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A hedonic motivation model in virtual reality tourism: Comparing visitors and non-visitors

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ABSTRACT

Virtual reality (VR) tourism provides consumers with the opportunity to experience a destination in VR and can play a significant role in encouraging visitation and engaging in particular travel activities and behaviors. Hedonic motivation adoption frameworks with flow state and subjective well-being have been shown to have significant roles in continued use of information technology. However, research on a theoretically integrated hedonic motivation system adoption model (HMSAM) specifically with enjoyment, flow state, subjective well-being, and continued use has not previously been conducted with respect to VR tourism. To address this gap, this study develops and investigates a conceptually comprehensive model on the effect of consumers' hedonic behaviors on continued use, with the moderating role of visitor or non-visitor at the destination portrayed in VR tourism. Results identified the highly significant effect of consumers' perceived enjoyment on flow state and of flow state on subjective well-being. Continued use was greatly influenced by flow state and subjective well-being. Importantly for destinations association between usefulness and flow state had a significant moderating effect depending on whether a visitor or non-visitor. The findings offer new knowledge to researchers and industry in the VR tourism fields.

1. Introduction

Virtual reality (VR) is one of the most significant topics in contemporary information management given its increasing application in a number of different industries (Choi & Kim, 2017; Hamari, 2015; Li & Mao, 2015; Mäntymäki & Riemer, 2014; Mäntymäki & Salo, 2015), including tourism (Huang, Backman, & Backman, 2012; Huang, Backman, Backman, & Moore, 2013; Huang, Backman, Backman, & Chang, 2016; tom Dieck, tom Dieck, Jung, & Moorhouse, 2018; Tussyadiah, Wang, Jung, & tom Dieck, 2018). Tourism is estimated to account for 10% of global gross domestic product (GDP) and one in ten jobs (World Tourism Organization, 2018). VR tourism is a virtual representation of an actual attraction, destination, or visitor experience that is designed as a prelude to visitation or to extend previous experiences of consumers. VR tourism can also be used as a management tool to educate consumers and/or protect attractions by acting as a substitute for visitation, especially for environmentally sensitive sites (e.g., Guttentag, 2010) and by encouraging efforts to help people gain a deeper appreciation of environmental challenges (e.g., Gössling and Hall, 2018; The Guardian, 2016). For example, the Korean government is using a VR visitor experience with a head-mounted display (HMD), as a conservation management tool at the World Heritage listed Seokgulam Grotto hermitage and monastery complex (Kim, 2016).

VR technologies are removing the barrier of distance to potential tourists to gaining information and understanding of a destination prior to purchasing decisions and visitation, transforming the ways people travel and experience a location (Accenture, 2018). Studies in Hong Kong and the UK suggest that the majority of potential tourists have experienced some form of destination related VR before their actual visits (Tussyadiah et al., 2018). According to the World Economic Forum (2017), the total value of the tourism related virtual industry will reach US$200 billion by 2027. Therefore, given the substantial market size of the VR tourism industry and its information management needs, gaining an improved understanding of the role of VR in tourism represents a significant contribution in information and communications research as well as tourism management and marketing.

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Although originally primarily conceived for management and marketing purposes (Hobson & Williams, 1995; Williams & Hobson, 1995), consumers are increasingly participating in VR tourism activities for hedonic motivations (e.g., enjoyment, pleasure, flow experience, happiness). For example, Tussyadiah et al. (2018) find that enjoyment has an important role in VR tourism, resulting in intention to visit attractions in VR. In addition, VR tours influence tourists' decisions when users derive pleasure from the VR experience (Pantano & Corvello, 2014). Happiness as a form of satisfaction is one of the main reasons to use VR tourism and three dimensional (3D) virtual worlds (Huang et al., 2016), while Huang et al. (2013) find that flow experience has a significant impact on VR users' behavioral intentions for actual visitation.

Flow is defined as an "optimal experience … developed by the holistic experience that people feel when they act with total involvement" (Csikszentmihalyi, 1975, p. 36). A 'flow state' refers to involvement in an activity that produces experiences that are "so gratifying that people are willing to do it for its own sake, with little concern for what they will get out of it, even when it is difficult or dangerous" (Csikszentmihalyi, 1990, p. 71). Flow and flow states have long been identified in a number of tourism and tourism communications technology contexts (e.g., Pomfret & Bramwell, 2016; Skadberg & Kimmel, 2004) and are recognized as extremely significant for VR tourism. In a *Second Life* context, Huang et al. (2012) demonstrate positive associations between VR tourists' involvement, the antecedents of flow, flow experience, and their intentions to travel. From 3D virtual worlds, hedonic motivations (e.g., positive emotions, emotional involvement, flow) have central roles in VR tourist behavior in a technology acceptance model (TAM) (Huang et al., 2013). VR tourists' enjoyment is also an important variable in a VR technology adoption context (Huang et al., 2016). In addition, flow is a key factor in explaining consumer beliefs, attitudes, and behavior in virtual travel communities (Gao, Bai, & Park, 2017). However, although hedonic motivation systems are significant in VR tourism, such research has not been conducted on a strong theoretical basis. Therefore, this study aims to develop and validate hedonic motivation systems related to VR tourism technology usage.

The role of TAM in information systems adoption has been then extensively documented (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh, 2000; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003). Tourism research has broadly applied the TAM to explain VR tourist behavior (Huang et al., 2013, 2016; Yung & Khoo-Lattimore, 2017). As an alternative TAM from online games, researchers have developed a hedonic motivation system adoption model (HMSAM) to highlight hedonic motivation systems for fun (Lowry, Gaskin, Twyman, Hammer, & Roberts, 2013; Lowry, Gaskin, & Moody, 2015). However, despite the significant effect of hedonic motivation systems on VR tourists, there is limited VR tourism research on consumers' continued use, particularly the HMSAM related to enjoyment and flow state.

When consumers adopt a certain technology for an activity (e.g., VR technology for tourism), they expect to experience subjective well-being (e.g., being satisfied, being happy) from using the technology. For example, users can receive psychological well-being, life satisfaction, and subjective well-being from using social media sites (Ellison, Steinfield, & Lampe, 2007; Valenzuela, Park, & Kee, 2009; Yoon, 2014). Social media usage for tourism-related purposes is also closely related to users' subjective well-being (Kim, Chung, & Ahn, 2014; Kim, Lee, & Bonn, 2017). VR gaming has even been identified as bringing players' subjective well-being even when they are ill (Li, Chung, & Ho, 2011; Singh et al., 2017). Therefore, given its potential significance, this study attempts to examine consumers' subjective well-being as a second target variable and continued use as a first target variable from using VR tourism in the HMSAM.

The differences between visitor and non-visitor groups is important to VR tourism providers when targeting market segments. In this study, visitor refers to a person who visited the place shown in VR tourism, while non-visitor refers to a person who did not visit the place shown in VR tourism. The importance of actual visiting experience as a criterion (i.e. as a moderator) for segmenting consumers on the basis of destination familiarity is critical for future visit intention (Tan & Wu, 2016; see also Davies & Prentice, 1995; Kirchberg, 1996; Krakover & Cohen, 2001; Pitts & Woodside, 1986). The visitor/non-visitor category is a significant moderator of destination image (Phillips & Jang, 2010; Sroypetch, Caldicott, & Carr, 2018) and destination marketing strategies (Riscinto-Kozub & Childs, 2012; Tan & Wu, 2016). It has also been reported that non-visitors and visitors to destinations are different in terms of personal values (Pitts & Woodside, 1986), interests (Davies & Prentice, 1995), and motivations (Riscinto-Kozub & Childs, 2012). Such findings reinforce the importance of knowledge of the moderating effect of visitor/non-visitor for the VR tourism industry.

Even though the moderating role of visitor/non-visitor is critical for market segmentation and product targeting, it has not yet been a focus of VR tourism studies. Accordingly, the purpose of this research is to build a theoretical framework by utilizing an HMSAM while incorporating perceived easiness, perceived usefulness, perceived enjoyment, flow state, and subjective well-being, continued use, and the moderating effect of visitor and non-visitor groups in VR tourism activities. Consequently, this study contributes to developing and testing the theoretical model of the HMSAM in VR consumers for continued use and actual visitation. Also, the moderating impact of visitors/non-visitors among perceived easiness, usefulness, and enjoyment and flow state offers market segmentation strategies to the VR tourism sector. With the use of HMSAM in flow theory and subjective well-being, it is believed that the results of this study will contribute greatly to the understanding of how VR tourism can be used to improve consumers' subjective well-being. Further, the results of study may be able to assist industries in developing effective promotional tools and market segmentation strategies to encourage VR consumers to continually use the technology.

2. Literature review

2.1. Theoretical background

2.1.1. Virtual reality tourism

VR can be defined as an interactive digital-generated medium that enables participants to experience simulated environments using the HMD of a VR device (Hobson & Williams, 1995). According to Williams and Hobson (1995), a 3D world is formed via a combination of visual, kinetic, and audio elements, so users experience the real object. Travel and tourism was an early adopter of the experiential potential of VR allowing experience of interplanetary voyages, trips to fantasy worlds, sporting events, and large theme parks (Dewailly, 1999). As technology developed, Lee and Oh (2007) found that VR tourism reduces customers' perceived anxiety or risk by familiarizing them with unfamiliar destinations or hotels. Guttentag (2010) suggests that VR has been used in six principal tourism-related areas: planning and management, heritage preservation, marketing, accessibility, education, and entertainment, with information provision a common commercial dimension (Huang et al., 2013).

VR has enjoyed a significant upswing of interest from tourism researchers and businesses (Jung, Claudia, Lee, & Chung, 2016; Jung, tom Dieck, Moorhouse, & tom Dieck, 2017; Tussyadiah et al., 2018). The 3D virtual world has provided opportunities for destination marketers to connect with potential visitors by providing an experience that enables prospective tourists to search tourism destinations (Huang et al., 2016), from the comfort of their homes before making the decision to visit (Stanley, 2017). Jung and tom Dieck (2017) find that the effective use of VR tourism in cultural heritage destinations provides co-creative value in tourists' pre-, onsite, and post-visit experience. In this study, the term VR tourism refers to using VR devices to play, enjoy, experience, travel, and explore information by looking at pictures, gaming,

watching 3D 360 degree videos, watching drone videos, looking at holographic images, and other tourism-related activities.

2.1.2. Hedonic motivation system adoption model

The hedonic motivation system has been found to have a strong positive relationship with using information systems and to assist in determining adoption for using digital technologies (Van Der Heijden, 2004). Hedonic motivation systems had a stronger positive relationship than utilitarian motivation systems in using product virtualization technologies with online apparel shopping (Kim & Forsythe, 2007). Hedonic performance expectancy (e.g., enjoyment) is found to be significantly related to cognitive absorption (e.g., flow state) in acceptance of hedonic volitional contexts (e.g., Facebook) (Lallmahomed, Nor, Ibrahim, & Rahman, 2013).

Hedonic motivations have explained users' technology adoption in relation to virtual game enjoyment (Hamari, 2015), hedonic health information systems (Li & Mao, 2015), and a virtual hotel (Mäntymäki & Riemer, 2014). Researchers have modified the TAM to be more appropriate in explaining the adoption of mainly intrinsic or hedonic motivation systems (i.e., gaming and using for fun). A HMSAM was suggested as an alternative model to TAM by Lowry et al. (2013), showing that flow as a full mediator is a powerful and appropriate predictor of behavioral intention to use VR. The HMSAM is particularly useful in elucidating gamification features of systems use, which emphasize enjoyment (hedonic motivation) and flow in the context of VR worlds (Lowry et al., 2013, 2015). The TAM is also applied to VR tourism, incorporating hedonic constructs to better understand VR tourists' behavior (Huang et al., 2013). An integrated TAM, including self-determination theory, is proposed by Huang et al. (2016) to predict VR tourists' behavioral intentions. However, research on VR tourism, particularly with the HMSAM, is regarded as potentially theoretically limited (Yung & Khoo-Lattimore, 2017).

Cognitive absorption is defined as the state of deep involvement, conceptualized as a second-order construct comprising control, curiosity, heightened enjoyment, focused immersion, and temporal dissociation (Agarwal & Karahanna, 2000). In the context of information technology, cognitive absorption as the optimal holistic experience is closely related to perceived hedonic performance (Deng, Turner, Gehling, & Prince, 2010). In the HMSAM, Lowry et al. (2013) applied cognitive absorption with four sub-constructs of curiosity, immersion, joy, and control as mediators for behavior intention to virtual game use. Importantly, flow state can be identified by two key characteristics of enjoyment and concentration, whereas cognitive absorption has dimensions beyond the scope of flow and is less related to intrinsic rewards (Chen, Zhang, Gong, Zhao, & Liang, 2017). Accordingly, this study chooses flow state rather than cognitive absorption as a key mediator of VR tourism use.

Based on the literature review, we extend HMSAM by including flow state as a cognitive absorption mediator, subjective well-being as a second target variable, continued use as a first target variable, and visitor/non-visitor as a moderator for testing a new context of tourism-related VR users. Thus, this study employs the HMSAM to identify consumer behavior in the context of VR tourism.

2.1.3. Flow theory

Flow theory has been one of key hedonic theoretical frameworks in examining consumer behavior in using technology (Huang, Backman, & Backman, 2010; Nah, Eschenbrenner, DeWester, & Park, 2010). Flow theory has been applied to information technologies to understand users' behavior on compulsive smartphone use (Chen et al., 2017), mobile social networking (Kim et al., 2017; Wang, Yan, Lin, & Cui, 2017), and online shopping (Wu, Chen, & Chiu, 2016). Moreover, flow theory is a valuable tool to recognize individuals' experiences when navigating virtual environments and the flow state has been identified as mediating the relationship between involvement and potential VR tourists' behavior (Huang et al., 2012). Lee and Jeong (2012) suggest that flow state is a mediator on associations among e-servicescape, emotion, and satisfaction in the context of the hospitality industry. In VR tourism environments, flow state has significant mediating effects between ease and intention to travel as well as between usability and behavioral intention (Huang et al., 2013). In tourism, mobile social media flow experience mediates between motivations (e.g., enjoyment, usefulness) and subjective well-being as well as between motivations and purchase intention (Kim et al., 2017). In virtual travel communities, flow has key mediating roles on the relationships among information quality, system quality, satisfaction, stickiness, and word-of-mouth (Gao et al., 2017).

Despite the recognized importance of the users' flow state in virtual tourism as a hedonic mediating variable, research has not been devoted to understanding VR tourists' continued use, particularly integrating antecedents of flow state in the HMSAM. In this study, we identify the antecedents of flow state as easiness, usefulness, and enjoyment. Perceived easiness has an effect on flow state as an antecedent, resulting in their continued use among smartphone users (Chen et al., 2017) and tourism virtual users (Huang et al., 2013). Perceived usefulness also significantly influences flow state, resulting in their behavioral intention in terms of travel virtual communities (Gao et al., 2017), e-servicescape (Lee & Jeong, 2012), and online shopping (Wu et al., 2016). Moreover, perceived enjoyment has a key role as an antecedent of flow state, resulting in users' well-being in the context of tourism social media (Kim et al., 2017), virtual games (Lowry et al., 2013), and leisure activities (Seifert & Hedderson, 2010). As shown in Table 1, in the context of innovative technologies, previous studies find that easiness, usefulness, and enjoyment are important antecedents of flow. Therefore, this study focuses on incorporating the HMSAM and flow theory, along with three antecedents of flow state, perceived enjoyment, perceived easiness, and perceived usefulness, in the VR tourism domain.

2.1.4. Subjective well-being

According to Diener (1984), subjective well-being is defined as experiencing happiness, including life satisfaction and positive affect, that can be acquired when a certain state, for example a goal or need, is reached. An individual with 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" (Diener, Suh, Lucas, & Smith, 1999, p. 295). Subjective well-being has been found to be associated with many desirable social and psychological outcomes, such as higher income, better physical and mental health, more optimistic outlook and meaningful relationships, and greater community involvement (Larsen & Eid, 2008).

Ellison et al. (2007), for example, found that Facebook can offer benefits to users with less self-esteem and lower life satisfaction. Valenzuela et al. (2009) suggest that individuals in healthy relationships have a specific degree of subjective well-being, and are engaged in specific actions by joining social media. Yoon (2014) claims that individuals can use social media to obtain subjective well-being that is related to inner feelings such as life satisfaction, happiness, and self-esteem. Further, use of information and communication technologies via mobile devices has been found to be positively related to many indicators of users' subjective well-being (Chan, 2015; Sum, Mathews, Pourghasem, & Hughes, 2008).

From tourism-related contexts, Kim, Chung et al. (2014) reveal that social media affect users' subjective well-being by providing an emotional perspective of social media with respect to pleasure, happiness, and satisfaction, rather than a cognitive perspective focused on the advantages of social media. From mobile social media sites for tourism activities, subjective well-being has highly significant impacts on users' purchase intention (Kim et al., 2017). More importantly, social media users' flow experience has highly significant impact on their subjective well-being (e.g., "The conditions of my life at the SM for tourism-

Table 1
Review of studies on flow theory and its antecedents (easiness, usefulness, and enjoyment).

Studies	Antecedents	Findings	Context
Chen et al. (2017)	Enjoyment (instant gratification); easiness (convenience)	Significant effect of easiness on flow; highly significant effect of enjoyment on flow; great impact of flow on compulsive smartphone use	The desirability–feasibility perspective and reinforcement sensitivity theory
Gao et al. (2017)	Usefulness (system and information quality)	System and information quality have significant effect on flow that influences satisfaction a and word of mouth	Sustained participation in virtual travel communities
Huang et al. (2013)	Easiness; usefulness	Significant effect of easiness on flow; highly significant influence of usefulness on flow; great impact of flow on behavioral intention	VR worlds for travel and tourism marketing; hedonic constructs
Kim et al. (2017)	Usefulness; enjoyment	Enjoyment has a significant effect on flow experience, which in turn influence subjective well-being and purchase intention	Travel-related purchase intentions among mobile social media users
Lee and Jeong (2012)	Usefulness (E-servicescape)	E-servicescape influence flow experience that lead to emotion and satisfaction related to behaviors	The lodging industry in the holistic perspective
Lowry et al. (2013)	Easiness; perceived usefulness enjoyment(joy)	Easiness has highly significant effects on usefulness as well as enjoyment that leads to flow state (immersion)	Taking fun and games seriously applied the HMSAM
Seifert and Hedderson (2010)	Enjoyment (intrinsic motivation)	Intrinsic motivation can derives a rich, subjective experience characterized by a sense of freedom, euphoria and efficacy, challenge and satisfaction (i.e., flow)	Flow phenomenon and its relationship with intrinsic motivation
Wu et al. (2016)	Perceived usefulness	Perceived usefulness has positive impact on flow experience that influences online impulse buying	Online impulse purchasing; technology use

related activities are excellent") in the context of tourism-related activities (Kim et al., 2017). In the VR game context, research on subjective well-being has been well documented as improving mental and physical health (Li et al., 2011; Singh et al., 2017). Noticeably, enjoyment and flow from VR worlds have a critical role in enhancing users' satisfaction (e.g., subjective well-being) in the context of HMSAM (Lowry et al., 2013, 2015). Despite the considerable role of subjective well-being from consumers' technology use, research is largely neglected on the subjective well-being of VR tourists. Therefore, this study aims to examine subjective well-being as a second target variable and continued use as a first target variable with the HMSAM and flow theory in VR tourism settings.

2.2. Hypothesis development

2.2.1. Relationship between perceived easiness and flow state

Perceived easiness is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 320). In an extension of the TAM, perceived easiness has a significant role in using a technology through usability and usage behavior (Venkatesh & Davis, 2000). Perceived easiness is a vital element influencing individual acceptance as well as the intention to use of information technologies in three extended TAMs (Venkatesh, 2000). In the context of VR tourism TAM, perceived easiness is associated with intention to travel (Huang et al., 2013). Hence, this study considers perceived easiness as an input factor in an alternative TAM of the HMSAM for VR tourism.

From online games in HMSAM, players' easiness significantly influences their joy, which in turn influences immersion of flow state (Lowry et al., 2013). In the context of understanding compulsive smartphone use, convenience (i.e., perceived easiness) has a significant impact on smartphone users' flow (Chen et al., 2017). Moreover, VR tourists' perceived ease of use has a significantly positive effect on their flow experience (Huang et al., 2013). In association with the literature review, this research proposes:

H_1. Perceived easiness has a positive effect on flow state of VR tourists.

2.2.2. Relationship between perceived usefulness and flow state

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). In a TAM, usability strongly influences consumers' intentions, explaining more than half of the variance in behaviors of their computer technology adoption (Davis et al., 1989). From a HMSAM, usefulness plays key role in explaining game players' behavior intention to use (Lowry et al., 2013). Among VR tourists, perceived usefulness is closely related to key variables to predict consumers' behavioral intention (Huang et al., 2013, 2016). Accordingly, this study regards perceived usefulness as an important input variable in the HMSAM for VR tourism.

Significantly positive association between usefulness and flow experience is found if the extrinsic motivations (e.g., usefulness) are self-determined (Lee, 2005). From research on information technology users, Sharafi, Hedman, and Montgomery (2006) suggest that the flow experience occurs when the users are able to master efficiency and productivity in order to be useful. In the online technology use, e-servicescape (e.g., perceived usefulness) has a significant effect on flow experience that influences users' emotion and satisfaction (Lee & Jeong, 2012). In a perspective of both impulse shopper and system users, perceived usefulness has a significant effect on flow experience that influences users' online impulse buying (Wu et al., 2016). In virtual tourism websites, flow is significantly influenced by system and information quality (i.e., usefulness) (Gao et al., 2017), and it is presumed that perceived usefulness is associated with flow state. Furthermore, usability substantially influences flow during virtual travel experiences (Huang et al., 2013). Accordingly, the following hypothesis is proposed in VR tourism;

H_2. Perceived usefulness has a positive effect on the flow state of VR tourists.

2.2.3. Relationship between perceived enjoyment and flow state

Enjoyment has been a vital hedonic element in elucidating human behavior in relation to use of technology. Venkatesh (2000, p. 351) defines enjoyment as "the extent to which the activity of using specific system is perceived to be enjoyment in its own right aside from any performance consequence resulting from system use." In mobile social media sites, enjoyment plays a highly significant role in better understanding users' behavior (Kim et al., 2017). Moreover, joy as enjoyment has a leading impact on immersion as a flow state in the HMSAM among online game players (Lowry et al., 2013). Enjoyment also has a vital role in predicting VR consumers' behavioral intention to an actual visit to the destination (Huang et al., 2016). The effect of enjoyment on attitude change confirms VR tourism as a hedonic experience (Tussyadiah et al., 2018). Grounded in the studies above, this research takes perceived enjoyment as a hedonic-input variable in the VR tourism context.

Van Der Heijden (2004) suggests that perceived enjoyment specifies

the extent that consumers obtain fun from searching hedonic information technology systems. The relationship between enjoyment and the flow of individuals' experience with peak performance is significant (Seifert & Hedderson, 2010). Keller, Ringelhan, and Blomann (2011) find that enjoyment of an activity that needs a challenging skill and task results in a flow experience. Moneta (2012) finds that flow experiences are derived from enjoyment of the interaction of personality attributes. For intrinsic motivations, enjoyment greatly influences flow experience among mobile social media users (Kim et al., 2017). In the context of VR gaming, joy has a highly significant impact on immersion as a flow state which in turn influences behavior intention to continuously use VR games (Lowry et al., 2013). In other words, if a player's enjoyment increases during VR gameplay, the player will become immersed at that time, reaching high levels of flow (Lowry et al., 2013). Based on these previous studies, this research posits the next hypothesis specific to VR tourism:

H_3. Perceived enjoyment has a positive effect on flow state of VR tourists.

2.2.4. Relationship between flow state and subjective well-being

The flow experience is closely and positively associated with subjective well-being (Vittersø, 2004). Carpentier, Mageau, and Vallerand (2012) find that the greater an individual's passion, the more they tend to experience flow in a preferred activity, which then leads to improved subjective well-being. Cheng and Lu (2015) found a positive relationship between a higher degree of flow experience from surfing activities and the subjective well-being of surfers. The optimal flow state of completely involved experiences are regarded as a means for an individual to attain a good life (Csikszentmihalyi, 1990), implying that the flow experience is closely related to subjective well-being. Asakawa (2010) also suggests that people who experience flow states more frequently in their everyday lives are more likely to have higher well-being than their counterparts.

In tourism-related activities, consumers who have a higher flow experience from mobile social media are more likely get higher subjective well-being rather than their counterparts (Kim et al., 2017). Pleasure from playing VR games (i.e., flow state) is positively related to users' psychological subjective well-being (i.e., subjective well-being) (Li et al., 2011). Positive emotion from playing VR games (i.e., flow state) also increases players' psychological well-being (i.e., subjective well-being) (Singh et al., 2017), and it is assumed that potential tourists' flow state from using VR tourism leads to their subjective well-being. In accordance with the literature, this research posits the next hypothesis with respect to VR users of tourism products and services:

H_4. Flow state of VR tourists has a positive effect on their subjective well-being.

2.2.5. Relationship between flow state and continued use

Continued use is defined as "consumers' intentions to use information systems again following initial uses, and continued use of the information systems are influenced by experience" (Bhattacherjee, 2001, p. 351). Bhattacherjee and Sanford (2006) claim that consumers' continued use is a key element to a lot of e-commerce companies to survive. Satisfying users' needs increases their continued usage by providing social networking, information, or services (Chen & Lee, 2008). In mobile tourism shopping sites, continued usage by shoppers is a critical target variable that leads to repurchasing from the shopping sites (Kim, Chung, Lee, & Preis, 2016a). Continued use of social virtual worlds is also highly influenced by users' feelings of satisfaction, enjoyment, and gratification (Jung, 2011). Considering the importance of consumers' continued use, this study takes continued use as a main target variable for VR tourism.

Emotional involvement (e.g., flow state) of consumer experiencing tourism by VR wearable devices (e.g., head-mounted displays) influences the intention to travel to destinations (Marasco, Buonincontri, van Niekerk, Orlowski, & Okumus, 2018). In mobile social media for tourism shopping, consumers' flow experience predicts their purchase intention that is derived from continued use of the mobile social media site (Kim et al., 2017). The flow experience of users in virtual worlds also influences their intention to travel to a tourist attraction (Huang et al., 2010). In VR tourism, consumers' flow experience influences their intention to travel in the future (Huang et al., 2013). Consumers' flow experience in virtual travel communities influences their word of mouth that increases the likelihood of continued use (Gao et al., 2017). Interestingly, flow experience is an important factor in affecting online impulse buying in both impulse shoppers and system users (Wu et al., 2016). In addition, smartphone users' flow experiences are positively associated with compulsive smartphone use (Chen et al., 2017). In accordance with previous studies, this research therefore believes consumers who experience the flow state in VR are more likely to progress their intent to continuously use VR tourism:

H_5. Flow state from VR tourism has a positive effect on consumers' continued use.

2.2.6. Relationship between subjective well-being and continued use

Once consumers obtain subjective well-being from a certain activity, consumers may want to continue undertaking the activity. Contentment with the experience of using social virtual worlds leads to continued usage of such worlds (Jung, 2011). Among social media users, the subjective well-being derived from using social media highly influences social media use (Yoon, 2014). Cheng and Lu (2015) find that when surfers experience a high degree of subjective well-being it influences the continued intention to engage in surfing activities. Kim, Chung et al. (2014) suggest that users of social media having higher degrees of subjective well-being from such media are more likely to intend to use the social media continuously. Consumers' subjective well-being from using the tourism social media sites influences their continued purchase from the sites (Kim et al., 2017).

Importantly, subjective well-being associated with using technologies leads to users' behavioral intention to continuously use those technologies (Chiu, Cheng, Huang, & Chen, 2013; Jin, 2014; Kim, Chung et al. (2014); Li et al., 2011; Li, Shi, & Dang, 2014; Singh et al., 2017). In addition, the loyalty of users of social media (i.e., intention to continue using and positive word of mouth) is affected by their psychological well-being (Chiu et al., 2013). Psychological well-being gained from social media use brings users life satisfaction (Jin, 2014; Li et al., 2014), and it is presumed that subjective well-being influences continued use. Thus, this study anticipates that subjective well-being from VR tourism activities will be positively associated with the continued use of the VR tourism activities:

H_6. Subjective well-being from using VR tourism has a positive effect on continued use of VR tourism.

2.2.7. Moderating effect of visitors/non-visitors

There is a well-established literature on the differences between visitors and non-visitors in terms of destination image (Hughes, 2008; Schofield, Phillips, & Eliopoulos, 2005). Cognitive and affective image are regarded as significantly dissimilar between visitors and non-visitors to New York (Phillips & Jang, 2010). Significant differences between visitors and non-visitors across Thai destination attributes, revealed that visitors have much more positive image of the country than non-visitors (Sroypetch et al., 2018). Images of visitors and non-visitors to London are found to be different with respect to their level of specificity and vagueness: vagueness is a typical characteristic of non-visitors' image with people who have never been to London often holding inaccurate and unreal images, whilst the images held by visitors were more specific (Stylidis & Cherifi, 2018). Based on the previous literature, we expect that perceptions on VR tourism activities are

different between visitors and non-visitors.

Furthermore, studies on visitor and non-visitors have found many differences between the two segments. For example, it has long been recognized that understanding the dissimilarities between visitors and non-visitors is essential to identifying tourism market segments (Davies & Prentice, 1995). Dissimilarities have been identified between visitors and non-visitors with respect to consumers' socioeconomic, demographic, and geographic characteristics (Kirchberg, 1996) and their travel decision-making (Pitts & Woodside, 1986). At major heritage attractions in Israel, visitors and non-visitors are more distinguishable via socio-demographic traits than previous experience (Krakover & Cohen, 2001). In winery settings, visitors and non-visitors differ in attitudes, identification of barriers, leisure preferences, indoor recreational favorite, travel planning, and local purchasing (Riscinto-Kozub & Childs, 2012). Tan and Wu (2016) also indicate the importance of experience as a criterion for segmentation and demonstrate the value of a critical examination of non-visitors regarding how destination marketing organizations can formulate effective strategies for both visitors and non-visitors. In order to better segment tourist markets, this research therefore argues that the visitor and non-visitor groups have moderating effects in VR tourism as articulated in the following three hypotheses:

H_{7a}. Visitors and non-visitors significantly differ in the relationship between perceived easiness and flow state.

H_{7b}. Visitors and non-visitors significantly differ in the relationship between perceived usefulness and flow state.

H_{7c}. Visitors and non-visitors significantly differ in the relationship between perceived enjoyment and flow state.

In association with the study's hypotheses, the theoretically comprehensive model is proposed in Fig. 1. The framework displays proposed associations among perceived easiness, perceived usefulness, perceived enjoyment, flow state, subjective well-being, continued use, and visitors/non-visitors as a moderator in VR tourism activities.

3. Methods

3.1. Measurements

This study employed previously validated multi-measurement items to overcome the disadvantage of single items (Churchill, 1979). The survey questionnaire in this study initially included 26 items for 6 constructs as presented in Fig. 1. The constructs consists of perceived easiness, perceived usefulness, perceived enjoyment, flow state, subjective well-being, and continued use. Specifically, four items of perceived easiness were used from Davis (1989) and Davis et al. (1989) (e.g., "It is easy for me to understand how to manipulate the tourism-related VR activity"). Four items to assess perceived usefulness were taken from Venkatesh (2000), Venkatesh and Davis (2000), and Venkatesh et al. (2003) (e.g., "I gain knowledge from using the tourism-related VR activity"). Perceived enjoyment was gauged by utilizing four questions derived from Lowry et al. (2013, 2015) and Venkatesh and Bala (2008) (e.g., "Using the tourism-related VR activity is enjoyable for me").

Five items were adapted from prior research (Csikszentmihalyi, 1975; Nah et al., 2010) to measure the flow state (e.g., "When I am using the tourism-related VR activity, I feel totally captivated"). To evaluate subjective well-being, five questions were derived from prior literature by Diener (1984), Diener et al. (1999), and Ellison et al. (2007) (e.g., "Using the tourism-related VR activity is part of my ideal life"). To assess continued use, four questions were drawn from Bhattacherjee and Sanford (2006) and Kim, Chung et al. (2016) (e.g., "I will continue to use tourism-related VR activities in the future"). All the items were evaluated by a 7-point Likert-type scale ranging from strongly disagree (1) to strongly agree (7). In addition, five questions associated with VR tourism activities (length of experience, time spent per experience, primary motivation, visit/non-visit, and frequency of accessing) were used based on the literature (Kim, Lee, Chung, & Kim, 2014; Kim, Lee, & Bonn, 2016c). Six questions related to socio-demographics (i.e., gender, age, monthly household income, education, occupation, and marital status) were also included.

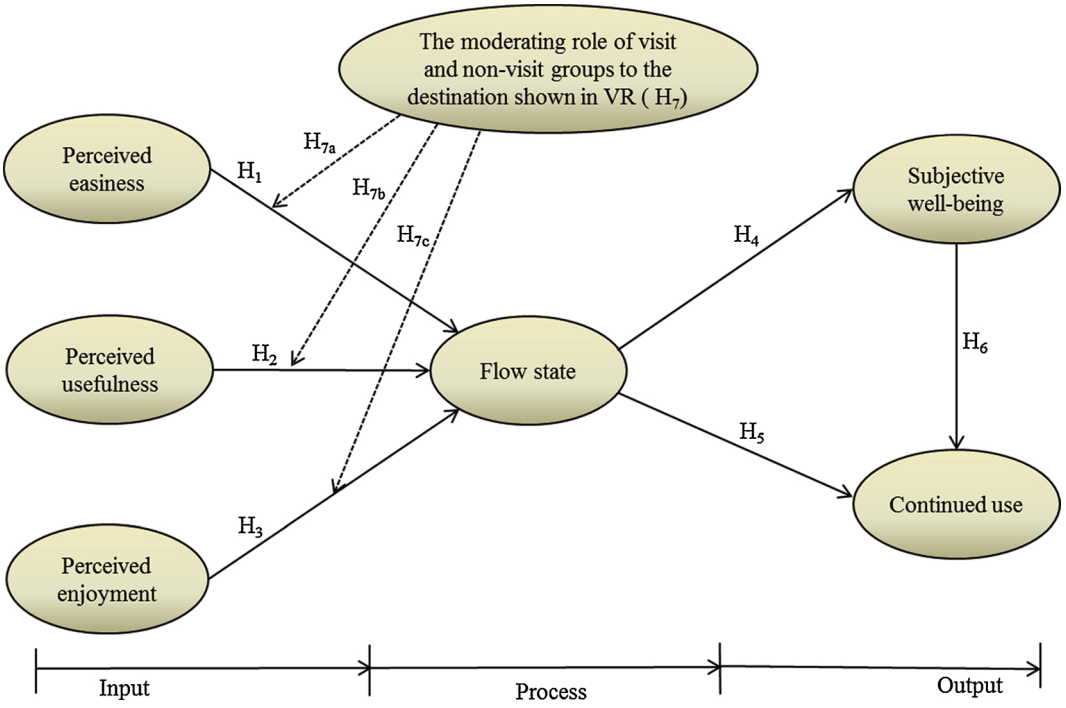

Fig. 1. Proposed research model.

The survey instrument was first generated in English and then translated into Korean by professionals who are proficient in English and Korean. The survey instrument was then back-translated into English, with discrepancies then remedied between English and Korean expressions (Brislin, 1970). Three scholars who know the study topic well evaluated the content validity of the survey questions. In addition, three practitioners of VR technology were asked to evaluate whether the questionnaire appropriately assessed VR consumer behaviors. Based on these processes, one item for flow state ("Experiencing the VR tourism content often makes me forget where I am") and one item for subjective well-being ("So far, I have gotten the important things I want by experiencing the VR tourism content") were eliminated from the questionnaire because of their overlapping meaning. A pilot test of the questionnaire was administered to five graduate students who majored in tourism. Several items on perceived easiness, usefulness, and enjoyment and flow state were reworded following their comments. A pretest was also administered to 50 students who had engaged in VR tourism within the previous 12 months. This procedure resulted in further revision of some ambiguous items on subjective well-being and continued use to ensure clarity. The modified questionnaire was then used for the final survey.

3.2. Data collection

Because of their fast response rates and cost effectiveness online surveys are now commonly used (Wright, 2005). An online survey is considered particularly appropriate as a data collection method in this study because it investigates consumer usage in VR tourism (Huang et al., 2013, 2016). An online survey company, Macromill Embrain (www.embrain.com) with Asia's largest panel of three million panelists, was employed to collect samples for the study. The online survey company strictly adheres to consumer sample selection to ensure data quality. To compare and verify respondent's personal information the survey company first used panel registration numbers and individuals' legitimate names. Second, surveys completed too quickly or repeatedly were identified and removed. Third, respondents who were not qualified by the screening question for participation in the research were removed from subjects by the survey system. Fourth, the multiple-choice items were rotated so every respondent had their own set of items in order to avoid response bias. Fifth, subjects were questioned to present the activity name of the VR tourism that they had recently experienced. The name of the VR activities stated by the respondent was represented on each question of the questionnaire for all following questions.

In the current research, the subjects were Koreans who were 19 years old or over and who had experience with VR tourism within the prior 12 months. A quota sampling method was employed for mobile Internet users based on the VR users' age and gender (Korea Internet Security Agency, 2017). The online survey was administered from October 30 to November 25, 2017. Providing the objective of the research as well as the security of personal information, an invitation was designed for research participation. Based on panel databases of the survey company, the invitation was randomly sent via email to 5,813 subjects among 1.2 million Korean panel members. Of the 2034 respondents who opened the email, 1,756 respondents linked to the Internet invitation. All subjects were requested to state whether they had previously experienced VR tourism in the selecting question which was purposely designed for this survey (i.e., "In the past 12 months, have you had any experience with tourism-related VR activities?"). Via the screening question, 753 panelists who responded "yes" to this question were eligible to complete the survey. Of these, 469 respondents completed the questionnaire as usable samples. Since there were no outliers or omitted answers, all 469 subjects were utilized for the analysis, indicating a response rate of 62.3% (American Association for Public Opinion Research, 2016, p. 58).

3.3. Data analysis

To examine the suggested study framework, this research employed partial least squares (PLS)-structural equation modeling (SEM) analysis for the following reasons. First, PLS-SEM requires minimal criteria for sample size, measurement scales, and residual distributions in order to validate a model with bootstrap re-sampling method as a non-parametric approach unlike traditional covariance-based SEM (Chin, Marcolin, & Newsted, 2003). Second, for complicated models or multi-group analysis (MGA), PLS-SEM has been suggested as being more appropriate than traditional SEM (Hair, Sarstedt, Ringle, & Mena, 2012). In addition, SmartPLS introduced an algorism to simultaneously analyze multiple mediation effects (i.e., indirect effects) automatically in a model (Ringle, Wende, & Becker, 2015). Thus, SmartPLS 3.2.7 was applied in order to analyze the measurement and structural models in this study.

Common method variance might be a potential issue since respondents were asked to rate all survey questions at once with the same subjects. Thus, precautions were taken using several procedural remedies to address common method bias (Conway & Lance, 2010; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). First, to select only respondents who had experienced VR tourism activities during past year, a screening question was employed. Second, the introduction section of the questionnaire incorporated the study's purpose and statement assuring anonymity of all respondents. Third, the survey instructions noted there are no right or wrong answers to each item so as to decrease respondent apprehension. Fourth, at the beginning of the survey, the definition of important concepts (e.g., tourism-related activities, VR usages) and main constructs (e.g., subjective well-being) was clearly explained to help ensure response validity. Fifth, there are three sections in the questionnaire. For example, the first section incorporated definitions about VR tourism activities, the second section incorporated questions related to the hypotheses, and the third section incorporated demographic characteristics. Lastly, to reduce response bias, orders of scaled questions were randomly rotated for each respondent.

As a post hoc statistical test, Harman's single-factor test was implemented to check whether the resultant data set has common method bias (Harman, 1967). This study conducted exploratory factor analysis (EFA) for all self-reported survey items. Based on Podsakoff et al. (2003), if a single factor appears and/or a factor has more than 50% of the variance of factors in this process, common method bias is an issue. The EFA results indicate that five variables were delineated (eigenvalue > 1), representing 72.0% of all factors including the first factor (45.3%) and subsequent factors (8.1%, 7.9%, 6.0%, and 4.8%). Because the single-factor test has some limitations (Chin, Thatcher, & Wright, 2012), a marker variable approach was also employed using a PLS algorithm. In the PLS-SEM framework, a marker variable (i.e., consumers' negative emotional response to VR tourism experience) was used to calculate the correlations of all theoretical constructs. The corrections of the marker variable with the six constructs of the research model were perceived easiness (−0.115), perceived usefulness (−0.061), perceived enjoyment (−0.302), flow state (−0.107), subjective well-being (−0.120), and continued use (−0.292). The resultant average of the squared multiple corrections with the marker variable was 0.036 for the theoretical constructs, which is small and insignificant as compared to the cutoff (0.1) (Lindell & Whitney, 2001). Moreover, we have assessed a full collinearity test by PLS-SEM so variance inflation factors (VIFs) are generated for all latent variables in the research model. As shown in Table 2, all VIFs resulting from the full collinearity test are equal to or lower than 3.3, the model can be considered free of common method bias (Kock, 2015). Therefore, the traditional single-factor test, the marker-variable method, and the full collinearity assessment reveal common method variance in this study is not an issue.

4. Results

4.1. Sample profile

Slightly more than a half of respondents were females (52.0%) and a quarter of respondents were in the 40–49 years old bracket (25.9%). The majority of respondents were attending university or had a university degree (65.9%) and were single (63.4%). More than a third of participants was office workers (42.8%) and earned monthly household incomes of KRW (Korean Won) 4.00–5.99 million (35.2%) (US$ 1 was equivalent to KRW 1,065). Almost half of participants experienced VR tourism from 6 to 12 months prior to undertaking the questionnaire (48.5%) and spent time from10 to 29 min per each VR tourism session (71.3%). The respondents' main motivation to enjoy VR tourism was playing (52.3%) and a half of participants experienced VR tourism once a year or more (55.8%).

4.2. Grouping check

Visit and non-visit groups to the destination shown in VR were measured using a question of general information ("Have you ever visited any places after you have experienced them using VR?"). Based on the item of destinations, respondents were split into two groups by saying 'yes' or 'no' respectively. Of 469 respondents, the visit group had 159 respondents (33.9%), whereas the non-visit group had 310 respondents (66.1%). To identify differences and similarities between visit and non-visit groups, this study conducted the multi-group analysis (MGA) using PLS-SEM algorithm and bootstrapping 1,000 resamples.

Table 2
Full collinearity test for inner VIF value.

Hypothesis	Input variable	Output variable	Inner VIF value
H_1	Perceived easiness	Flow state	1.510
H_2	Perceived usefulness	Flow state	1.467
H_3	Perceived enjoyment	Flow state	1.695
H_4	Flow state	Subjective well-being	1.000
H_5	Flow state	Continued use	1.494
H_6	Subjective well-being	Continued use	1.494

4.3. Measurement model

Confirmatory factor analysis (CFA) was conducted on the measurement model (Kline, 2011). One for subjective well-being was found to share residual variance with benefit construct, resulting in it being dropped (Hair, Black, Babin, & Anderson, 2010). As illustrated in Table 2, the analysis was applied for the remaining 23 items. Validity assessment of reliability, convergent, and discriminant was subsequently executed (Stevens, 2009). As illustrated in Table 3, the composite reliability and Cronbach's α of each concept were greater than 0.70, validating the reliability and satisfying internal consistency (Campbell & Fiske, 1959). Furthermore, each concept's average variance extracted (AVE) was higher than 0.5 (Hair et al., 2010), confirming convergent validity. Also, discriminant validity was assured since the square root of the AVE of each concept was higher than the corresponding concept correlation (Fornell & Larcker, 1981).

4.4. Structural model

Fig. 2 displays the PLS-SEM's results, which evaluated the suggested research model (Ringle et al., 2015). Each of the endogenous variables had ample variance explained as the R square (R^2) for flow state (35.1%), subjective well-being (33.1%), and continued use (39.2%). Both path estimates and *t*-statistics were estimated for testing the hypotheses applying a PLS bootstrapping method since the data was not found to have multivariate normality in this study as displayed in Table 2 (Hair et al., 2012; Stevens, 2009). As a non-parametric method, bootstrapping includes large numbers of re-samplings to assess sampling distribution of statistics of the shape (Chin et al., 2003). Results show that relationships between perceived usefulness and flow state ($\gamma = 0.149$, t-value = 3.220, $p < 0.01$) as well as between perceived enjoyment and flow state ($\gamma = 0.474$, t-value = 9.079, $p < 0.001$) were significant. Also, flow state had positive effects on subjective well-being ($\beta = 0.575$, t-value = 16.116, $p < 0.001$) as well as continued use ($\beta = 0.300$, t-value = 5.803, $p < 0.001$). Moreover, continued use

Table 3
Results of confirmatory factor analysis.

Construct	Items	Factor loading	t-value	Skew-ness	Kurtosis
Perceived easiness	1. It is easy for me to understand how to manipulate the tourism-related VR activity.	0.851	44.786	−0.614	0.898
	2. Using the tourism-related VR activity does not require a lot of mental effort.	0.767	19.819	−0.274	0.019
	3. I think that using the tourism-related VR activity is simple.	0.886	54.930	−0.571	0.779
	4. I find that it is easy to get what I want when I am using the tourism-related VR activity.	0.831	39.194	−0.338	0.379
Perceived usefulness	1. I gain knowledge from using the tourism-related VR activity.	0.877	38.349	−0.400	0.464
	2. Using the tourism-related VR activity is useful to collect information.	0.874	39.840	−0.397	0.309
	3. Using the tourism-related VR activity is beneficial.	0.886	57.469	−0.579	0.882
	4. Using the tourism-related VR activity allows me to form friendships with other users.	0.789	27.156	−0.364	0.326
Perceived enjoyment	1. Using the tourism-related VR activity is enjoyable for me.	0.916	84.752	−0.475	0.862
	2. Using the tourism-related VR activity is pleasurable for me.	0.935	131.747	−0.615	0.769
	3. Using the tourism-related VR activity is fun for me.	0.903	78.297	−0.705	*1.308*
	4. Using the tourism-related VR activity keeps me happy.	0.875	65.193	−0.356	0.635
Flow state	1. When I am using the tourism-related VR activity, I feel totally captivated.	0.850	50.599	−0.516	0.250
	2. When I am using the tourism-related VR activity, time seems to pass very quickly.	0.862	53.764	−0.657	0.961
	3. When I am using the tourism-related VR activity, I forget all concerns.	0.880	71.083	−0.580	0.531
	4. Using the tourism-related VR activity often makes me forget where I am.	0.747	25.070	−0.202	−0.408
Subjective well-being	1. Using the tourism-related VR activity is part of my ideal life.	0.763	24.915	−0.343	−0.293
	2. The conditions of my life at using the tourism-related VR activity are excellent.	0.818	32.929	−0.289	0.434
	3. I am satisfied with my life when I am using the tourism-related VR activity.	0.892	74.426	−0.355	0.721
	4. So far, I have gotten the important things I want by using the tourism-related VR activity.[a]	–	–	–	–
Continued use	1. I will continue to use tourism-related VR activities in the future.	0.853	43.058	−0.607	*1.099*
	2. I will update tourism-related VR activities in the future.	0.910	89.079	−0.438	0.620
	3. I will search for tourism-related VR activities in the future.	0.878	62.684	−0.145	0.051
	4. I will continue to use tourism-related VR activities in the future.	0.907	88.492	−0.456	0.639

Note: Figures in italics have non-normal distribution.
[a] Items were deleted according to confirmatory factor analysis.

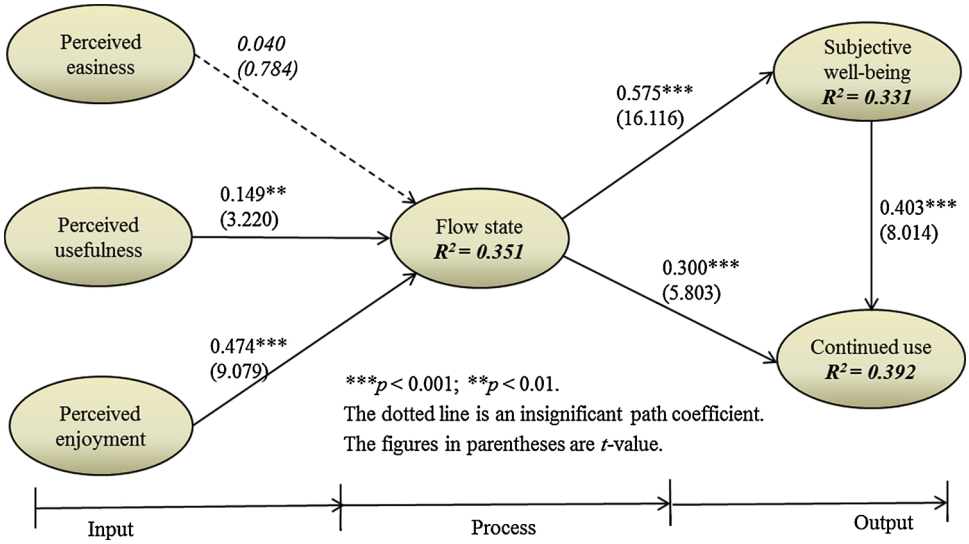

Fig. 2. Results of path analysis.

Table 4
Reliability and discriminant validity.

Construct	Correlation of the constructs					
	(1)	(2)	(3)	(4)	(5)	(6)
(1) Perceived easiness	**0.835**					
(2) Perceived usefulness	0.446	**0.857**				
(3) Perceived enjoyment	0.554	0.535	**0.908**			
(4) Flow state	0.369	0.421	0.576	**0.836**		
(5) Subjective well-being	0.463	0.505	0.554	0.575	**0.826**	
(6) Continued use	0.530	0.575	0.703	0.532	0.576	**0.887**
Composite reliability	0.902	0.917	0.949	0.903	0.865	0.937
Cronbach's alpha (α)	0.856	0.880	0.929	0.856	0.764	0.910
AVE	0.697	0.735	0.824	0.700	0.682	0.787
Mean[a]	4.774	4.564	4.947	4.398	4.397	4.784
Standard deviation	0.933	1.010	0.990	1.096	0.952	1.031

Note: "All boldfaced diagonal elements appearing in the correlation of constructs matrix indicate the square roots of AVEs" (Bhattacherjee & Sanford, 2006, p. 815).

[a] 7-point Likert scale.

was influenced by subjective well-being (β = 0.403, t-value = 8.014, p < 0.001). Hence, H_2, H_3, H_4, H_5, and H_6 were supported. Lastly, perceived easiness has an insignificant effect on flow state (γ = 0.040, t-value = 0.784, p > 0.05), thus H_1 was not supported (Fig. 2).

To test the moderating role of visit/non-visit groups among perceived easiness, usefulness, and enjoyment and flow state, H_{7a}, H_{7b}, and H_{7c} were assessed. PLS-SEM was used to perform MGA to compare relationships between perceived easiness and flow state, perceived usefulness and flow state, and perceived enjoyment and flow state across the visit and non-visit groups. Table 4 shows that the difference of visit and non-visit groups between perceived usefulness and flow state was significant (visit group: γ = 0.367 > non-visit group: γ = 0.048, p < 0.001). Therefore, the finding supported H_{7b}. The differences of visit and non-visit groups between perceived easiness and flow state as well as perceived enjoyment and flow state were insignificant, thus, H_{7a} and H_{7c} were not supported.

Multicollinearity of each independent variable was diagnosed, applying the VIF. Since all VIF values of the variables fell from 1.000 to 1.695, multicollinearity was not an issue from the data (Hair et al., 2010, 2012).

4.5. Mediating effect

PLS bootstrap resampling was applied to examine the mediating roles of flow state and subjective well-being in the model. As indicated in Table 5, perceived usefulness had significantly positive indirect effects on subjective well-being (γ = 0.086, t-value = 3.010, p < 0.01) as well as continued use (γ = 0.045, t-value = 2.573, p < 0.05), along with the indirect effect of flow state on continued use (β = 0.035, t-value = 2.674, p < 0.01). Also, enjoyment had indirect impact on subjective well-being (γ = 0.273, t-value = 7.010, p < 0.001) and continued use (γ = 0.142, t-value = 4.460, p < 0.001), along with the indirect effect of flow state on continued use (β = 0.110, t-value = 5.267, p < 0.001). Thus, flow state as well as subjective well-being played significant mediating roles in the model, except perceived easiness (Table 6).

4.6. Inclusion of control variables

To determine whether there are demographic influences on the research model, this study tested age, education, gender, occupation, marital status, and income as control variables, using bootstrap 1,000 re-samples by PLS algorithm. This analysis confirms the additional variable bias and verifies the research model. Specifically, the six demographic variables were controlled to warrant a precise assessment of the relationship between subjective well-being and continued use. Control variables are included to test whether research hypotheses can be still held. Fig. 3 shows the hypotheses of the research model within control variables. Results indicate that the data supported six hypotheses when demographic variables are included. Therefore, the results support the argument that control variables of age, gender, education, occupation, marital status, and income are not biased toward current outcomes.

5. Discussions and conclusions

5.1. Discussion

The main results of this study in the VR context are consistent with those of previous research that hedonic performance expectancy (e.g., enjoyment) is found to be significantly related to cognitive absorption (e.g., flow state) in acceptance of hedonic volitional contexts (e.g.,

Table 5
Results of multi-group analysis on visitor and non-visitor groups.

Hypothesis	Path	Visitor group (A)	Non-visitor group (B)	A-B	p value	Hypothesis test
H_{7a}	Perceived easiness → Flow state	0.140^{ns}	0.013^{ns}	0.128	> 0.127	Not supported
H_{7b}	Perceived usefulness → Flow state	0.367^{***}	0.048^{ns}	0.319	< 0.001	Supported
H_{7c}	Perceived enjoyment → Flow state	0.257^{**}	0.553^{***}	0.296	> 0.998	Not supported

ns = non-significant; ***p < 0.001; **p < 0.01.

Table 6
Testing mediating effects.

Path	Indirect effect
Perceived easiness → Flow state → Subjective well-being	0.023^{ns}
Perceived easiness → Flow state → Continued use	0.012^{ns}
Perceived easiness → Flow state → Subjective well-being → Continued use	0.009^{ns}
Perceived usefulness → Flow state → Subjective well-being	0.086^{**}
Perceived usefulness → Flow state → Continued use	0.045^{*}
Perceived usefulness → Flow state → Subjective well-being → Continued use	0.035^{**}
Perceived enjoyment → Flow state → Subjective well-being	0.273^{***}
Perceived enjoyment → Flow state → Continued use	0.142^{***}
Perceived enjoyment → Flow state → Subjective well-being → Continued use	0.110^{***}

ns = non-significant; *p < 0.5; **p < 0.01; ***p < 0.001.

Facebook) (Lallmahomed et al., 2013). From the results, six out of nine hypotheses are supported (details are shown in Fig. 2 and Table 4).

Specifically, we found that the perceived easiness of using VR activities insignificantly influence the flow state from VR use. The results are consistent with those of prior studies that perceived ease of use is less likely to be a determinant of affection state and usage intention with mobile devices (Kim, Kim, Kim, & Kim, 2016b). Possible reasons for these results are that current information technologies can be regarded as highly user-friendly so that perceived ease of use does not influence users' flow state in the VR environment. This study confirms that perceived usefulness can become an antecedent to flow state. That is, if people find that using VR content is highly beneficial, then they are likely to develop a flow state. As a result, perceived usefulness would have a direct effect on VR users' flow state, indicating an important evidence of the mediating role of flow experience in the motivations and outcomes consistent with the finding of research (Wu et al., 2016). We also confirm that perceived enjoyment can indeed become a critical precursor stage to VR users' flow state. That is, if people find using VR content is intrinsically rewarding, so as to be highly enjoyable and happy, then their flow state is likely to be well developed. This finding provides additional empirical evidence regarding the value of flow theory in VR technology contexts. Moreover, the finding of this study is supported by the effect of enjoyment on flow state in smartphone use (Chen et al., 2017).

In addition, we successfully identify that VR users' flow state has a significant effect on their subjective well-being. This implies that it is important to shed light on positive reinforcement hedonic motives in the formation of subjective well-being from VR use. Thus, the finding is supported by the effect of flow experience on social rewards with respect to mobile social networking (Wang et al., 2017). We also find that VR users' flow state is strengthened by desirability factors that contribute to continued VR use and, significantly, is important for VR users' future behavior. Hence, the finding of this study confirms the results of Chen et al. (2017) in the context of flow state and mobile information technology use from the desirability (e.g., related to usefulness or enjoyment)-feasibility perspective (e.g., related to easiness) as flow's determinants. Regarding hypothesis 6, high subjective well-being from using VR activities leads to consumers' continued VR use. A possible explanation is that the development of high subjective well-being from VR use necessarily leads to consumers' positive behavior in the future, indicating that the findings are consistent with the relationship of subjective well-being to consumer behavior in mobile social media use for tourism (Kim et al., 2017).

This study further demonstrates the moderating role of visitors/non-visitors between perceived usefulness and flow state among VR users in a tourism context. That is, for non-visitors who have never been to places shown in VR, the perceived usefulness is less likely to influence their flow state when using VR content. On the other hand, for visitors who went to destinations or attractions after they had been shown them in VR, the perceived usefulness is more likely to influence their flow state when using VR content. The findings of this study further highlight how characteristics operate differently between mobile and non-mobile users among Twitter users (Han, Min, & Lee, 2015). Interestingly, the moderating roles of visitors/non-visitors between perceived easiness and flow state as well as between perceived enjoyment and flow state are insignificant. In particular, the difference in visitors/non-visitors' identification between perceived enjoyment and flow state in the context of VR use is not statistically significant from the result by PLS-MGA, although it should be noted that the magnitude of the difference between enjoyment and flow state is quite large (visitors' coefficient = 0.257, $p < 0.01$ and non-visitors' coefficient = 0.553, $p < 0.001$). This potentially implies that if a less rigorous algorithm was used to analyze the data, the difference may be more significant.

5.2. Key findings

VR tourism provides consumers the opportunity to experience and enjoy a destination presented in VR (Huang et al., 2016; Tussyadiah et al., 2018). VR tourism content also offers a chance for consumers to experience a flow state with the attraction or destination in VR in advance (Huang et al., 2012, 2013), which is related to hedonic factors. Along with the rapid advancement of digital technologies, consumers receive subjective well-being from using new technologies, such as VR (Li et al., 2011; Singh et al., 2017). However, such research has not examined the hedonic factors of perceived enjoyment and flow state in the VR tourism context. Utilizing the HMSAM based on Lowry et al. (2013, 2015), to address this gap, the primary aim of this study was to identify the effect of consumers' hedonic behaviors on continued use of VR tourism from the perspectives of hedonic motivation systems. Specifically, this study examined perceived easiness, usefulness, and enjoyment, flow state, subjective well-being, and continued use, along with the moderating role of visitors/non-visitors from consumers who experienced VR tourism activities.

The results discovered the significant effect of consumers' usefulness on their flow state from the VR tourism activities. Also, the highly significant effect of consumers' perceived enjoyment on their flow state indicate that enjoyment is the key element in hedonic motivation systems for continued usage of VR tourism. Additionally, this study identified the strongest impact of flow state on subjective well-being in the research model, implying that flow state and subjective well-being are important factors in the HMSAM. Moreover, continued use was greatly influenced by flow state and subjective well-being, revealing that this study's model is concrete. The results further demonstrated that the association between usefulness and flow state has a significant

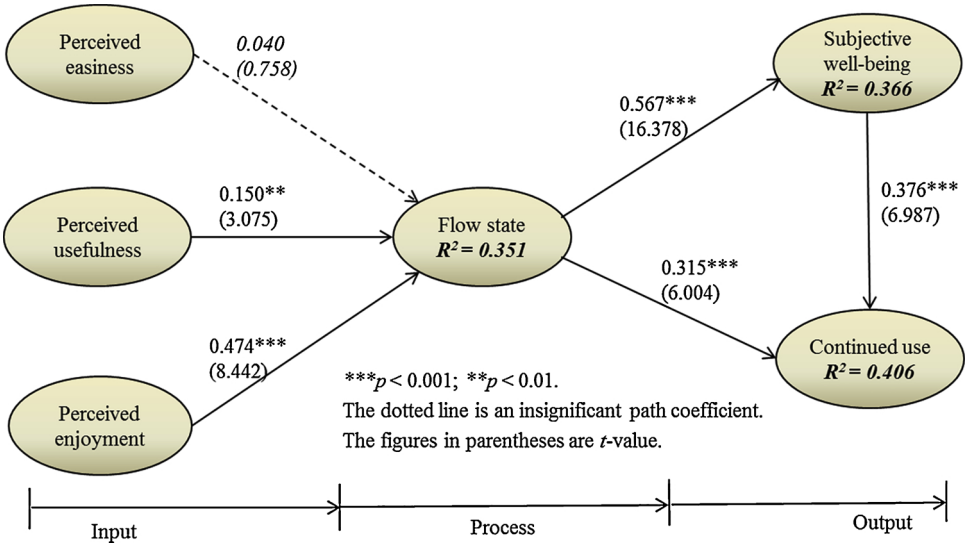

Fig. 3. Estimation of the research model considering six demographic control variables.

moderating effect depending on visitors or non-visitors, showing that the visitor group has a highly significant relationship between perceived usefulness and flow state than the non-visitor group. This study sheds light on why consumers want to use VR tourism activities and visit the destinations shown in VR, providing implications for academics and practitioners based on the HMSAM.

5.3. Theoretical implications

Despite the growing importance of VR tourism as hedonic experiences (tom Dieck et al., 2018), such research on hedonic motivation systems is limited. In this respect, this study provides several useful insights for theory formation and verification of the HMSAM. First, the current research validated the utility of the HMSAM framework with the inclusion of subjective well-being as a second outcome variable in the VR tourism setting. Second, this research theoretically validated that the flow state can be an important mediator in the VR tourism platform of hedonic motivation systems. Third, from the great impact of perceived enjoyment on flow state, this study finds that enjoyment and flow are key factors for hedonic motivation systems. Fourth, the theoretically important finding is that the flow state on potential tourists' subjective well-being for continued use is much greater than the effect of flow state on continued use VR directly. In other words, people are more likely to use VR tourism continuously if they receive subjective well-being from using VR tourism. Interestingly, the visitor group has a greater relationship between perceived usefulness and flow state than the non-visitor group. This result implies that attributes of usefulness on VR tourism are more likely to be important to visitors in relation to their flow state, which in turn leads to actual visits.

The finding of the significant effect of perceived usefulness on flow state enhances the literature and extends the findings of previous studies on the relation between usefulness and flow experience (e.g., Gao et al., 2017; Huang et al., 2013) to the VR tourism context. Moreover, the strong association between perceived enjoyment and flow state in this study theoretically demonstrates that VR tourism content is closely related to the emotional immersive experience as hedonic factors. This result substantially enlarges the findings of previous literature on the relation between enjoyment and flow experience (e.g., Kim et al., 2017; Moneta, 2012). This result suggests that our primary contribution is to propose and provide empirical support for a new theoretical model, the HMSAM, which was found to be predicting VR tourist behavior by this study.

Furthermore, this research found the strongest association between flow state and subjective well-being from VR tourism provides a tremendous opportunity for theory building. This result expands the findings of former research on the relation of flow experience to subjective well-being in social media (e.g., Kim et al., 2017). This study's finding that using VR tourism activities creates feelings of subjective well-being through their flow state, which eventually leads to continuous usage and actual visit to the place in the VR is a valuable contribution to theory development. In addition, the significant effect of flow state on continued use provides a new starting point for VR tourism research, considerably broadening previous studies on the linkage of flow experience to behavioral intention (e.g., Gao et al., 2017; Huang et al., 2013). That is, this study adds knowledge that subjective well-being gained from experiencing VR tourism activities increases VR tourists' behavioral intention to use VR for tourism purposes. This research demonstrated that consumers' subjective well-being largely influenced their continued usage of VR tourism, broadening prior studies on the association between subjective well-being and behavior of social media users (e.g., Kim, Chung et al., 2014; Kim et al., 2017). Since the effect of subjective well-being on on-going use of innovative technologies still have not been demonstrated in the VR tourism domain, the finding of this study extends the literature in the VR domain.

This research found that the association between perceived usefulness and flow state had a significantly greater effect for visitors than non-visitors. This study extends the results of previous research on differences in destination image (e.g., Phillips & Jang, 2010; Sroypetch et al., 2018) between visitors and non-visitors by adding the extrinsic motivation construct to cognitive absorption in HMSAM and VR contexts. The significantly positive effect of usefulness on flow state in the visitor group is reasonably consistent with prior findings that tourism purchasers of products or services are more likely to be sensitive to gratification on social media (Kim, Lee, & Contractor, 2019). This implies that the visitor group consider utilitarian factors (e.g., usefulness) as an important element in deciding their actual visits to the attractions shown in VR. In contrast, the non-visitor group place more emphasis on hedonic factors (e.g., enjoyment) in VR tourism content.

On the other hand, the association between easiness and flow state was insignificant, contrary to this study's expectations. The most plausible reason is that operating VR tourism programs and VR devices are quite easy to use so easiness (e.g., no challenge) does not influence the flow state. That is, when individuals experience the flow state, they need certain levels of challenge according to flow theory (Csikszentmihalyi, 1975, 1990), i.e., if a task is too easy for users to perform, then users are not able to immerse themselves in the task. Furthermore, contrary to this research's hypotheses, the results

revealed that the relationships between perceived easiness and flow state as well as perceived enjoyment and flow state had insignificant differences depending on the visitors or non-visitors categories. It is presumed that the MGA approach is a highly rigorous method to test moderating effects. In addition, the relationships with hedonic motivations (easiness and enjoyment) are not different between visitors and non-visitors compared to the relationship with utilitarian motivation (usefulness).

5.4. Practical implications

The findings suggest that VR content producers should focus on generating hedonic motivations because the effects of perceived enjoyment and flow state were found to significantly impact consumers' continued usage of VR tourism within the HMSAM. That is, VR producers could design their content to have enjoyable, funny and happy elements by using gamification so that consumers obtain hedonic experiences from the VR. Given that the relationship between flow state and continued use via subjective well-being is much stronger than the relationship between flow state and continued use, VR tourism developers may boost consumers' subjective well-being to increase their usage of VR tourism. In other words, developers can highlight VR tourism-related programs to be satisfied, gratified, and contented by utilizing the technology of artificial intelligence.

According to the finding of this research, VR commercial sectors should focus on attributes of usefulness if they want consumers to become immersed in VR tourism. For example, VR marketers could promote their VR products as knowledgeable, useful, and beneficial activities through online/mobile social media and websites. Additionally, the current study recommends that VR developers should make efforts to create VR content that is more enjoyable if developers need consumers to be completely absorbed in their VR tourism content. This could possibly be done by creating the VR content using drones or 360 degree cameras (Li, 2017). Technicians can augment flow components of their VR tourism content with audio, video, and haptics along with 3D printing technology so that consumers can receive psychologically subjective well-being from using the VR.

Since the impact of flow state from VR tourism was found to be significant on consumers' continued use of VR, it is recommended that tourism managers and agents should encourage consumers by providing VR tourism activities with updates and improved usability. Given that consumers' continued use was highly influenced by their subjective well-being, VR business and practitioners should concentrate more on consumers' psychological well-being in VR consumer engagement strategies.

The stronger influence of perceived usefulness on flow state in visitors than in non-visitors suggests that if VR stakeholders (e.g., local governments, communities, destination marketing organizations) want potential tourists to visit or re-visit their destinations offered in VR tourism, the VR stakeholders should make the VR platforms and content more useful as tourist attractions and information sources. This could be done by emphasizing historical, educational, and socio-cultural characteristics of the destinations presented in VR and may also provide opportunities to encourage potential tourists to traditionally less well visited areas of a destination (Hall, 2014). In addition, this study's finding of the insignificant relationship between perceived usefulness and flow state in the non-visitor group to the destinations shown in VR is extremely significant for the VR industry with respect to the marketing of tourism products and suggests that a more targeted communication strategy is required that distinguishes between of visitors and non-visitors in light of the different importance given in their VR destination experience to usefulness and enjoyment.

5.5. Limitations and future research directions

This research has limits that suggest future research directions although the results of the current research provide pertinent theoretical and managerial contributions to the field. Future studies may need to apply this model to other cultures or countries to make it generalizable or to determine whether any cultural difference exists because the current research model tested VR tourists in Korea. Future research could also identify the differences between consumers depending on using VR devices such as untethered-mobile devices such as Samsung Gear VR, Google Cardboard, and Google Daydream or tethered devices such as HTC Vive, OSVR, and Oculus Rift to better understand consumer behavior. Moreover, future studies can employ mixed reality to examine consumers' behaviors as using augmented reality (AR) and VR so that tourism businesses and destinations are able to take advantage of both AR and VR technologies.

Given that subjective well-being is similar to satisfaction in using innovative technologies future research may need to compare the difference between the relationship of subjective well-being with continued use and the relationship of satisfaction with continued use in order to better understand the significant business indicator of continued use. Further research should also seek to frame the user's actual visiting behavior to the places presented in VR as a major dependent variable in order to reflect key contributions to the tourism industry and/or behaviors at destinations that utilize VR technologies in order to measure its success. Finally, to better identify mediation theory with flow state and subjective well-being, future studies could conduct a model comparison analysis with alternative models so that the mediating roles can be more specifically indicated in the HMSAM, thereby extending the current study's model.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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