

Customer Engagement With VR-Enabled Tourism Activities at Cultural Heritage Sites

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Abstract: Despite the tremendous amount of academic interest in virtual reality (VR), the existing conceptual models that presented VR attributes as antecedents of users' acceptance and attitudes, failed to examine the power of VR technologies in promoting the alternative attractiveness of virtual tourism compared to traditional onsite visitation. This is of great significance to the solution of over-tourism issues frequently seen in the today's tourism destinations, especially world-famous cultural heritage sites. Therefore, the present study fills the literature gap and empirically validates a conceptual framework that shows how visitors' engagement with VR-enabled tourism activities could lead to an enhanced alternative attractiveness of virtual tourism, and their pro-cultural behaviors. A total of 571 valid responses from US visitors that have adopted VR-enabled tourism activities were collected to confirm the role of four VR attributes, i.e., immersion, vividness, presence, and enjoyment, in motivating users' engagement behaviors with VR tourism activities. The study findings also testified that visitors who engaged with VR tourism activities are likely to adopt pro-cultural behaviors in the future and assessed the alternative attractiveness of VR tourism against the traditional onsite visitation. The findings will provide valuable implications for policymakers who aspire to preserve the cultural heritage sites while promoting cultural heritage destinations through advanced VR technologies

Keywords: customer engagement, virtual reality, virtual tourism, alternative attractiveness, cultural heritage sites, pro-cultural orientation

1. Introduction

As a manifestation of advances in technology in general, information and communication technologies (ICTs) and artificial intelligence (AI) in particular, virtual reality's (VR) permeation of the travel and tourism industry gave rise to a digital transformation (Buhalis and Law, 2008). VR can be defined as a 3D simulation that entails lifelike and authentic computer-generated graphics to stimulate all five senses and thereby immerse users/participants for the entire duration of the experience (Wohlgenannt, Simons, & Stieglitz, 2020). Given the pandemic-induced acceleration in the adoption of VR-based technologies, a compelling argument can be made about being at the threshold of a transformation from mobile technologies to immersive technologies (Ong, 2020). This VR-enabled digital transformation found various applications throughout the travel and tourism industry as it had an impact on the perceptions of tourism destinations and offered opportunities for wider consumption of tourism services and content (Tussyadiah, Wang, Jung, & Dieck, 2018). Cultural heritage destination tourism is no exception (Little, Bec, Moyle, & Patterson, 2020). Cultural heritage is the legacy of the objects of archaeological interest and a culture's intangible attributes passed on generation to generation (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2021). As a tourism activity, cultural heritage comprises all the travel and visits that are aimed at exploring the cultural and historic sites and destinations that harbour these objects of interest (Munjal, 2021).

Over the past two decades, numerous studies have been conducted on VR across disciplines, stemming from the increased popularity of the technology and the growing interests of the scholars in the field. Several studies explored VR in various contexts (see Table 1 for contextual highlights). However, the existing conceptual models that embraced various VR attributes as antecedents of users' acceptance and attitudes, failed to examine the power of VR technologies in promoting the alternative attractiveness of virtual tourism compared to traditional onsite visitation. This is of great significance to the solution of overtourism issues frequently experienced in modern-day tourism destinations, especially the world-famous cultural heritage sites. Moreover, the Covid-19 pandemic created a renewed impetus and urgency for the destination marketing organizations (DMOs) at tourism destinations that experience overtourism. VR-enabled tourism as an alternative to traditional travel holds a great potential to control and mitigate the overtourism phenomenon (Schiopu, Hornoiiu, Padurean, & Nica, 2021). Through an integrated approach of all the stakeholders, VR-enabled tourism's alternative attractiveness can be marketed to simulate travellers' switching behaviour (Bansal, 2005). This, however, requires the economic growth and sustainability of the communities at cultural heritage sites, effective policy

making, and cultural heritage destination planning and marketing (Jamieson & Jamieson, 2019). The present study proposes and examines a multidimensional model that encompasses both the impact of VR attributes on visitor engagement and the positive outcomes of VR-enabled tourism activities. Findings of this study will provide inspiration for tourism marketers and DMOs who intend to incorporate VR technologies in their marketing strategies. The findings will also yield implications for policymakers who aspire to preserve the cultural heritage sites while promoting cultural heritage destinations through advanced VR technologies. Further, this study shows how visitors' engagement with VR-enabled tourism activities could lead to an enhanced alternative attractiveness of virtual tourism, and their pro-cultural behaviours by empirically validating a conceptual framework.

2. Literature review

2.1 VR-enabled tourism

As the VR definition suggests, the application of the 3D technology is fundamental in creating a simulated environment as it enables the users to navigate and manoeuvre within the artificial dimension while interacting with the virtual environment (Cowan & Ketron, 2019). Although a consensus does not seem to have been reached in the existing tourism literature, Guttentag's (2010) definition manages to encapsulate what the term virtual reality signifies in the tourism context: "The use of a computer-generated 3D environment – called a 'virtual environment' (VE) – that one can navigate and possibly interact with, resulting in real-time simulation of one or more of the user's five senses.". The present study will adopt this definition. As a type of tourism that has been catalysed by the advancements in technology, virtual tourism centres around the virtual representation of touristic sights, destinations, and experiences. It is usually designed and marketed as either a preview of the touristic attraction before the arrival of the targeted audience or a prolongation of the visit that has already taken place (Kim and Hall, 2019). Despite its technology-based contemporary practices, virtual tourism is as old as the human history. As presented in Table 1, VR applications in various industries and the VR research in a diverse set of disciplines have gained significant recognition in contemporary literature.

Table 1: Interdisciplinary review of virtual reality

Studies	Context	Highlights
Choi and Kim (2017)	Museums	Incorporation of head-mounted display (HMD) to enhance display methods.
Lee et al. (2020)	Museums	VR's absorptive impact on immersion, museum experience and intention to visit.
Hamari (2015)	Gaming	Attitude toward virtual product purchases in free-to-play game environments.
Zyda (2005)	Gaming	Game sciences's influence on VR community, entertainment industry, and other domains.
Dickinson et al. (2020)	Gambling	VR-based experimental research in gambling behavior and problem gambling.
Liu, Dong, and Zhu (2021)	Gambling	Value creation through digital technologies in the gaming industry.
Ansari et al. (2022)	Entertainment	VR as a tool to minimize the impact of Covid-19 on the entertainment industry.
Bates (1992)	Art & Entertainment	Progress of VR as an artistic medium through content and style development.
Cardoş, David, and David (2017)	Healthcare	Virtual reality exposure therapy (VRET) to treat flight anxiety and fear-related avoidance.
Rothbaum et al. (2006)	Healthcare	VRET to treat fear of flying (FOF) in a control clinical trial versus exposure therapy (SE).
Van Benthem and Herdman (2021)	Healthcare	VR as a cognitive health screening tool to assess elevated risk for older pilots.
Davila Delgado et al. (2020)	Architecture	Organizational VR and AR applications in architecture, engineering and construction sectors.
Portman, Natapov, and Fisher-Gewirtzman (2015)	Architecture	Use of VR in (landscape) architecture, environmental planning in research and teaching.
Lai et al. (2020)	Engineering	Enabling high-quality VR apps on untethered mobile devices.
Wolfartsberger (2019)	Engineering	Development of a VR-based tool to support engineering design review process.
Wang et al. (2018)	Engineering	VR technologies and applications in construction engineering education and training.
Kavanagh et al. (2017)	Education	Systematic review and thematic analysis of the use of VR in education.
Radianti et al. (2020)	Education	Benefits and applications of immersive VR in higher education via systematic review.
Boardman, Henninger, and Zhu (2020)	Fashion	Applications of VR and AR in the fashion industry from TAM perspective.
Pizzi et al. (2019)	Retail	Consumers' hedonic and utilitarian shopping orientations in a VR store.
Israel, Zerres, and Tscheulin (2019)	Hospitality	Effects of telepresence in a smartphone-based VR system (SBVR) on booking intention.
Leung, Lyu, and Bai (2020)	Hospitality	Comparison of the effect of VR and traditional hotel commercials on purchase intentions.
(Han, Hou, Wu, & Lai, 2021)	Hospitality	Acceptance of VR and other smart technologies in the hospitality industry.
(Beck, Rainoldi, & Egger, 2019)	Tourism	Review of the applications and implications of VR and other technologies in tourism.
Huang et al. (2013)	Tourism	User acceptance of virtual worlds in tourism destination marketing from TAM perspective.
Lee, Agarwal, and Kim (2012)	Tourism	VR in travel helplessness and intention to travel in disabled tourism market.
Bec, Moyle, Schaffer, & Timms (2021)	Tourism	Second chance tourism through innovative preservation methods such as VR and mixed reality.
Tussyadiah et al. (2018)	Tourism	The impact of sense of presence in VR experiences at tourism destinations.

2.1.1 Immersion

Pine, Pine, and Gilmore (1999) describe immersion as “becoming physically (or virtually) a part of the experience itself” (p. 31). As a result, immersion occurs when the experience that is taking place has a high level of involvement by the participant. With this in mind, a virtual environment’s capacity to generate engagement is directly correlated with its ability to elicit the active participation and, thus, immersion of participants (Loureiro, Guerreiro, & Ali, 2020). According to Lee, Jung, Dieck, and Chung (2020), knowledge and interest are significant contributors to the level of immersion. Highlighting the subjective aspect of immersive experiences, Raptis, Fidas, and Avouris (2018) argued that immersion does not only involve interaction with the other participants but is also an interplay between the virtual environment and the participant. As suggested, immersion is a key element in virtual, non-physical experiences as it dictates the engagement level, which in return determines the longevity of the interaction. Hudson, Matson-Barkat, Pallamin, and Jegou (2019) expounded the reinforcement capacity of social interactions in immersion levels during a virtual experience, while suggesting that social interactions may also lead to the opposite outcome when social interactions serve as a distraction.

2.1.2 Vividness

According to Zheng, Chen, Zhang, and Guo (2021), vividness of the virtual images, which are presented as a feature of the virtual tourism experience, is an effective attribute to create a stimulus in the participants’ mind. Wohlgenannt et al. (2020) described vividness as “the richness, resolution, or quality of the displays” (p. 457) and concluded that vividness was significant contributor in consumers’ perception of media richness. Lee, Lee, Jeong, and Oh (2020) empirically tested a quality-driven VR model and found that vividness positively influenced consumers’ attitude, resulting in a behavioural intention to visit the virtually experienced destination. Drawing on this theoretical and empirical background, the present study presents vividness as one of the four key VR attributes that positively influence visitors’ engagement level with the VR-enabled tourism activities.

2.1.3 Presence

Presence is a key attribute of VR technology in that it determines the activity’s level of effectiveness in diverse application settings, such as virtual heritage tourism. In a VR context, presence can be defined as a state of mind where the individual is immersed in the virtual environment, with limited or no connection to real world that exists outside the VR. This replacement or substitution of a real environment or an activity constitutes the foundation of the presence attribute of the VR technologies (Tussyadiah et al., 2018). VR experiences offer the users a virtual environment where the movements of the participant are tracked and reactions are digitally tailored depending on the purpose and theme of the VR-enabled activity (Bogicevic, Seo, Kandampully, Liu, & Rudd, 2019). The virtual presence created through this simultaneous interactive experience, represents the essence of the visitor engagement opportunity in the context of cultural heritage tourism. The virtual alternative to a cultural heritage destination can serve as a destination marketing strategy to entice potential visitors to actually visit the destination in the future. At cultural heritage destinations where the sustainability of the cultural heritage is sought due to overtourism, VR-enabled activities can replace the actual visitation through a virtual substitution.

2.1.4 Enjoyment

As an emotional construct, enjoyment was introduced by Davis, Bagozzi, and Warshaw (1992) as a mediator in individual usage intentions of computers. In the virtual reality context, enjoyment can be defined as the extent to which visitors find the VR activity enjoyable, without a regard to the anticipated outcome of the experience (Davis et al., 1992). Hamari (2015) explored enjoyment as hedonic motivation in customers’ technology adoption behaviour in the gaming context. Mäntymäki and Salo (2011) conducted an empirical study to investigate teenagers’ continuous use intention and purchasing behaviour in social virtual worlds (SVWs) context and identified a relationship between teenagers’ continuous engagement with SVW and their perceived enjoyment. The present study further advances the construct by analysing its motivational dimension as a VR attribute in virtual cultural heritage tourism. More specifically, the present study postulates that enjoyment is a significant factor in visitors’ level of engagement with the VR-enabled tourism activities.

2.2 Customer engagement with VR-enabled tourism experience

Engagement was identified as one of the most recurring themes regarding happiness in the psychology literature by Seligman, Steen, Park, and Peterson (2005), concerning the individual’s immersion in engaging activities.

Customer engagement, on the other hand, is a psychological state that stems from the interaction and co-creation of the experiences with the object of interest, e.g., brand, tourism activity, etc. (Brodie, Hollebeek, Jurić, & Ilić, 2011). Therefore, it can be defined as the customer's personal relationship with this object, which manifests in her cognitive and affective states and behavioural actions (So, King, & Sparks, 2012). In customer behaviour studies, engagement concept is often utilized due to its potential to explain behavioural outcomes of the customers (Arnould & Thompson, 2005). The concept, however, usually transcends the conventional buyer-seller relationship as a consequence of the increasing levels of interconnectivity between these actors (Hollebeek, Jaakkola, & Alexander, 2018).

In the VR context, Willems, Brengman, and Van Kerrebroeck (2019) explored how three types of virtual representation media, i.e., pictures, 360° video, and VR, differed in terms of their capacity in engaging millennials. The assessment was based on three VR attributes, namely interactivity, vividness, and telepresence, in terms of their influence on flow, enjoyment, and purchase intentions, and the results indicated that VR received the highest scores on all three dimensions (Willems et al., 2019). Kim, Lee, and Jung (2018) deployed an extended stimulus-organism-response (SOR) model to explore tourists' visit intentions based on their VR-based experience of the destination. The authenticity of the activity constituted the stimulus dimension, cognitive and affective responses form the organism dimension, and the attachment and visit intention were the response dimension of the framework (Kim et al., 2018).

H₁: Immersion will have a positive influence on the customer engagement with VR enabled tourism activities at cultural heritage sites.

H₂: Vividness will have a positive influence on the customer engagement with VR enabled tourism activities at cultural heritage sites.

H₃: Presence will have a positive influence on the customer engagement with VR enabled tourism activities at cultural heritage sites.

H₄: Enjoyment will have a positive influence on the customer engagement with VR enabled tourism activities at cultural heritage sites.

2.3 Alternative attractiveness

Alternative attractiveness refers to the degree of satisfaction that consumers can expect when dealing with alternative suppliers (Ping, 1993). Virtual reality tourism has great potential to replace traditional tourism in solving overtourism at heritage sites, but there is little research on whether and how users can improve their acceptance of this new alternative (Guttentag, 2020). The related research of alternative attractiveness shows that attractive features from competitors can stimulate consumers' switching behaviour (Bansal, 2005). Once customers find alternative products or services that can provide low price, convenience, completeness, higher profit return or more attractive, they may terminate their relationship with current service providers and choose other service providers (Tesfom, Birch, & Culver, 2016). In other words, alternative attractiveness will negatively affect customers' loyalty to existing products (Ghazali, Nguyen, Mutum, & Mohd-Any, 2016) and retention rate (Vázquez-Carrasco & Foxall, 2006), and stimulate the willingness to switch to alternative products (Amoroso & Magnier-Watanabe, 2012). Then introducing alternative attractiveness into this study can make up for the gap that emerging VR tourism products have not empirically tested their substitution potential for traditional tourism products in heritage sites and improve the conclusion scientifically so that VR tourism solves the problem of overtourism in heritage sites through substitution (Guttentag, 2020).

H₅: Customer engagement with VR-enabled tourism activities will have a positive influence on alternative attractiveness at cultural heritage sites.

2.4 Pro-cultural orientation

The principle of sustainability involves the environmental, economic and socio-cultural aspects of tourism development (Chang, McAleer, & Ramos, 2020). In the economic field, the role of tourists' consumption behaviour in promoting the economic sustainability of destinations is emphasized. Because culture can achieve sustainable development at different levels and protect cultural beliefs, traditions and heritage (Samaddar, Mondal, & Sharma, 2021), the concept of socio-cultural sustainability has become an important concern of global destination management organizations and tourism researchers (Qiu Zhang, Fan, Tse, & King, 2017). However, in the social and cultural field, there are relatively few studies on tourists' behaviours or attitude

towards different cultures (Lin et al., 2021), while pro-cultural orientation refers to tourists' active participation and contribution after interacting with different cultures, and it is considered that sustainable tourism should promote tourists' responsible behaviours in cultural or cross-cultural experience, the goal of sustainable tourism service providers is to enable tourists to explore local culture responsibly and take actions according to cultural background (Chang et al., 2020). As for the interaction between tourists and cultural environment, some studies suggest that tourists should respect and appreciate different local cultures and propose codes of conduct according to different cultural situations (Lin, Chen, Trac, & Wu, 2021). Artal-Tur (2018) believes that cultural tourists should maintain and attach importance to local culture in cultural tourism, so as to promote the sustainability of destinations.

H₆: *Customer engagement with VR-enabled tourism activities will have a positive influence on their pro-cultural behaviours at cultural heritage sites.*

The following figure (Figure 1) is the proposed model that delineate how visitors' engagement with VR-enabled tourism activities could lead to an enhanced alternative attractiveness of virtual tourism, and their pro-cultural behaviours.

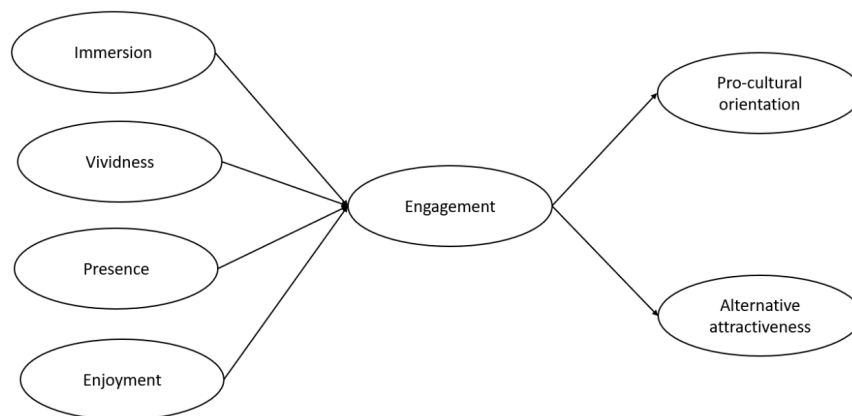


Figure 1: Proposed conceptual model

3. Methodology

3.1 Data collection and sample profile

Data were collected in November 2021 through Amazon Mechanical Turk, a crowdsourcing platform that is now commonly used to sample participants for hospitality and tourism research. There was a recruitment incentive (\$1) to increase participation. Sampling method was convenience sampling due to constraints of budget and time. Participants took part in an online self-administered survey. In the beginning of the survey, the respondents were introduced to the VR-enabled tourism concept and examples. Then only participants who agreed to proceed were invited to complete the rest of the survey. Before rating their perceptions of VR-enabled tourism activities and their overall assessment of behavioural outcomes, participants were asked to experience a VR-enabled tourism product by clicking a provided link to Machu Picchu VR-enabled travel video. There was a timer to time out those who didn't complete the entire VR-enabled travel video. The rest of the survey is composed of three sections: First, several screening questions regarding previous experience of VR-enabled tourism activities and travel experience of Machu Picchu were provided. Second, measurements for each proposed construct were stated to allow participants to evaluate. Finally, participants were asked to provide their demographic information such as age, gender, marital status, income, ethnicity, and education. Total of 571 valid responses were collected after data cleaning (attention checks, incomplete answers, invariance of scores, etc.). Among the respondents, the majority of the sample were male (66%) and between 25-34 years old (55%). About 51% of the sample had an annual household income between \$45,000 and \$85,000. Caucasians (65%) and Asians (25%) were the two major ethnicities in the sample. Most of the respondents were married (88%), followed by single (10%). About 70% of the sample had a bachelor's degree, followed by 22% who had a master's degree.

3.2 Measures

All measurements for the proposed constructs were adapted from previous literature. Immersion was measured using four items derived from Hudson et al. (2019). Vividness and presence were measured using three and seven items respectively adapted from works of Kim and Ko (2019) and (Wei, Qi, & Zhang, 2019) respectively. Enjoyment was measured using four items adapted from Hu et al. (2021). Alternative attractiveness was measured with four items from Ha and Park (2013). Pro-cultural behaviours were measured from Choi, Papandrea, and Bennett (2007). All the scales were measured using 7-point Likert scale (1=strongly disagree, 7=strongly agree). Table 1 displays the measurement items for each construct.

4. Results

4.1 Measurement model validation

Confirmatory factor analysis (CFA) was employed by the aid of SmartPLS statistical packages to assess the reliability, convergent, and discriminant validity of the constructs. Table 2 shows the factor loadings, composite reliability (CR), and AVE (average variance extracted) for the constructs to reveal the constructs' reliability and convergent validity (Hair, Ringle, & Sarstedt, 2013). Table 3 shows that the inter-construct correlations were smaller than the square roots of AVEs on the diagonal, indicating the scale's sufficient level of discriminant validity (Hair et al., 2013).

Table 2: Reliability and convergent validity

Constructs	Items	CR	FL	AVE
Immersion (IM)	IM_1 I could interact with the scenes in the VR tourism as if I was at the cultural heritage site in person.	0.715	0.882	0.778
	IM_2 I felt detached from the outside world while experiencing the VR tourism at the cultural heritage site.		-	
	IM_3 I felt completely immersed while experiencing the VR tourism at the cultural heritage site.		0.883	
	IM_4 I forgot about my everyday concerns while experiencing the VR tourism at the cultural heritage site.		-	
Vividness (VV)	VV_1 I thought the sensory information provided by the VR tourism at the cultural heritage site was highly vivid.	0.763	0.904	0.808
	VV_2 I thought the sensory information provided by the VR tourism at the cultural heritage site was highly rich.		0.894	
	VV_3 I thought the sensory contents provided by the VR tourism at the cultural heritage site was highly detailed.		0.809	
Presence (PS)	PS_1 I felt like I was actually at the cultural heritage site shown in the VR tourism.	0.848	0.793	0.566
	PS_2 It seemed as though I actually took part in the action of the VR tourism at the cultural heritage site.		0.708	
	PS_3 It was as though my true location had shifted into the cultural heritage site in the VR tourism.		0.777	
	PS_4 I felt as though I was physically present at the cultural heritage site in the VR tourism.		0.743	
	PS_5 The objects in VR tourism gave me the feeling that I could do things with them at the cultural heritage site.		-	
	PS_6 I had the impression that I could be active in the VR tourism at the cultural heritage site.		0.753	
	PS_7 I felt like I could move around among the objects in VR tourism at the cultural heritage site.		0.738	
Enjoyment (EN)	EN_1 I am thrilled about having such VR tourism experience at the cultural heritage site.	0.747	0.901	0.798
	EN_2 I really enjoy this VR tourism experience at the cultural heritage site.		-	
	EN_3 The VR tourism experience at the cultural heritage site is exciting.		0.886	
	EN_4 I am indulged in the VR tourism experience at the cultural heritage site.		-	
Alternative attractiveness (AA)	AA_1 Live-stream tourism provides me with opportunities to communicate with the tourism practitioners in the destination.	0.774	0.893	0.688

	AA_2 Live-stream tourism provides me with opportunities to communicate with other viewers.		-	
	AA_3 Live-stream tourism enables me to feel part of the community.		0.865	
	AA_4 VR tourism at the cultural heritage site gives more benefits.		0.721	
Pro-cultural orientation (PC)	PC_1 The cultural values of our forefathers are important to me.	0.76	-	0.541
	PC_2 Culture does not help me to identify myself*.		0.808	
	PC_3 I want to know the foods our grandmothers made.		0.764	
	PC_4 We are not losing our cultural heritage*.		-	
	PC_5 We need to conserve more cultural heritage for future generations.		-	
	PC_6 Cultural heritage does not mean anything to my wellbeing*.		0.771	
	PC_7 I would like to know our traditional style of dress.		-	
	PC_8 Students do not need to learn what their culture is*.	0.887	0.873	
	PC_9 The present cultural heritage should be available for my children's children.		0.753	
	PC_10 Cultural heritage is not disappearing*.		-	
	PC_11 The foods our grandmothers made are important to be.		0.728	
	PC_12 We do not need to care about cultural heritage*.		0.843	
	PC_13 Cultural heritage must be a part of our life.		0.734	
	PC_14 Although we do our business as usual, there won't be any major cultural loss*.		0.716	
	PC_15 Our traditional style of dress is important to me.		-	
	PC_16 Buildings, museums and paintings do not have the right to be preserved*.		0.722	
	PC_17 Future generations have the right to enjoy the present cultural heritage.		0.707	
	PC_18 Ideas, beliefs and customs do not have the right to be preserved*.		0.769	
	PC_19 Culture helps us to live with people of different backgrounds.		0.703	
Engagement (EG)	EG_1 I was absorbed in the VR tourism experience at the cultural heritage site.	0.78	0.866	0.695
	EG_2 Using VR in the cultural heritage tourism site was worthwhile.		-	
	EG_3 My VR tourism experience at the cultural heritage site was rewarding.		0.793	
	EG_4 The time I spent using VR to experience the cultural heritage tourism site just slipped away.		-	
	EG_5 I felt interested in this VR tourism experience at the cultural heritage site.		0.84	

Note: *reverse coded during analysis so that endorsement of all items equates to stronger pro-cultural orientation.

Table 3: Discriminant validity

	AA	EG	EN	IM	PC	PS	VV
AA	0.829						
EG	0.684	0.834					
EN	0.628	0.782	0.893				
IM	0.676	0.697	0.676	0.882			
PC	0.58	0.699	0.63	0.56	0.898		
PS	0.775	0.724	0.711	0.712	0.61	0.753	
VV	0.619	0.773	0.698	0.708	0.61	0.698	0.899

Note: AA= alternative attractiveness, EG=engagement, EN=enjoyment, IM=immersion, PC=pro-cultural orientation, PS=presence, VV=vividness

4.2 Hypothesis testing

The model fit was assessed through SRMR and corrected R^2 values. SRMS was 0.070, which was less than the recommended cut-off value of 0.08 (Henseler, Hubona, & Ray, 2016), indicating a satisfactory model fit. Moreover, corrected R^2 values were computed to explain the power of the predicting variables on the respective construct. In the proposed model, four features of VR-enabled tourism activities, namely, enjoyment, immersion, presence, and vividness, explained 73.1% of the users' engagement with such VR-enabled tourism activities construct ($R^2=0.731$). The model's explanatory power is substantial, approaching substantial according to the standard suggested by (Chin, Peterson, & Brown, 2008), which classify the levels as substantial ($R^2=0.67$), moderate ($R^2=0.33$), or weak ($R^2=0.19$). Model testing results reveal the significant influence of enjoyment ($\beta=0.370$, $p<0.001$), presence ($\beta=0.158$, $p<0.01$), and vividness ($\beta=0.336$, $p<0.001$) on the engagement variable, thus supporting H2, H3, and H4. However, the link between immersion ($\beta=0.096$, $p>0.05$) and engagement was found not statistically significant were found not statistically significant, thus failing to support H1. The construct of engagement was found significantly associated with pro-cultural orientation ($\beta=0.699$, $p<0.001$) and alternative attractiveness ($\beta=0.684$, $p<0.001$), thus supporting H5 and H6.

4.3 Robustness test

In order to improve the robustness of the proposed model, the researchers tested the moderating role of previous visiting experience of the tourism destination in the relationships between users' engagement with VR-enabled tourism activities and pro-cultural orientation. SmartPLS software was employed to conduct the moderation test on the model. The statistics confirmed visitors' previous visiting experience ($\beta=0.184$, $p<0.05$) moderated the effect of engagement with VR-enabled tourism activities on their pro-cultural orientation. Specifically, visitors who had previous visiting experience of the destination exhibited more pro-cultural orientation after they engaged with the VR-enabled tourism activities about this destination, compared with their counterparts who never visited the destination in person before.

5. Conclusion and discussion

The modern-day travel and tourism industry, recognized as one of the largest industries in the world (Guttentag, 2010), has shown considerable amount of success in synthesizing technology and tourism products. As a popular advanced technology with versatile applications, VR has gained prevalence in the last decade thanks to the advancements in ICTs and the increased awareness around the preservation of cultural heritage sites (Arias, Escobar, Padilla, & Matamoros, 2020). The results of the study confirmed the link between the four VR attributes, immersion, vividness, presence, and enjoyment, and visitors' engagement with the VR-enabled activities. Engagement has also been verified as a predictor of visitors' willingness to continue using the VR-enabled activities against the alternatives, i.e., the alternative attractiveness, and their pro-cultural orientation in the cultural heritage destination context.

The study findings provide several distinct and significant contributions to the theoretical understanding of the VR-enabled tourism activities. First, we elaborated on the four VR attributes and empirically evaluated their significance as the antecedents of visitors' engagement with the VR-enabled activities. Second, we examined engagement as a predictor of visitors' intention to seek alternative attractiveness and their pro-cultural orientation. This is a particularly significant contribution of the present study as the prior research on various VR attributes neglected to assess the ability of VR technologies in promoting the alternative attractiveness of virtual tourism compared to conventional visitation patterns. As the results indicated, assessment of the said VR attributes establishes an important first step for DMOs and other stakeholders to motivate potential visitors to be more culturally aware and environmentally conscious by adopting the VR-enabled tourism activities. This particular aspect provides significant insights for cultural heritage destinations that experience overtourism, where the levels of the tourism activity is beyond what is sought by the destination stakeholders and has a detrimental impact on the destination (Goodwin, 2017). In such a circumstance, VR-enabled tourism activities present a noteworthy potential to control the levels of visitation while engaging with the potential visitors. Moreover, the virtual alternative to a cultural heritage destination can be adopted as a destination marketing strategy to engage with the potential visitors to motivate them to actually visit the destination in the future.

6. Limitations and future directions

Future research endeavours can incorporate other VR attributes to extend the model proposed by the present study. Furthermore, given the number of the destinations that are recognized as cultural heritage sites by UNESCO, future studies can expand the scope of the proposed model by evaluating the visitor perceptions of VR-enabled tourism activities in countries other than U.S. This expansion can also provide valuable insights about the cultural dimension of VR adoption behaviour in other geographies. Furthermore, the present model can be assessed in different contexts, such as museums, disabled tourism markets, and ecologically sensitive tourism destinations, to generate further theoretical and practical results.

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