experiencing happiness, including life satisfaction and positive affect" (Diener, 1984, p. 542). According to Diener et al. (1999), a person having subjective well-being is "blessed with a positive temperament, tends to look on the bright side of things, and does not ruminate excessively about bad events, has social confidants, and possesses adequate resources for making progress toward valued goals" (p. 295). Individuals having low levels of subjective well-being can use technology to improve their subjective well-being (Yoon, 2014). For example, Facebook benefits users have low self-esteem and low life satisfaction (Ellison et al., 2007). Valenzuela et al. (2009) find people with healthy involvement in information technology have high degrees of well-being and life satisfaction and have high levels of social trust, political participation, and civic engagement.

In tourism-related contexts, information technologies influence individuals' subjective well-being through affective responses more than through rational responses (Kim et al., 2014a). Even if people are sick, they need to play; for example, using VR games enhances the subjective well-being of cancer patients (Li et al., 2011). Using interactive VR games as an exercise tool improves subjective well-being as well as upper limb reaction time among people with disabilities (Singh et al., 2017). Based on these prior findings, we consider subjective well-being to be a significant variable among VR tourists.

2.2. Development of hypotheses

2.2.1. Innovation diffusion and authentic experience

In the field of tourism, one reason that VR technology spreads is that tourists perceive they are having authentic experiences (Yung and Khoo-Lattimore, 2019). Among online travel consumers, simplicity, one innovation diffusion attribute, affects potential tourists' attitudes toward, and their trust in, online travel communities (Agag and El-Masry, 2016). Benefit, another innovation diffusion attribute, influences authenticity of experience of travel consumers (Kim et al., 2017). For some users (notably those in the laggard, late majority, and early majority segments of technology adopters), compatibility of the technology with prior experiences positively influences those users' attitudes towards continued use of the technology (Chiang, 2013). This implies that compatibility with prior experience is associated with perceptions of authenticity of VR experiences among travel consumers. Drawing on these studies, we propose that features of innovations help explain VR consumers' perceptions of authenticity of experience in the tourism context as follows:

H_1: Attributes of innovation diffusion positively influence perceptions of authenticity of experience for VR travel consumers.

2.2.2. Innovation diffusion and subjective well-being

Attributes associated with innovation diffusion are closely related to potential tourists' usage of VR tourism (Yung and Khoo-Lattimore, 2019), implying that innovation diffusion influences VR tourists' behavior with respect to their subjective well-being. Benefit and compatibility of the attributes of an innovation are closely associated with attitude, which leads to intention to continue using a technology (Chiang, 2013). This supports the assumption that diffusion of technology innovations leads to subjective well-being of technology users. The innovation diffusion theory predicts that benefits and compatibility of a technology have significant impacts on its adoption; this is confirmed for mobile banking by Al-Jabri and Sohail (2012), suggesting that attributes of innovations lead to subjective well-being. Further, innovation diffusion theory suggests that attributes of technologies (simplicity, relative advantages, and compatibility) affect consumers' attitudes towards those technologies. In turn, those attributes influence consumers' behavior and loyalty to those technologies and the consequent diffusion of those innovations; Agag and El-Masry (2016) confirm this for travel agencies. Thus, we assume that the attributes of innovations used by VR tourists lead to subjective well-being for those VR tourists. Hence, the following hypothesis is suggested:

H_2: Attributes of innovation diffusion positively influence subjective well-being for VR tourists.

2.2.3. Uses and gratifications and authentic experience

According to uses and gratifications theory, hedonic, integrative, and convenience attributes of information technologies create positive attitudes toward using the technologies (Ha et al., 2015). Also, informativeness and playfulness have positive effects on attitudes towards online communication technologies (e.g., social networking services) for laggard consumers, while social interactivity and playfulness influence attitudes toward using the technologies for innovators and early adopters (Chiang, 2013). These results imply that informativeness, playfulness, and social interactivity may be related to authenticity of experience.

When VR experiences are perceived as fulfilling the desire to learn, the attributes of convenience and entertainment influence intention to use VR for learning (Gallego et al., 2016). Information seeking and desire for status resulting from sharing VR experiences are perceived as gratifying (Gallego et al., 2016), suggesting that attributes of VR (i.e., innovations) lead to perceptions of authenticity. Social interaction and diversion derived from use of VR games and pleasant aesthetics of VR games have strong positive relationships with users' psychological dependency upon online games (Chen et al., 2010). Based on these findings, this research posits that when the gratification needs of VR users' are met, authenticity of experience is increased for tourism activities. Hence, we propose a hypothesis as follows:

H_3: Meeting the gratification needs of VR tourists positively influences their perceived authenticity of experience.

2.2.4. Uses and gratifications and subjective well-being

Using VR has been shown to create feelings of subjective well-being in a variety of contexts. For example, Chiu et al. (2013) find that when identification and satisfaction with using social media fulfill users' desires, users experience positive subjective well-being. Fulfilling the desires of escapism, entertainment, challenge, and fantasy by using social network games influences the psychological subjective well-being of the game users (Jin, 2014). Satisfaction of psychological needs through use of online communication is associated with user's positive evaluations of subjective well-being (Li et al., 2014). According to some studies (Li et al., 2011; Singh et al., 2017), pleasure from playing VR games influences players' subjective well-being, implying that attributes of uses and gratifications of using VR lead to subjective well-being. Hence, the following hypothesis is proposed:

H_4: Use of VR that meets the gratification needs of VR travel consumers positively influences their subjective well-being.

2.2.5. Authentic experience and behavioral intention

Behavioral intention can be a proxy for real action (Fishbein and Ajzen, 1975). Warshaw and Davis (1985) describe intention to behave as "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" (p. 214). In the tourism domain, positive behavioral intention refers to intention to travel, plan to travel, willingness to make an effort to travel, or willingness to invest money and time in tourism products or services (Meng and Choi, 2016a,b). For VR tourism, Huang et al. (2013, 2016) show that intention to behave in a given manner is formed by finding out more information about the place, gaining an interest in visiting the place, trying to visit the place, and willingness to recommend the place experienced in VR. In the context of medical tourism, intention to pay higher costs for accommodations in VR scenarios was shown by Suess and Mody (2017). Therefore, we regard behavioral intention as a target construct that encompasses intention to repeat the VR experience, to make positive recommendations, and to travel to the attraction experienced in the VR.

Authentic experience gained from using any given technology enhances behavioral intention of the technology users (Dueholm and Smed, 2014; Guttentag, 2010; Kim et al., 2017; Mura et al., 2017; Yung and Khoo-Lattimore, 2019). Specifically, authentic experience from using mobile information technologies increases users' intention to re-use mobile technologies among travel consumers (Kim et al., 2017). Consumers perceive VR experiences as substitutes for trips if the VR provides sufficiently authentic experiences (Guttentag, 2010). VR technology has made heritage sites attractive by increasing perceived authenticity and leads to actually visiting the sites (Dueholm and Smed, 2014). VR trips can be proxies for actual tourism if the VR technologies offer sufficient authenticity (Mura et al., 2017), implying that authentic experience influences VR tourists' behavioral intention. Yung and Khoo-Lattimore (2019) review prior studies performed by Dueholm and Smed (2014) and Mura et al. (2017) of tourists' perceptions of authenticity of VR travel and find that greater perceived authenticity creates higher intention to experience VR tourism. In accordance with the literature review above, we propose the following hypothesis:

H_5: Authentic experience has a positive effect on VR tourists' behavioral intention to travel.

2.2.6. Subjective well-being and behavioral intention

Subjective well-being while using technologies is closely associated with users' behavioral intention toward those technologies (Chiu et al., 2013; Jin, 2014; Li et al., 2011; Li et al., 2014). For example, subjective well-being while using information and communication technology (e.g., social network sites) is positively correlated with happiness and satisfaction with the users' lives (Kim et al., 2014a), and presumably, subjective well-being is associated with behavioral intention. Loyalty (intent to continue using and making positive recommendations) of users of information and communication technologies is influenced by consumers' subjective well-being (Chiu et al., 2013). Perceived subjective well-being while using technology leads to consumers' satisfaction with their lives (Li et al., 2014). Moreover, perceived subjective well-being while playing VR games improves players' physical health (Singh et al., 2017). In keeping with this literature, we anticipate subjective well-being while experiencing VR travel has a positive effect on VR travel consumers' behavioral intention:

H_6: Subjective well-being positively influences VR tourists' behavioral intention.

2.2.7. Technology readiness and its moderating role

According to Parasuraman (2000), technology readiness can be defined as "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work" (p. 308). According to Liljander et al. (2006), technology readiness fosters optimism and innovativeness, and reduces discomfort and insecurity, "resulting from mental enablers and inhibitors that collectively determine a person's predisposition to use new technologies" (p. 178). Optimism of employees is closely associated with simplicity and usability of their most frequently used information technologies; innovativeness positively impacts simplicity, but is negatively related to usability (Walczuch et al., 2007). Technological readiness in the adoption of the Internet and Internet-based activities has a significant impact on user behavior (Lam et al., 2008). Each dimension of technology readiness (e.g., optimism, innovativeness, discomfort, insecurity) is associated with Internet protocol television users' usage (Son and Han, 2011).

Optimism and innovativeness attitudes related to users' technology readiness, have significant impacts on usability of augmented reality technologies for heritage destinations (Chung et al., 2015). How travelers rate the importance of technology-based services is positively related to travelers' technical readiness, and this relationship is greater for airline customers than for hotel customers (Wang and Sparks, 2014). Tourists reporting high levels of optimism have rated technology-enabled services as particularly important, while tourists reporting high levels of innovativeness have focused on network access as well as new technology-based services (Wang et al., 2017b). Optimism and innovativeness attitudes of users moderate the relationship between quality of technology-enabled service and tourists' behavior, and the associations are greater for tourists having stronger technology readiness (Wang et al., 2017a). Among members of virtual communities, technology readiness (e.g., optimism, innovativeness) is positively associated with technology acceptance (Hung and Cheng, 2013). Despite the importance of technology readiness, the moderating role of optimism and innovativeness has not yet been demonstrated for VR travel consumers' well-being and intentions. Thus, we propose two hypotheses:

H_7: Users' optimism moderates the relationship between subjective well-being and behavioral intention.

H_8: Users' innovativeness moderates the relationship between subjective well-being and behavioral intention.

The theoretically integrated model developed from the hypotheses is shown in Fig. 1. The research model presents the relationships between characteristics of innovations (i.e., simplicity, benefit, and compatibility), characteristics related to uses and gratifications (i.e., informativeness, social interactivity, and playfulness), authentic experience, subjective well-being, behavioral intention, and attitudes related to technology readiness (i.e., optimism and innovativeness) for VR tourism activities.

3. Methods

3.1. Measurements

Based on Churchill (1979), this study applies multi-measurement items to overcome the disadvantages of single item measures. The questionnaire comprised 44 items for measuring the 11 concepts. As shown in Fig. 1, the characteristics related to innovation diffusion are simplicity, compatibility, and benefit; the characteristics related to uses and gratifications are social interactivity, informativeness, and playfulness; characteristics associated with technology readiness are optimism and innovativeness. The remaining constructs are authentic experience, subjective well-being, and behavioral intention.

The four items to measure simplicity were adopted from previous research (e.g., Agag and El-Masry, 2016; Chiang, 2013) (e.g., "It is easy for me to understand how to manipulate the tourism-related VR activity"). Four items to measure benefit were generated from prior studies (e.g., Al-Jabri and Sohail, 2012; Rogers, 1983) (e.g., "I gain knowledge from using the tourism-related VR activity"). Four questions to measure compatibility were derived from previous study (e.g., Robertson, 1967) (e.g., "Using the tourism-related VR activity is compatible with all aspects of my life"). Informativeness was evaluated with four questions derived from previous research (e.g., Kim et al., 2017; Stafford et al., 2004) (e.g., "I appreciate various things about the tourism-related VR activity"). Social interactivity was evaluated using four questions from prior studies (e.g., Ha et al., 2015; Han et al., 2015) (e.g., "Using the tourism-related VR activity enables me to create social relationships with other users"). Playfulness was measured with four items derived from past research (e.g., Smock et al., 2011) (e.g., "Using the tourism-related VR activity is enjoyable for me").

Authentic experience was evaluated with four items used in studies by Gilmore and Pine (2007) and Meng and Choi (2016a,b) (e.g., "Using the tourism-related VR activity provided me with authentic experiences"). To appraise subjective well-being, four items

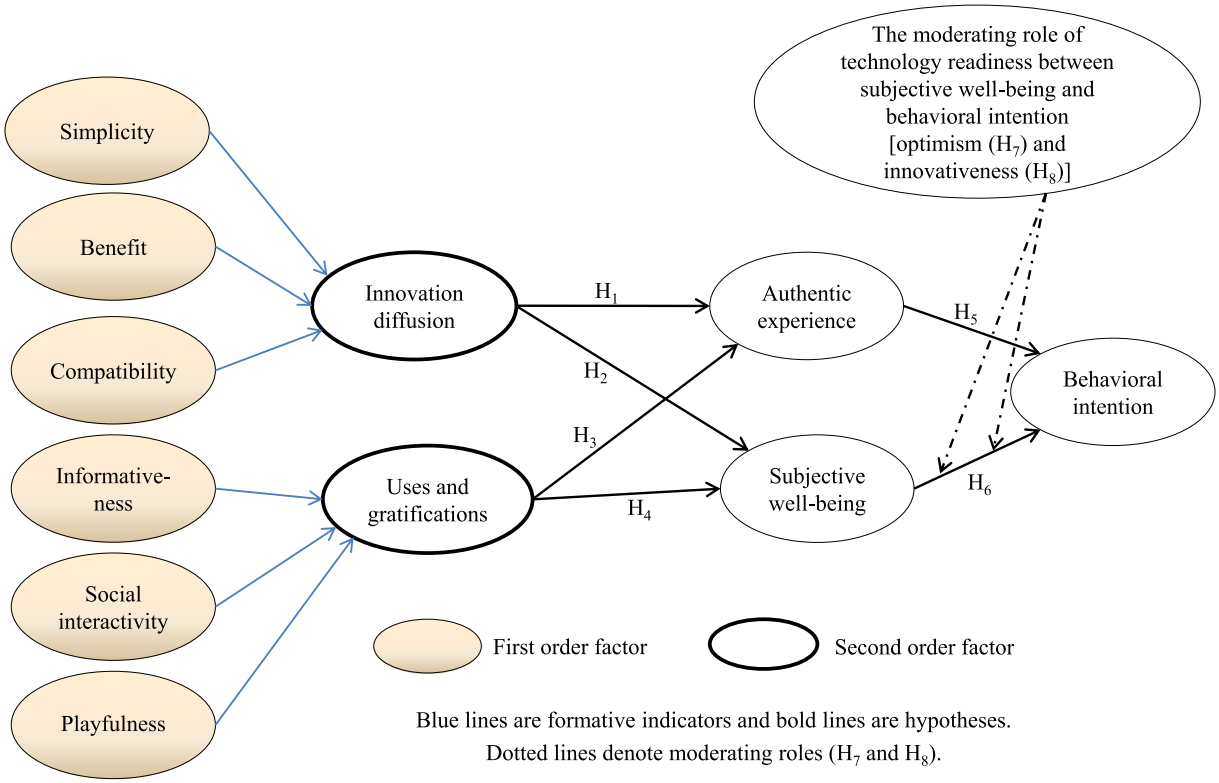

Fig. 1. Proposed research model.

used by Diener (1984) (e.g., "Using the tourism-related VR activity is part of my ideal life") were utilized in this study. Four items used in research by Huang et al. (2013, 2016) (e.g., "I want to re-experience the tourism-related VR activity in the future") were adopted to evaluate behavioral intention. Optimism was evaluated with four questions drawn from research by Chung et al. (2015) and Wang et al. (2017a,b) (e.g., "Technology gives me more control in my daily life"). Innovativeness was measured by four items modified from Son and Han (2011) and Walczuch et al. (2007) (e.g., "In general, I am among the first in my circle of friends to acquire new technology when it appears").

The questions were measured by 7-point Likert-type scales. In addition, five items concerning VR travel behavior (length of experience, primary motivation, time spent per experience, whether the VR destination was subsequently visited, and frequency of VR experiences) as used in prior research (e.g., Kim et al., 2014b, 2016) were utilized in this study. Socio-demographics were also included (i.e., gender, age, education, monthly household income, marital status, and occupation).

The questionnaire was originally developed in English and then, translated into Korean by three professionals proficient in both languages. Then, the questionnaire was translated back into English and some incongruous items were revised (Brislin, 1970). Two academic professionals knowledgeable about this area of research assessed the content validity of the questionnaire. Additionally, two practitioners of VR travel evaluated whether the questionnaire appropriately assessed VR travel consumers' behavior. As a result of these procedures, one item on optimism ("Technology gives me more freedom and mobility") and one item on innovativeness ("I have fewer problems than other people in making technology work for me") were added to the questionnaire.

A preliminary assessment of the survey instrument was conducted by four doctoral candidates majoring in tourism studies. These candidates were chosen because they were familiar with both augmented and virtual reality in tourism-related fields. Based on their comments, several items on authentic experience, subjective well-being, behavioral intention, optimism, and innovativeness were reworded. These items are "Using the tourism-related VR activity provided me with unique experiences," "So far, I have gotten the important things I want by using the tourism-related VR activity," "I would like to visit the place that I saw in the tourism-related VR activity," "Technology gives me more freedom and mobility," and "I have fewer problems than other people in making technology work for me." In addition, they said that the screening question was unclear in terms of what constituted experience with tourism-related VR activities. To address this latter issue, we provided specific examples of VR travel activities at the beginning of the questionnaire (see Supplement A).

Fifty potential travel consumers (not including the four doctoral students who assessed the wording) who had experienced VR programs in the prior year were invited for pretest. We asked them to provide feedback and whether, in their opinions, any changes, revisions, additions, or deletions were necessary. This procedure resulted in further revisions to some questions on innovation diffusion and uses and gratifications, in order to assure clarity. After completing these changes, the adjusted questionnaire was utilized for the main survey. The responses from the pretest were not included in the final analyses since the wording of some items was changed.

3.2. Data collection

Online surveys are commonly used because they result in rapid responses as well as expense reduction (Wright, 2005). Internet surveys are deemed particularly appropriate for data collection for this research since the study examines travel consumer behavior in VR programs. An Internet survey firm (Embrain), with Asia's largest panel (over three million panelists), was hired to administer the survey instrument. Subjects were drawn from the panel using quota sampling with strata tailored to assure the sample is representative of the age and gender profile of mobile Internet users as determined by the Korea Internet Security Agency (2017). The company adheres strictly to protocols designed to ensure validity of responses. The protocols the firm uses also verify personal information of the respondents.

The first item on the questionnaire is a screening question; subjects who were not qualified for participation in the survey were deleted from the sample frame. Respondents who completed the screening question successfully were required to name a VR tourism activity they had experienced in the past 12 months. The VR activity named by each subject was presented to each subsequent item. The multiple-choice items were rotated to avoid response bias so the order of the questions presented to every respondent was different (Lee et al., 2008).

Based on information from the Korea Internet Security Agency (2017), the sample profile matched the age and gender profile of Korean mobile Internet users. The subjects were all Koreans, 18 or more years old, who had experienced VR travel content in the past 12 months year. The Internet survey was conducted from October 30 to November 25, 2017. An invitation to participate in the study was emailed to 5813 panelists. The email invitation was opened by 2034 individuals but 1756 clicked the questionnaire. Each subject was presented with the screening question ("In the past 12 months, have you had any experience with tourism-related VR activities?"). Of those who were presented with the screening question 753 panelists responded in the affirmative and, hence, were qualified to participate in the survey. A total of 499 respondents completed the questionnaire. An automated procedure identified 30 questionnaires that were completed too quickly or that used repetitive response patterns; these questionnaires were deleted. The remaining 469 completed questionnaires were used for the analysis as there were no outliers or omitted answers, representing a response rate of 62.3% (469 divided by 753) based on American Association for Public Opinion Research (2016, p. 58).

3.3. Data analysis

According to Chin et al. (2003), partial least squares-structural equation modeling (PLS-SEM) criteria are somewhat less demanding measurement scales, sample size, and residual distributions than covariance-based SEM (CB-SEM). In the PLS-SEM technique, both formative and reflective indicators are analyzed together (Chin, 1998). PLS-SEM is suggested as more appropriate than CB-SEM for multi-group analysis (MGA) or complicated models (Hair et al., 2012). Accordingly, PLS-SEM (SmartPLS 3.2.7) was used to analyze the measurement and structural models (Ringle et al., 2015).

Since subjects were required to complete all questionnaire items during one online session and respondents completed survey items related to both independent and dependent variables, common method variance is a potential problem. Several steps, advocated by Conway and Lance (2010) and Podsakoff et al. (2003), were taken in order to eliminate common method variance; these steps are described next. As previously described, only subjects who had experienced VR travel programs in the prior year were selected via the screening question. A description of the research goals and a guarantee of privacy for all respondents were incorporated into the beginning of the questionnaire. In order to decrease respondents' apprehension, a statement that there are no right or wrong answers to any of the questions was also included in the survey instructions. At the beginning of the survey, VR travel programs and VR usage were described along with the definitions of important concepts, to help ensure response validity. The questionnaire has three sections; the first section incorporates descriptions of VR travel programs, the second has scaled items related to the hypotheses, and the third contains demographic questions. As previously described, the order in which the questions in the second section were presented was rotated randomly.

Harman's single-factor analysis was conducted as a post hoc statistical test to see if the collected data exhibit common method variance (Harman, 1967). In order to conduct the test, in the manner advocated by Podsakoff et al. (2003), we performed exploratory factor analysis. If a single factor explains over half of the variance of the factors, common method variance can be a problem. Nine factors, representing 74.9% of all variables, had eigenvalues exceeding 1.0. The first variable accounted for 42.4% of the variance and the remaining eight variables accounted for 7.4%, 5.8%, 4.4%, 3.9%, 3.1%, 2.8%, 2.5%, and 2.4% of the variance, respectively. Since single-factor analysis has certain restrictions, a marker variable method was then applied using a PLS algorithm (Chin et al., 2012). Negative emotional response to the VR travel programs was used as the marker variable to measure the relationships of the theoretical constructs. The marker variable corrections for all 11 variables are simplicity (−0.112), benefit (−0.073), compatibility (−0.118), informativeness (−0.126), social interactivity (0.031), playfulness (−0.302), authentic experience (−0.094), subjective well-being (−0.118), behavioral intent (−0.271), optimism (−0.194), and innovativeness (−0.024). With the marker variable corrections the average correlation of the squared multiple is 0.025 for all the concepts, which is well below than the cutoff value of 0.1, indicating that common method variance is not a problem (Lindell and Whitney, 2001). Hence, common method variance is not a problem as demonstrated by both traditional single-factor analysis and the marker-variable method.

4. Results

4.1. Sample profile

Females represented over one half (52.0%) of all subjects and age groups in 20s, 30s, 40s, and 50s were relatively evenly distributed. Almost two thirds of respondents (65.9%) were university educated and 63.4% were single. Over a third of respondents (42.8%) were office employees and had monthly household income of 4.00–5.99 million Korean Won (KRW) (35.2%) (equivalent to US$ 3800–5600). Slightly less than half of respondents (48.5%) had more than 6 months' but less than 12 months' experience with VR tourism prior to completing the survey and almost three quarters of participants (71.3%) spent from 10 to 29 min on VR tourism per session. The respondents' main motivation for engaging in VR travel programs was playing (52.3%) and more than half of respondents (55.8%) engaged in VR tourism less frequently than once a month but at least once a year. Approximately one third (33.9%) of the sample actually visited the destinations they had viewed while engaged in VR tourism (see Table 1 for more details).

Table 1
Respondents' demographic characteristics.

Characteristics	N (469)	% (100)	Characteristics	n (469)	% (100)
Gender			**Monthly household income**		
Male	225	48.0	<2.00 million KRW*	35	7.5
Female	244	52.0	2.00–3.99 million KRW	130	27.7
Age			4.00–5.99 million KRW	165	35.2
Under 20 years old	8	1.7	6.00–6.99 million KRW	79	16.8
20–29 years old	109	23.2	8.00 and over million KRW	60	12.8
30–39 years old	104	22.2	**Length of experience with VR tourism**		
40–49 years old	121	25.9	<6 months	207	44.1
50–59 years old	117	24.9	6 months up to and including 12 months	227	48.5
60 years old and over	10	2.1	More than 12 up to and including 24 months	32	6.8
Educational level			More than 24 months	3	0.6
Below or high school	51	10.9	**Time spent on VR tourism per session**		
2-year college	61	13.0	<10 min	102	21.7
University degree	306	65.9	10 min up to and including 30 min	334	71.3
Graduate school or higher	48	10.2	More than 30 up to and including 60 min	25	5.3
Marital status			More than 60 min	8	1.7
Married	170	36.2	**Motivation for engaging in VR tourism**		
Single	297	63.4	Playing	245	52.3
Divorced	1	0.2	Leisure/tourism	131	27.9
Widower/widow	1	0.2	Exploring information	25	5.3
Occupation			Experiencing	66	14.1
Professional	44	9.4	Other (e.g., show and amusement park)	2	0.4
Business owner	6	1.3	**Actual visit to VR tourism site**		
Service worker	25	5.3	Yes	159	33.9
Office worker	201	42.8	No	310	66.1
Civil servant	6	1.3	**Frequency of engaging in VR tourism**		
Home maker	59	12.6	Once a day or more	15	3.2
Retiree	1	0.2	Once a week or more but less than once a day	57	12.2
Self-employed	45	9.6			
Student	51	10.9	Once a month or more but less than once a week	135	28.8
Other	31	6.6			
			Once a year or more but less than once a month	262	55.8

* *Note:* US$ 1 = 1083 KRW (Korean won) as of March 4, 2018.

4.2. Grouping check

The K-means cluster method is appropriate for identifying groups to be used for analysis when grouping cases by similar traits and the sample size is greater than 200 (Hair et al., 2010). Using K-means clustering we divided the sample of 469 observations into two clusters, with each observation belonging to the cluster with the closest average. To test H_7, we divided the subjects (n = 469) into low and high optimism, and divided the sample into low and high innovation groups to test H_8. Cronbach's alpha was used to confirm validity for optimism (0.883) as well as innovativeness (0.928) since each construct is evaluated by five items (see Table 2); the values exceed 0.7, confirming validity (Campbell and Fiske, 1959). When the sample is grouped based on optimism, the high optimism group has 225 cases (mean = 5.838) and the low optimism group has 244 cases (mean = 4.408). Similarly, when the sample is grouped based on innovativeness, the high innovativeness group has 304 cases (mean = 5.103) and the low innovativeness group has 165 cases (mean = 3.293).

Table 2
Results of confirmatory factor analysis.

Construct	Items	Factor loading	t-value
Simplicity	1. It is easy for me to understand how to manipulate the tourism-related VR activity.	0.852	51.378
	2. Using the tourism-related VR activity does not require a lot of mental effort.	0.771	22.444
	3. I think that using the tourism-related VR activity is simple.	0.877	53.047
	4. I find that it is easy to get what I want when I am using the tourism-related VR activity.	0.836	60.405
Benefit	1. I gain knowledge from using the tourism-related VR activity.	0.925	109.153
	2. Using the tourism-related VR activity is useful to collect information.	0.926	109.117
	3. Using the tourism-related VR activity is beneficial.	0.880	58.052
	4. Using the tourism-related VR activity allows me to form friendships with other users.*	–	–
Compatibility	1. Using the tourism-related VR activity is compatible with all aspects of my life.	0.885	69.441
	2. Using the tourism-related VR activity fits well with the way I live.	0.917	106.507
	3. Using the tourism-related VR activity fits into my lifestyle.	0.927	113.145
	4. Using the tourism-related VR activity suits me.	0.926	121.800
Informativeness	1. I appreciate various things about the tourism-related VR activity.	0.863	53.438
	2. I have a variety of experiences while using the tourism-related VR activity.	0.891	72.674
	3. I get varied knowledge from using the tourism-related VR activity.	0.892	65.681
	4. I collect diverse information from using the tourism-related VR activity.	0.888	61.243
Social interactivity	1. Using the tourism-related VR activity enables me to create social relationships with other users.	0.869	64.936
	2. Using the tourism-related VR activity helps me maintain social relationships with others.	0.928	123.588
	3. Using the tourism-related VR activity helps me make new friends.	0.914	84.063
	4. Using the tourism-related VR activity enhances my social relationships with others.	0.915	94.123
Playfulness	1. Using the tourism-related VR activity is enjoyable for me.	0.918	82.793
	2. Using the tourism-related VR activity is pleasurable for me.	0.935	139.362
	3. Using the tourism-related VR activity is fun for me.	0.901	67.096
	4. Using the tourism-related VR activity keeps me happy.	0.875	65.048
Authentic experience	1. Using the tourism-related VR activity provided me with authentic experiences.	0.816	44.094
	2. Using the tourism-related VR activity provided me with genuine experiences.	0.868	58.273
	3. Using the tourism-related VR activity provided me with exceptional experiences.	0.887	75.198
	4. Using the tourism-related VR activity provided me with unique experiences.	0.872	64.283
Subjective well-being	1. Using the tourism-related VR activity is part of my ideal life.	–	–
	2. My life is excellent when I use the tourism-related VR activity.	0.807	28.139
	3. I am satisfied with my life when I am using the tourism-related VR activity.	0.908	92.001
	4. So far, I have gotten the important things I want by using the tourism-related VR activity.	0.842	47.408
Behavioral intention	1. I want to re-experience the tourism-related VR activity in the future.	0.877	62.771
	2. I would recommend the tourism-related VR activity to my friends or others.	0.901	83.089
	3. I want to tell other people positive things about the content of the tourism-related VR activity.	0.901	84.536
	4. I would like to visit the place that I saw in the tourism-related VR activity.	0.739	19.729
Optimism	1. Technology gives me more control in my daily life.	0.823	48.646
	2. Products and services that use the newest technologies are much more convenient for me to use.	0.840	45.837
	3. I prefer to use the most advanced technology available.	0.805	37.825
	4. Technology makes me more efficient in my job.	0.840	52.357
	5. Technology gives me more freedom and mobility	0.819	40.260
Innovativeness	1. In general, I am among the first in my circle of friends to acquire new technology when it appears.	0.870	68.160
	2. I can usually figure out new high-tech products and services without help from others.	0.862	46.547
	3. I keep up with the latest technological developments in my areas of interest.	0.899	81.902
	4. I enjoy the challenge of figuring out high-tech gadgets.	0.881	70.489
	5. I have fewer problems than other people in making technology work for me.	0.816	42.316

* *Note:* Items were deleted based on confirmatory factor analysis.

4.3. Measurement model

We conducted confirmatory factor analysis for the measurement model (Hair et al., 2010). Two questions (one each for benefit and subjective well-being) were removed since the factor loading for each is less than 0.5. (Kline, 2011). As shown in Table 2, we utilized 34 items for analysis. Based on Stevens (2009), tests of reliability, convergent, and discriminant validity were performed (Table 3). With regard to reliability and internal consistency, the composite reliability (CRs) and Cronbach's alpha for each construct is larger than 0.70, confirming validity (Campbell and Fiske, 1959). In addition, each construct's average variance extracted (AVE) is over 0.5 and each question's factor loading is higher than 0.7, confirming convergent validity (Hair et al., 2010). As shown in Table 3, discriminant validity is also confirmed since the square root of the AVE of each concept exceeds corresponding correlation coefficients (Fornell and Larcker, 1981).

Innovation diffusion as well as uses and gratifications are measured as formative variables, each with three sub-constructs. A formative approach allows the identification of multiple features, with each feature incorporating multiple dimensions (Ahrholdt et al., 2017). The three sub-constructs of innovation diffusion are simplicity, benefit, and compatibility. Uses and gratifications has three sub-constructs: informativeness, social interactivity, and playfulness. The six sub-constructs' weights, as measured by gamma (γ) coefficients generated from standard regression, are applied to test the validity of the formative constructs (Kuan and Bock, 2007). As shown in Fig. 2, each factor weight for the formative constructs is significant.

Table 3
Reliability and discriminant validity.

Construct	Correlation of the constructs								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Simplicity	**0.836**								
(2) Benefit	0.415	**0.910**							
(3) Compatibility	0.526	0.544	**0.914**						
(4) Informativeness	0.487	0.684	0.599	**0.884**					
(5) Social interactivity	0.337	0.507	0.575	0.505	**0.914**				
(6) Playfulness	0.554	0.516	0.656	0.615	0.417	**0.908**			
(7) Authentic experience	0.498	0.501	0.612	0.597	0.522	0.595	**0.861**		
(8) Subjective well-being	0.459	0.512	0.606	0.525	0.525	0.531	0.571	**0.853**	
(9) Behavioral intention	0.534	0.555	0.627	0.602	0.449	0.692	0.569	0.604	**0.857**
Cronbach's alpha (α)	0.856	0.877	0.884	0.906	0.934	0.929	0.884	0.813	0.877
Composite reliability	0.902	0.917	0.920	0.934	0.953	0.949	0.920	0.889	0.917
AVE	0.697	0.829	0.742	0.781	0.835	0.824	0.742	0.728	0.735
Mean*	4.774	4.606	4.379	4.700	4.107	4.947	4.487	4.468	4.901
Standard deviation	0.933	1.054	1.131	1.031	1.207	0.990	0.995	0.964	0.952

Note: All boldfaced diagonal elements appearing in the correlation of constructs matrix indicate the square roots of AVEs.
* 7-point Likert scale.

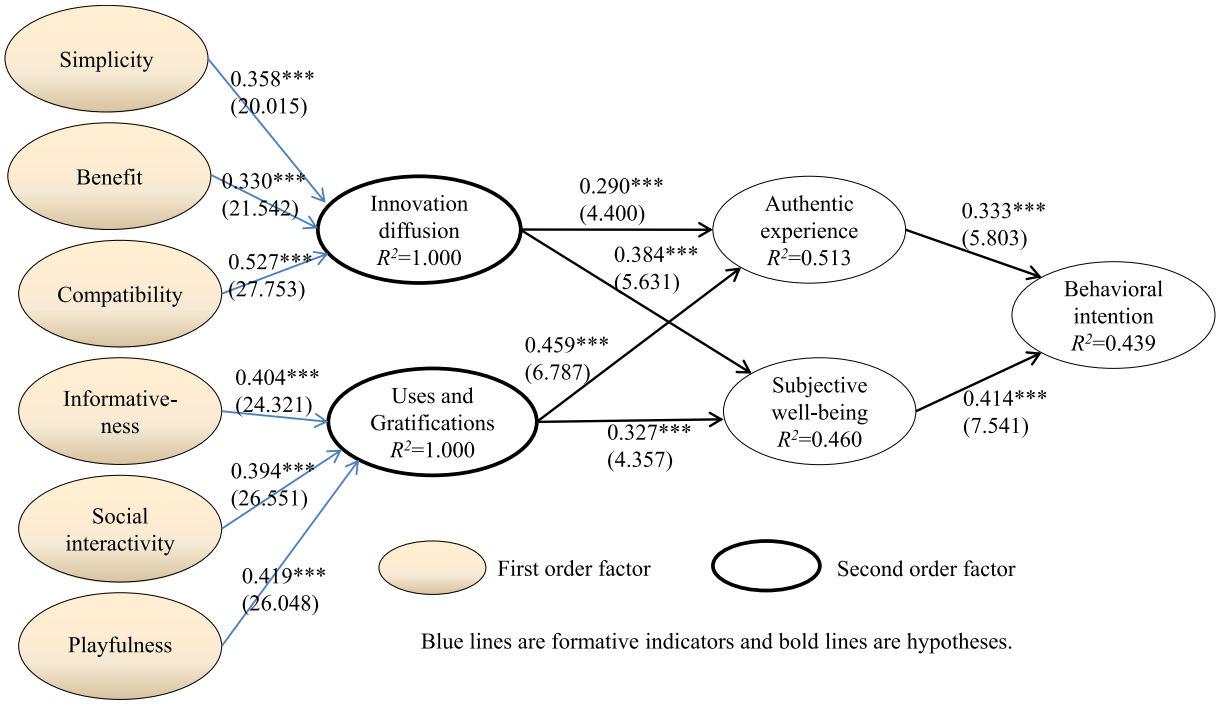

Fig. 2. Results of path analysis.
Note: ***p < 0.001. The figures in parentheses denote t-value.

4.4. Structural model

Fig. 2 represents the results of the PLS-SEM analysis (Ringle et al., 2015). The R^2 for authentic experience is 51.3%, for subjective well-being it is 46.0%, and for behavioral intention it is 43.9%. Because the data do not exhibit multivariate normality (see Supplement B), path estimates as well as *t*-statistics are assessed for the relationships by using the bootstrapping approach (Hair et al., 2012). To evaluate the shape of the sampling distribution with a non-parametric approach, PLS bootstrap conducts resamplings (Chin et al., 2003); we resampled 1000 times. Results indicate that relationship between innovation diffusion and authentic experience (β = 0.290, t-value = 4.400, p < 0.001) and between innovation diffusion and subjective well-being (β = 0.384, t-value = 5.631, p < 0.001) are significant. Also, uses and gratifications positively influence authentic experience (β = 0.459, t-value = 6.787, p < 0.001) and subjective well-being (β = 0.327, t-value = 4.357, p < 0.001). Finally, behavioral intention is affected by authentic experience (β = 0.333, t-value = 5.803, p < 0.001) and subjective well-being (β = 0.414, t-value = 7.541, p < 0.001). Therefore,

H_1, H_2, H_3, H_4, H_5, and H_6 are supported.

To verify the moderating role of technology readiness (consisting of the constructs of optimism and innovativeness) on the relationship between subjective well-being and behavioral intention, H_7 and H_8 were evaluated. PLS-SEM was utilized to conduct MGA to contrast the relationships between subjective well-being and behavioral intention with the high and low optimism groups of respondents and with the high and low innovativeness groups of respondents. Significant differences exist between the groups with high/low optimism as well as between the groups with high/low innovativeness (Table 4). Therefore, H_7 and H_8 are supported. The magnitude of the coefficient between subjective well-being and behavioral intention ($\beta = 0.489 > \beta = 0.257$, $p < 0.05$) is significantly greater for the high optimism subjects than for their counterparts. Also, the size of the coefficient between subjective well-being and behavioral intention ($\beta = 0.483 > \beta = 0.270$, $p < 0.05$) is significantly greater for the high innovativeness group than for their counterparts in the low innovativeness grouping.

Testing for multicollinearity of the independent factors was performed by applying the variance inflation factor (VIF) (Hair et al., 2010). Because the VIF values of the factors fall between 1.376 and 3.068, multicollinearity is not a problem (Hair et al., 2012).

Table 4
Moderating role of high and low technology readiness groups of optimism and innovativeness.

Hypothesis	Path	High group (A)	Low group (B)	A-B	p-value	Hypothesis test
H_7	Subjective well-being → Behavioral intention	0.489***	0.257***	0.232	<0.021	Supported
H_8	Subjective well-being → Behavioral intention	0.483***	0.270***	0.213	<0.024	Supported

*** $p < 0.001$.

4.5. Mediating effect

The mediating roles of authentic experience as well as of subjective well-being were tested to determine whether the constructs mediate in the model. PLS bootstrap resampling, as described previously, was used for this analysis. As shown in Table 5, innovation diffusion positively and indirectly influences VR tourists' behavioral intention ($\beta = 0.255$, t-value = 6.527, $p < 0.001$). Also, uses and gratifications significantly and indirectly influence behavioral intention ($\beta = 0.288$, t-value = 6.702, $p < 0.001$). As a result, we conclude that authentic experience and subjective well-being act as mediators in this research framework.

Table 5
Testing mediating effects.

Path	Direct effect	Mediating	Total effect
Innovation diffusion → Authentic experience	0.290***		0.290***
Innovation diffusion → Subjective well-being	0.384***		0.384***
Innovation diffusion → Behavioral intention		0.255***	0.255***
Uses and gratifications → Authentic experience	0.459***		0.459***
Uses and gratifications → Subjective well-being	0.327***		0.327***
Uses and gratifications → Behavioral intention		0.288***	0.288***
Authentic experience → Behavioral intention	0.333***		0.333***
Subjective well-being → Behavioral intention	0.414***		0.414***

*** $p < 0.001$.

4.6. Control variables

Control variables were tested to determine whether they influence the research model (Hair et al., 2010). For this analysis the same bootstrap resampling that was described earlier was used to test control variables (i.e., age, education, gender, occupation, income, and marital status). The six demographic variables were controlled to assess the linkage between subjective well-being and VR tourists' intention. Results confirm that these demographic factors do not affect the outcome of the model analysis (see Fig. 3).

To determine whether different types of VR tourism influence the research model, this study tested five different motivations for participation in VR tourism as control variables (see Table 1). Specifically, the different types of motivations were controlled to permit a precise assessment of the relationship between uses/gratifications and subjective well-being. The data still support six hypotheses when the five different motives are included. Therefore, the results support that the various types of VR tourism motives are not biased in the current research model. Furthermore, all the path coefficients and t-values in the research model are very similar to those of the five different types of motives.

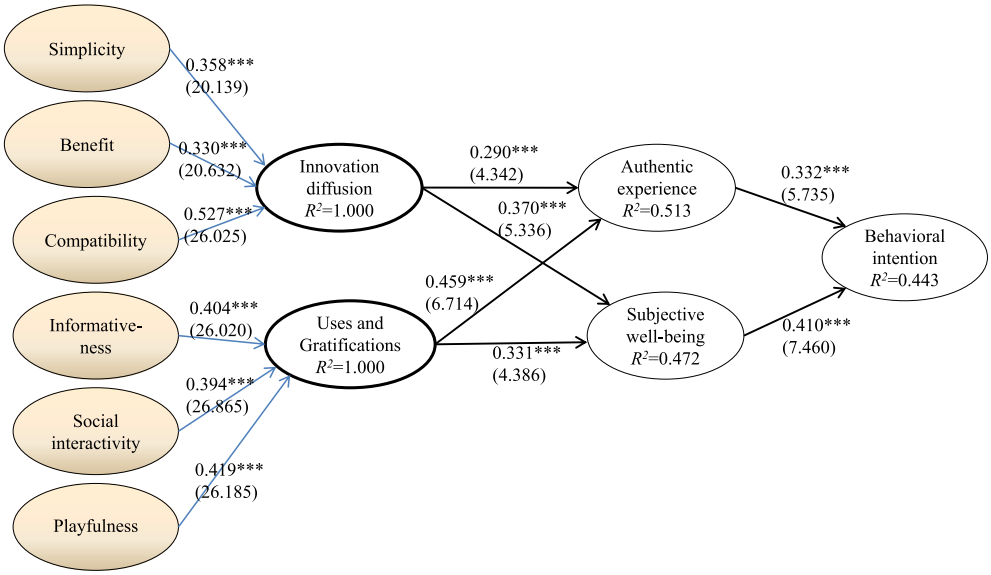

Fig. 3. Estimation of the research model after controlling demographic variables.
Note: ***p < 0.001. The figures in parentheses denote t-value.

5. Conclusion and implications

5.1. Discussion

VR technologies, devices, and tools for content creation have had a major impact on VR tourism, enhancing visitors' experiences (Kim and Hall, 2019; Kim et al., 2020; Tussyadiah et al., 2018). Despite the growing interest in and importance of VR tourism, a theoretically integrated model has not been developed and tested in the VR tourism domain (Yung and Khoo-Lattimore, 2019). To fill this void, we develop and examine a conceptually integrated model incorporating innovation diffusion as well as uses and gratifications theories to explain why people participate in VR tourism activities. In addition, the moderating role of VR tourists' technology readiness (optimism and innovativeness) between subjective well-being and behavioral intention is examined, and is found to play a major role in adopting new technologies.

This study demonstrates that simplicity, benefit, and compatibility (attributes of innovation diffusion) are related to authentic experience and subjective well-being. The association between innovation diffusion and subjective well-being is stronger than the association between innovation diffusion and authentic experience. In addition, informativeness, social interactivity, and playfulness (attributes of uses and gratifications) are found to positively influence authentic experience and subjective well-being. The effects of uses and gratifications on authentic experience are larger than the effects of uses and gratifications on subjective well-being. Notably, subjective well-being has a greater impact on behavioral intention to experience tourism-related activities than authentic experience.

The moderating effects of technology readiness (optimism and innovativeness) on subjective well-being and behavioral intention are stronger in the high optimism and high innovativeness groups than in the low optimism and low innovativeness groups. That is, travel consumers with higher optimism related to technology readiness are more likely to participate in VR tourism activities than their low optimism counterparts to adopt a new technology. Hence, consumers having greater optimism related to tech technology readiness have stronger intention to participate in experiencing VR tourism activities than potential consumers with lower optimism. In addition, consumers with higher innovativeness related to technology readiness are more likely ready to use a new technology than their counterparts with lower innovativeness.

5.2. Theoretical implications

This theoretically based research makes the following contributions to the VR tourism-related fields. First, this study develops a comprehensive model using the innovation diffusion and uses and gratifications theories to explain travel consumers' intention to use or experience VR programs. This is the first attempt to develop an integrated model of travel consumer behavior in the VR realm. This work demonstrates empirically that both the innovation diffusion and uses and gratifications theories provide significant and distinct contributions to understanding the behavior of VR travel consumers. Second, the integrated model developed in this research contributes to understanding VR travel consumers by incorporating the effects of authentic experience and subjective well-being on behavioral intention. Third, the model contributes to extending theory by demonstrating that travelers' levels of optimism and innovativeness moderate their subjective well-being and behavioral intention.

In addition, the results of this study support and help explain previous studies. For example, the results explicate connections

between the benefits associated with diffusion of innovations and perceived authentic experience of mobile information and communication technology use (e.g., Kim et al., 2017, 2019). Also, this work supports the work of Chiang (2013), who demonstrated the relationships between the benefits and compatibility associated with diffusion of innovation and positive attitude toward information and communication technology use. The results also extend the findings on the relationship between the theory of uses and gratifications and intention to use social media and account for the linkage between VR game use and psychological well-being (e.g., Li et al., 2011; Singh et al., 2017). The findings of the impacts of authentic experience and subjective well-being on behavioral intention also extend prior research on the linkage between authenticity and intention to experience VR travel programs (Yung and Khoo-Lattimore, 2019).

Because personal characteristics of users influence VR consumer behavioral intention, this research demonstrates the significant moderating role of technology readiness (optimism and innovativeness) on the association between subjective well-being and behavioral intention. This is the first research in which the moderating role of technology readiness has been studied in the context of VR travel. The results show that optimism and innovativeness, two other personal characteristics of users, influence the effects of subjective well-being on behavioral intention. The findings extend the findings of prior studies on the moderating role of technology readiness (i.e., optimism and innovativeness) on behavioral intention of tourists (e.g., Wang et al., 2017a,b). Lastly, this research provides insights into behavioral intention to adopt new technologies in the realm of VR tourism by incorporating innovation diffusion and as well as uses and gratifications theories.

5.3. Practical implications

This research makes practical contributions to the association between innovation diffusion and authentic experience that VR travel industry practitioners can use. Because simplicity, benefit, and compatibility of VR content are important to the diffusion of innovations in general, and specifically to the diffusion of VR technology in the tourism sector, VR technicians should incorporate the characteristics of simplicity, benefit, and compatibility in the design of their products and services. Nevertheless, VR engineers should not get too far in front of where users are with respect to incorporating VR technology into their experiences (i.e., VR tourism should be compatible with users' levels of comfort with the technology). VR developers should also bear in mind the benefits users seek from VR technology and try to meet those expectations as they relate to both the technology and content (compatibility). Likewise, VR practitioners should simplify how the programs are well operated so that first-time users do not give up in frustration because they experience difficulties in making the technology work.

The same factors mentioned above that affect diffusion of innovation are also relevant to promoting subjective well-being. In other words, VR tourism content that is simple, usable, and beneficial and that promotes authentic experience will also be psychologically satisfying to potential VR tourists. Tourism marketers may benefit from the results of this research regarding the effect of uses and gratifications on authentic experience useful and valuable. For example, if marketers develop VR products that are explanatory, socially connected, and enjoyable (factors that affect subjective well-being), they will increase users' affinity to the VR programs. Additionally, practitioners may find it beneficial to incorporate the finding of the effects of uses and gratifications on psychological and subjective well-being of VR users. That is, VR tourism industry managers could add elements of knowledge, social relations, and playful elements to their VR products and services so that users experience an increased sense of psychological well-being. The findings of this research will assist field professionals who wish to adopt sound practices related to the association between authentic experience and behavioral intention. Specifically, VR tourism practitioners should make their VR programs authentic; one way of doing so might be by including unique aspects of content. This could be done by designing the VR tourism activities with vivid sound, video, and haptics. Marketers need to keep in mind the effect of subjective well-being on behavioral intention to use technologies and they create content that develops a sense of subjective well-being. For instance, VR developers should create their VR tourism content to be mentally stimulated by using advanced techniques such as three dimension (3D) and 360 degree technologies.

Importantly, the moderating impact of technology readiness (optimism and innovativeness) on subjective well-being and behavioral intention in VR tourism offers insights into potentially successful marketing practices. These insights can be used for market segmentation by targeting groups with high levels of optimism, focusing on physiological well-being of travel consumers. Additionally, marketers could use strategies for market segmentation based on the levels of technology readiness, emphasizing subjective well-being of travel consumers. For example, when VR practitioners target users with high technology readiness, they could include the latest technological innovations in their offerings. On the other hand, when marketers target consumers with low technology readiness, they should incorporate simpler and easier-to-use technology in their VR tourism offerings. More importantly, this research provides novel insights into VR tourism offerings by incorporating the notion of subjective well-being. Findings show that commercial operators whose VR tourism programs create high levels of satisfaction, happiness, and fulfillment, will contribute to continued use of VR tourism and may lead to visiting the destinations shown in VR content. By applying some or all of these techniques, the industry should become more satisfying to users and more profitable to practitioners.

5.4. Limitations and future research directions

The study's limitations should be borne in mind when applying the findings. The sample was collected in Korea so caution should be exercised when applying the findings of the study beyond this country. We focused on using VR content and not on the devices being used; further study should be conducted to determine whether the findings apply across all types of VR devices. In particular, the technology acceptance model is useful in explaining the adoption of VR devices (e.g., Lee et al., 2019). Future researchers should consider incorporating other theories of human behavior into an extended VR technology acceptance model to better elucidate VR

technology adoption by tourists. Moreover, future research on the reasons people have for not using VR for tourism will contribute to practitioners' abilities to attract non-VR tourism consumers, thereby extending the VR travel market. In addition, consumers with no experience with using technology for tourism, and/or tourists who actively try to avoid experiences utilizing technology are part of the market to reach. Hence, future research should consider different samples to capture non-users' attitudes towards digital experiences. Furthermore, since there is a wide range of ways to experience VR tourism, from mobile applications to large scale VR rides at amusement parks, future research should focus on different types of VR experiences. Since this study does not consider the impact of the variety of tourism experiences (e.g., visiting museums, nature excursions, dark tourism, shopping, etc.) and the different motivations that might be associated with each of them, qualitative research on various types of VR tourism would deepen the understanding of tourist/visitor behavior.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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