Virtual reality's impact on destination visit intentions and the moderating role of amateur photography

Abstract

Purpose - This research investigated the effects of virtual reality experiences (VREs) and emotions on holiday destination visit intentions by applying the stimulus-organism-response (S-O-R) framework. It also examined the role of amateur photography as a moderator in the relationship between VREs, emotions, and visit intentions.

Design/methodology/approach - Primary data were collected through a structured survey questionnaire administered in India, and structural equation modelling (SEM) was used to examine the relationships among variables. The formal survey was preceded by a pilot study. The PLS-SEM product indicator technique was applied to measure the moderation effect of amateur photography.

Findings - When people have high levels of positive emotions in the pre-travel stage with VRE participation, their intentions to visit destinations are stronger. Amateur photography moderated the relationships between user interactivity, memorable experiences, mental imagery, and visit intentions. No significant moderating effect was found between emotional experiences and visit intentions.

Originality/value – This research has value in making several potential contributions to the tourism applications of virtual reality. It is the first study to use and test the stimulus-organism-response (S-O-R) framework to analyse tourist behaviour from the perspective of emotions generated by VR applications. The analysis focuses on India's tourism market, which has not been explored much in the context of VR and from the perspective of a developing country. The research emphasises the use of VR as a tool to understand tourist behaviour, rather than just focusing on visit intentions. The findings provide valuable insights into the importance of VR in tourism. The knowledge generated will contribute to the understanding of the impact of VR experiences on emotions and visit intentions and the moderating effect of amateur photography. It has practical

implications for destination marketers in developing effective marketing strategies that enhance tourists' emotions and motivate visit intentions.

Keywords Virtual reality experiences, emotional experiences, visit intentions, holiday destinations, amateur photography, S-O-R framework, structural equation modelling

1. Introduction

VR offers a computer-generated environment with realistic images and personalised information overlays, allowing users to experience a virtual world that mimics reality (Pew Research Center, 2008). This technology is having a significant impact on the tourism and leisure industry (Tussyadiah *et al*., 2018). A VR world is considered a digital space where the action and movements of a user are traced and exhibited to the user to stimulate their senses relating to their activities and movements (Fox *et al*., 2009). In a VR world, users should be provided with an alternative world where they can block the stimuli from the real world to immerse themselves entirely in the virtual world (Bogicevic *et al*., 2019). Users can visit any destination worldwide with virtual reality technology, like 360˚ virtual reality tours and wearable VR devices (Kim, Lee and Jung, 2020).

The tourism experience is stimulated through the various VR elements shaping tourists' emotional and psychological desires to visit a holiday destination. The study of Braun-LaTour *et al*. (2006) argued that the selection of a destination largely depends on how much the tourism experience will be memorable and noteworthy. Furthermore, a memorable experience is vital for expanding the positive word of mouth that attracts new tourists to the destination. Thus, providing memorable experiences within destinations is a major challenge for tourism service providers. Therefore, it is essential to understand the behaviour that drives intentions to visit destinations through the tools of VR.

Photographic experiences have been shown to have a positive effect on tourist emotions and memories. Amateur photography has become a popular activity among tourists for capturing memories and experiences of their trips. As people take photos, they engage with the destination,

participate in activities, and interact with other tourists. These activities shape their emotions and enhance overall experiences of destinations. Amateur photography can also play a role in shaping tourist emotions and visit intentions.

VR technology assists in the creation of effective destination marketing experiences (Buhalis et al., 2019). This technology engages people during all stages of the customer journey and generates valuable overall experiences. In the pre-experience stage, VR inspires potential visitors by conveying realistic previews of real experiences, reducing the ambiguity and risk of purchasing the tourism product. During the actual experience stage, VR is implemented by immersively providing information about tourism activities. Post-trip, VR can be a reminder of the enjoyable time spent in destinations.

Academic research is increasingly observing visitor experiences and evaluations of virtual tourism. Studies have investigated experiences, attitudes, enjoyment, and subjective well-being (Tussyadiah et al., 2018; Zhang et al., 2022). Research has also been conducted on specific aspects of tourist experiences, including immersiveness, authenticity, presence, flow experience, and technology, content, and service quality (Atzeni et al., 2022; Trunfio et al., 2022). This research has a focus on emotions with virtual tourism from the standpoint of visitor objectives or aims. It elucidates on the drivers of emotions in the context of VR experiences.

This work investigated the relationship between virtual reality (VR) experiences, emotional aspects, and future visit intentions of tourists. The specific objectives were to: (a) explore the role of VR experience attributes in tourist behaviour and visit intentions; (b) determine the impact of different attributes of emotional experiences on visit intentions; and (c) examine the influence of amateur photography on the relationship between emotional experiences and visit intentions. The findings were intended to shed light on the role of VR in understanding tourist emotions, experiences, and behaviours, and its significance in predicting future visit intentions.

This research makes several significant potential contributions to the field of tourism and virtual reality. It is the first study to use and test the stimulus-organism-response (S-O-R) framework to understand tourist behaviour from the perspective of emotions generated by virtual reality applications. Second, the study focuses on India's tourism market, which has not been

explored much in the context of virtual reality, particularly from the perspective of a developing country. Third, the study emphasises the use of virtual reality as a tool to understand tourist behaviour, rather than just focusing on visit intentions. The findings provide valuable insights into the importance of virtual reality in tourism. Finally, the research contributes to the understanding of the impact of VR experiences on tourist emotions and visit intentions and the moderating effect of amateur photography. The findings have practical implications for destination marketers in developing effective marketing strategies that enhance tourists' emotions and motivate visit intentions.

2. Theoretical foundations, research hypotheses and proposed model

2.1 S-O-R framework

The S-O-R framework was introduced by Woodworth (1929) as an extension of the stimulus-response classic theory proposed by Pavlov (1927). The S-O-R model reveals that environmental factors are stimulating (S), which consists of a set of symptoms that lead to an internal assessment of the individual (O), and then produce their behavioural response (R) or outcome. From this perspective, the stimulus can be an environmental feature that inspires human beings' emotional and physical well-being (Fu *et al*., 2020). The organism refers to an individual's sensitivities, state of mental affairs, and thinking. Moreover, the term organism signifies an internal mechanism and structure which mediate amid customers' environmental stimuli and outcomes (Kim *et al*., 2020). Finally, the response results from the association between stimuli and organism (Lalicic and Weismayer, 2018), indicating the consumers' inclination towards approach and avoidance behaviour (Bigne et al. 2020). Thus, the S-O-R framework presumes the interrelationship between external factor stimuli (S) impacted on the inner factor organism (O) and the succeeding behavioural response or outcome (R).

Tourism researchers have widely applied the S-O-R framework to investigate the psychological factors underpinning virtual tourist experiences (e.g., An et al., 2021; Talwar et al., 2022). They have identified a variety of social, economic, and psychological factors influencing travel intentions, including internal reasoning within individuals, as well as external factors such

as reference information, personal perceptions, and interactivity. Utilizing S-O-R, An et al. (2021) found that the psychological process through which the sensation and quality of information in virtual tours promote flow, resulting in satisfaction and a desire to visit. This research also applied S-O-R to investigate the interaction between virtual stimuli and participants' emotional and behavioural reactions in virtual tours.

2.2 VR experiences (S)

Experiences are inherently personal; however, they can be intentionally crafted to facilitate engagement. In tourism, there are opportunities to design consumption environments that create positive experiences for tourists (Agapito, 2022). This research focuses on the experiences that arise from VR participation, considered to be one of the most effective consumption environments in the pre-travel phase. The VR is a technology-based multi-sensory tool, that arouses various senses of users, most notably sight and sound. Thus, VR experiences provide an ample scope to for users to have personalized emotional responses to specific stimuli. The experiences of tourism through VR shape a new world that depicts the real world or a reflected object (Burdea and Coiffet, 2003). Using computer technology, VR generates a three-dimensional simulated environment and puts an individual inside an immersive experience where mimicking senses such as sight, sound, smell, and touch empowers them to interact with the 3D environment. Tourism marketers frequently use VR technology to encourage tourists to discover and experience marketing stimuli before their actual behaviour (Li *et al*., 2015).

One significant area of research in VR tourism experiences is the influence of VR on tourist behaviour. Virtual tourism experiences offer users the opportunity to temporarily escape from reality, providing relief from negative emotions and inducing positive emotions. Serving as a form of hedonic experience, virtual tourism can have a positive impact on the psychological well-being of people, serving as an effective way to alleviate stress. VR has been shown to positively affect decision-making process by providing potential visitors with realistic previews of destinations and activities before embarking on trips (Chung *et al*., 2018). Through VR, potential travellers virtually explore destinations, visit attractions, and engage in activities, influencing destination choice,

itinerary planning, and booking decisions. VR also enhances the sense of presence, immersion, and emotional connection with destinations, leading to a more engaging and interactive experience.

2.3 Emotions (O)

Emotions emerge as a consequence of an assessment of certain stimuli that are either pertinent or not to an individual's goals. In tourism, emotions are the outcome of hedonic consumption experiences, where the anticipation of pleasure is a strong motivator for travel (Li et al., 2014). Various studies (e.g., Song *et al*., 2015) have shown that tourist experiences have a positive influence on emotions. Stewart *et al*. (1999) found that tourists often report positive emotions during their trips. Within this field, the evaluation of emotions is often grounded in the theory of cognitive appraisal, which suggests that emotions are shaped by perceptions and evaluations of experiences at a particular place (Li *et al*., 2014). Emotions in tourism research are commonly measured using the dimensional approach, which involves assessing positive and negative emotions, or pleasure and arousal (Yuksel and Yuksel, 2007).

In this research, emotional reactions are linked to the sensations of happiness, including delight, excitement, mental imagery, and memorable experiences. Positive emotions play a crucial role in creating enjoyable experiences with tourism products, even during pre-purchase interactions with service providers (Wang and Beise-Zee, 2013). Thus, when marketers design pre-experiences that evoke positive emotions in potential visitors, it can pave the way for building initial connections and establishing a competitive edge. With technological advances and the integration of VR devices with human senses, immersive and sensory experiences may elicit profound emotional responses (Petit *et al*. 2019). Therefore, VR has the potential to evoke powerful emotional reactions in users, further emphasizing the significance of emotions in shaping tourist experiences. Considering the evidence that VR experiences with destination in the pre-travel stage have a meaningful impact on emotional involvement leading to favourable behavioural engagement, it is anticipated that emotional reactions will act as a mediator in the influence of VR on psychological and behavioural engagement.

2.4 Visit intentions (R)

The term visit intention implies an individual's interest or eagerness to visit a destination to discover the newness and beauty for leisure and entertainment. VR-induced visit intention is the interest of people and intention to visit a tourism destination that has been visited virtually, i.e., through VR equipment (Kim *et al*., 2020). The study by Wu and Cheng (2018) argued that involvement with VR positively affected behavioural intentions with the VR experiences during hotel booking experiences. Loureiro *et al*. (2021) further confirmed these associations. They observed that involvement with VR assistants was significantly associated with satisfaction, trust, and visit intentions. Similarly, Kim *et al*. (2020) argued that attachment to VR positively influenced the intention to visit destinations.

2.5 User interactivity

Interactivity is defined from the technical perspective as a specific property of a medium. In this context, the users' perception of interactivity depends on the degree to which a user can change the form and content of an intermediary environment (Steuer, 1992). In this research, the term interactivity implies the ability of users to change and get feedback from their activities where the experience is happening. This study emphasizes human-machine interactivity, as Hoffman and Novak (1996) proposed, where users interact with the mediating environment and react accordingly.

Within the tourism industry, virtual reality (VR) is a digital medium that offers an interactive experience by creating simulated environments using a head-mounted display device (Kim et al., 2020). VR technology enables destination marketing organizations to showcase destination environments through the delivery of 360-degree pictures and videos, reducing tourist anxiety and feelings of uncertainty associated with unfamiliar destinations. VR tourism introduces a novel approach to travel - "try before you visit" - allowing potential tourists to interact with the destination and objects present there in the virtual environment from their homes before committing to a trip (Stanley, 2017). Consequently, users can develop their emotions based on their assessment of the interactive features of the virtual tour. Therefore, it is argued that VR

interactivity influences the tourist's internal state of mind, i.e., the organism to select a holiday destination. Thus, it was hypothesized that:

H1 The user interactivity of VR has an impact on memorable experiences

H2 User interactivity has an impact on emotional experiences during VR participation

H3 User interactivity is positively related to mental imagery in VR participation

2.6 Visual appeal

As customer emotions and experiential aspects of technology-mediated consumption have gained increasing coverage in the literature (Schmitt, 1999), researchers of human-computer interaction have also examined how different quality aspects of technology influence emotions. Visual appeal is a crucial characteristic since VR gives users a pleasing appearance through visual aspects such as colour, photographs, shapes, and typefaces. Regarding VR experiences, being visually pleasing can evoke positive emotions such as joy, excitement, and awe, contributing to more memorable and engaging experiences for tourists (Wang *et al*., 2021). Wu, Weng, and Xue (2016) found that visual stimulation has a stronger impact on the tourist emotions compared to other aspects such as auditory and tactile. Hyun and O'Keefe (2012) discovered that virtual cognitive or perceptual images influenced the formation of emotions and virtual destination images. The use of VR devices create more immersive and authentic virtual environments that stimulate real-world emotional states and feelings (Reiners *et al*., 2014). Building on these prior research findings, it was hypothesized that visual appeal positively influences the emotional involvement of VR users. Hence, the following hypotheses were proposed:

H4 The visual appeal of VR has an impact on memorable experiences

H5 Visual appeal has an impact on emotional experiences during VR participation

H6 Visual appeal is positively related to mental imagery in VR participation

2.7 Memorable tourism experiences (MTEs)

The advent of the experience economy, noting that this is the fourth phase of development after agriculture, industrial, and the service economy, represents unforgettable experiences and memorability among consumers (Pine and Gilmore, 1999). Memorable tourism experiences (MTEs) and tourist experiences are interconnected but differ in meanings, connotations, and extensions (Seyfi *et al*., 2019). Kim et al. (2012) proposed a definition of an MTE as a tourism experience that is selectively constructed based on an individual's assessment of the experience and is positively remembered and recalled after the event has occurred. Tourists are looking for an experience that 'dazzles their senses,' 'stimulates their minds,' 'engages them personally', and 'touches their hearts' (Schmitt, 1999). MTEs are considered essential for enhancing the competitiveness and sustainability of a destination since they impact the decisions when selecting future destinations. If destinations marketers can provide MTEs to people in the pre-travel stage, the probability of visits to their destinations will increase. The existing research has shown the relationship between MTEs and behavioural intention. Memorable tourism experiences are remembered and recalled by people at the end of trips, and may affect subsequent decisions (Kim *et al*., 2013). Talarico and Rubin (2003) noted that extraordinary, surprising, unexpected, and sensory experiences produce unequivocal and long-lasting views in an individual's mind. Also, Zhang et al. (2018) showed that there is a positive correlation between MTEs and revisit intention. Thus, it was hypothesized that:

H7   Memorable tourism experiences from VR participation have a positive influence on visit intentions

2.8 Emotional experiences

Many consumers have the propensity to make decisions on product choices and post-consumption behaviours based on emotional rather than rational factors. Emotion is an essential concept in tourism experiences (Rahmani *et al*., 2019) and could be more influential than cognition (Wang *et al*., 2021). Thus, numerous researchers have made a significant effort to reconnoitre the importance of people emotional experiences (e.g., Fisher *et al*., 2016; Siakaluk *et al*., 2016). Also, Moyle *et al*., (2019) and Kim *et al*., (2020) identified that emotions are essential constructs influencing

tourists' decisions process. Similarly, emotions have a broad impact on experiences that improve destination interactions (Mohd *et al*., 2019). According to Reisenzein (2009), emotional experiences feel different from non-emotional experiences because their core is produced by specific set of emotions. At the pre-trip stage, emotions are vital in motivating people to visit destinations because emotions are omnipresent and crucial to the tourism experiences (Otoo *et al*., 2021), that affects knowledge, judgement, and experiences (Davis *et al*., 2010).

Though emotional experiences depend on several key indicators (Verduyn et al. 2009), this research treats emotions as valance based, i.e., positive and negative perceptions significantly impact experiences and lead to choosing particular destinations to visit (Milman *et al*., 2017). Moreover, emotions work as decision-makers for destination choices and buying decisions on tourism products (Chuang *et al*., 2007). Griffin *et al*. (2017) noted that VR generates more positive emotions toward destinations. In addition, Derbaix *et al*. (2003) determined that emotions directly influenced behavioural responses. Kwortnik and Ross (2007) argued that tourists may experience an array of positive emotions, such as comfort and pleasure, in their holiday planning processes. Thus, emotional experiences through VR may influence visit intentions and it was hypothesized that:

H8   Emotional experiences in VR participation have a positive influence on visit intentions

2.9 Mental imagery

According to MacInnis and Price (1987), mental imagery is an internal visualization process that occurs in the tourist's mind, activating concrete representations of beliefs and feelings related to their experience in a pictorial mode. Based on the experience or available information, individuals develop mental images when they imagine something (Gallarza and Gil, 2008).In marketing research, mental imagery has been explored as an essential mechanism for processing marketing stimuli, as it plays a pivotal role in both memory and motivation (White, 2004). Mental imagery is a higher-order thought processing system that is linked to memory and motivation and involves the reconstruction of past experiences through imagination as well as the anticipation of future

experiences through prospection (Thomas, 2014). Images are internal representations of external objects, and the act of imagination may evoke emotional and behavioral responses (Gendler, 2013). In hedonic consumption, the function of imagination is to visualize past experiences that have already occurred, while prospection involves simulating objects or incidents in the mind that have not yet taken place (Gilbert & Wilson, 2007). This study specifically focuses on the prospection function of mental imagery.

Liu *et al*. (2019) suggested that mental imagery develops in the consumer's mind with the help of sensory information provided in VR which enhances tourists' intention to visit a destination at higher levels rather than 2D or other technologies. Hyun and O'Keefe (2012) suggested that VR develops mental imagery that is directly and indirectly associated with visit intentions. Positive, vivid mental images tend to produce higher visit intentions (Lee and Gretzel, 2012). It is expected that a significant emotional bond exists when mental imagery creates vivid perceptions of destinations and it was hypothesized that:

H9   Mental imagery through VR participation has a positive influence on visit intentions

2.10 Moderating effect of amateur photography

The term amateur photography implies a non-professional photographer who likes to take many photos of the destination with random clicks accompanied by significant enjoyment and fun. For example, photography is becoming a passion with many Millennials while making destination trips. Photography is connected with the tourist gaze, leading to anticipation and daydreaming about potential destinations under consideration. Many are keen to take photographs to support memory and self-identity (Garlick, 2002). The captured photos are part of the experiences with holiday destinations.

In addition, photography provides trip souvenirs (Yeh, 2009) and reflects proof of visiting and activities during visits, which is a common factor influencing visit intentions (Jenkins, 2003). The interest in tourist photography can reinforce the intentions to visit a particular destination to find

attractive and photogenic spots. The study of Urry (1992) argued that photography is positively related to visit intentions and defined photography as acquiring and possessing or transcribing the reality of something. Moreover, photographs enables photographers to draw conclusions about captured images and communicate their stories. Thus, photography may be considered as an antecedent to visiting a destination.

Researchers argue that amateur photography is a vital pre-travel criterion (Jenkins, 2003) and a common factor influencing visit intentions (Yeh, 2009). Based on the existing literature, a significant moderating role of amateur photography is presumed with the association of stimuli (VREs) and with emotions and responses and it was hypothesized that:

H10a-c   Amateur photography moderates the association of user interactivity and emotions

H10d-f   Amateur photography moderates the association of visual appeal and emotions

H10g-i   Amateur photography moderates the association of emotions and visit intentions

Figure 1 represents the proposed research model with hypothesized relationships.

[Insert Figure 1 about here]

3. Methodology

3.1 Research framework

The S-O-R framework was used to predict the relationships of the proposed constructs. Figure 1 represents the framework that was utilized to investigate the relationships among stimuli (user interactivity and visual appeal), organism (memorable experiences, emotional experiences, and mental imagery), and visit intentions as the response of consumers to VR influences. Moreover, the study considered amateur photography as a moderator in the connection between stimuli, organism, and responses.

3.2 Questionnaire design

The scale used to measure the two dimensions of stimuli of tourists (user interactivity and visual appeal) was taken from prior studies by Liu *et al*. (2016) and Cyr *et al*. (2006) consisting of 14 items (see Appendix). The user interactivity and visual appeal were each assessed by seven items on five-point Likert scales ranging from strongly disagree to strongly agree.

Organism was measured by three constructs, namely memorable experiences, emotional experiences, and mental imagery. Measurement scales were taken from the prior studies of *Kim et al*. (2013), Tasci and Ko (2015), and Lee and Gretzel (2012), Leri and Theodoridis (2021) entailing a total number of 21 items. Memorable experiences, emotional experiences, and mental imagery were each assessed by seven items.

Visit intentions were assessed by a seven-item scale adapted from the prior studies of Kozak *et al*. (2001). Respondents were asked to indicate their agreement with the statement concerning their intentions to visit a destination shown in VR. A seven-item scale was utilized to assess the moderating role of amateur photography taken from the study by Yeh (2009).

3.3 Pilot survey

To establish the validity of the scales, a pilot test was conducted by distributing questionnaires to 50 individuals who recently utilised VR. The purpose of this test was to uncover any potential errors. The results of the preliminary reliability test on all variables indicated good internal consistency, as indicated by the Cronbach's alpha values that surpassed the 0.7 threshold. Based on the feedback, certain questions regarding user interactivity, visual appeal, and visit intentions were reworded. A pre-test was then administered to 30 students with VR tourism experiences and further modifications were made to some questions on emotions (emotional experiences, memorable experiences, and mental imagery) for improved clarity. The final survey utilised the revised questionnaire.

3.4 Data collection

The ease and cost-effectiveness of online responses by today's consumers has made it possible for researchers to explore various topics through online surveys (Evans and Mathur 2005). Given that this study focused on consumer behaviour in VR tourism, online surveys were deemed to be an appropriate method of data collection (Huang *et al*., 2016). The study participants were Indian adults aged 19 and above who had prior experience with VR tourism in the past year. They were selected through quota sampling, taking into account the age and gender of mobile Internet users who used virtual reality (VR). The information was sourced from the Telecom Regulatory Authority of India (TRAI) and was for the year 2022.

The online survey platform, Qualtrics, was utilised to gather the sample. Data collection through the online survey took place from March 30th to May 25th, 2022. Participants were invited to participate in the research with information about the purpose of the study and the protection of their personal information. A screening question, specifically designed for this survey, asked all subjects to confirm if they had prior experience with VR tourism in the previous year (i.e., *"Have you had any experience with VR activities related to tourism in the past?"*). Invitations were sent via email to 490 subjects chosen through random sampling from the survey platform's community. A total of 278 completed and valid responses were received, which exceeded the minimum ratio of 5:1 (N: p) as recommended by MacCallum et al. (1999). Among the 278 respondents, 86 were female and 192 were male. The majority (72%) were in the age range of 21-30 years, and almost two-thirds had completed a university degree. This could suggest that the respondents are tech-savvy and understand the advantages of technology for decision-making.

3.5 Common method bias (CMB)

To mitigate potential common method bias, precautions were taken in the survey design. Following recommendations from Conway and Lance (2010) and Podsakoff et al. (2003), several procedural remedies were employed. First, the introduction section of the questionnaire clearly outlined the study's purpose and assured respondents of anonymity. Second, the survey instructions explicitly stated that there were no right or wrong answers, aiming to reduce respondent apprehension. Third, important concepts, such as VR usage for tourism-related activities and

tourism-related content, were clearly defined at the beginning of the survey to ensure response validity. Fourth, the questionnaire was organized into three sections, with the first section containing information about VR activities, the second section consisting of measurement items related to the research model, and the third section including personal questions about demographic characteristics. Finally, to minimize response bias, the order of scale items was randomly rotated for each respondent. These measures were implemented to address potential common method bias and enhance the validity of the survey findings.

Since the study used single cross-sectional data, the results may have been susceptible to CMB, leading to inappropriate inferences (Chin *et al*., 2012). Therefore, the full collinearity test was performed and the results showed that the variance inflation factor (VIF) values of all constructs are lower than the threshold value of 3.33 (Kock, 2017), demonstrating no issue with CMB.

4. Results

Partial least squares-structural equation modeling (PLS-SEM) analysis was used to evaluate the theoretical model and hypotheses for several reasons. First, PLS-SEM does not impose strict requirements on measurement scales, sample sizes, or residual distributions, and instead, uses bootstrap resampling to validate the model with a nonparametric approach (Chin et al., 2003). Second, PLS-SEM analyses reflective and formative indicators, as well as second-order factors within a single model. Finally, PLS-SEM has been shown to be more suitable for complex models and multigroup analysis than traditional SEMs (Hair *et al*., 2012). These characteristics are in line with the research criteria. For these reasons, the SmartPLS 4.0.1 software was utilised to analyse both the measurement and structural models.

4.1 Outer model analysis - Construct reliability and validity

The measurement model's quality was determined by assessing internal consistency and examining the convergent and discriminant validity for the reflective constructs examined using PLS 4.0.1. First, indicators of latent variables with loadings more than 0.60 were chosen as indicated by Chen et al. (2022), since such a boundary value is permitted for exploratory study. Latent variables with

loadings lower than 0.6 were excluded; two items from user involvement, three items from memorable experiences, and a total of fourteen elements were eliminated before re-estimating the model. As shown in Table 1, all indicators with factor loadings greater than 0.7, except UI1 and MI3 which were slightly below 0.7, satisfied the proposed criterion recommended by Barclay et al. (1995).

The internal consistency of the measures was confirmed by ensuring that the values of Cronbach's Alpha and composite reliability (CR) were above the benchmark of 0.7 (Hair *et al*., 2017). The data presented in Table 1 shows that all three values exceeded the 0.7 threshold, indicating a high level of internal consistency. The convergent validity was evaluated using average variances extracted (AVEs) as metrics. It is generally expected that factor loadings and AVEs should be greater than 0.5. The results in Table 1 demonstrate that these conditions were met, meeting the criteria for good convergent validity as per Hair *et al*. (2017).

The final evaluation of the measurement model was focused on discriminant validity. To ensure that the partial least square (PLS) model was free from any issues of discriminant validity, two criteria were used. The first criterion, known as the Fornell and Larcker criterion, stated that the square root of the AVE of each construct should be higher than its correlation with any other construct (Fornell and Larcker, 1981). The second was the heterotrait-monotrait (HTMT) criterion. Also, there is cross loadings criteria to check the discriminant validity of the constructs. It is worth mentioning that the Fornell-Larcker criterion and Cross-Loadings criteria are failed to identify discriminant validity issues in contrast HTMT achieves highest specificity and sensitivity rates across all simulation conditions (Henseler *et al*., 2015). According to Henseler et al. (2015), in order to establish discriminant validity, the HTMT value should be less than 0.9. As shown in Table 2, the HTMT approach confirmed that the model had discriminant validity.

[Insert Tables 1 and 2 about here]

4.2 Inner model evaluation

According to the PLS-SEM findings, user interactivity and visual appeal accounted for 45%, 46%, and 42% of the variance in memorable experience, emotional experience, and mental imagery, respectively. Furthermore, the corresponding variables explained 61% of the variance in visit intentions. The structural model demonstrated a good fit, with a value of 0.558, which exceeded the threshold value of 0.36 proposed by Wetzels et al. (2009). This value was calculated by taking the square root of the product of the AVE mean and R^2 mean.

The proposed hypotheses were evaluated using bootstrapping, which involved 5,000 sub-samples. As shown in Figure 2 and Table 3, the path coefficients results were that user interactivity had a significant positive effect on memorable experiences ($\beta = 0.482, p < 0.001$), thus H1 was supported. User interactivity positively impacted tourists' emotional experiences ($\beta = 0.409, p < 0.001$); and mental imagery ($\beta = 0.405, p < 0.001$), supporting H2 and H3. Visual appeal had a significant positive effect on memorable experiences ($\beta = 0.285, p < 0.001$); emotional experiences ($\beta = 0.380, p < 0.001$); and mental imagery ($\beta = 0.345, p < 0.001$), thus supporting H4, H5, and H6, respectively. Memorable experiences had a significant association with visit intentions ($\beta = 0.361, p < 0.001$), supporting hypothesis H7. Additionally, there was a positive association between emotional experiences visit intentions ($\beta = 0.092, p < 0.003$), supporting H8. Finally, mental imagery positively predicted tourists visit intentions ($\beta = 0.525, p < 0.001$), supporting H9. Therefore, all hypotheses were statistically significant and supported.

[Insert Figure 3 and Table 2 about here]

4.3 Moderator analysis

The PLS-SEM product indicator technique was applied to measure the moderation effect as recommended by Fassott *et al*., 2016. The results revealed that amateur photography moderated the relationship between user interactivity and memorable experiences ($\beta = 0.233$); user interactivity and mental imagery ($\beta = 0.069$); visual appeal and emotional experiences ($\beta = 0.188$); memorable experiences and visit intentions ($\beta = 0.221$), and mental imagery and visit intentions ($\beta = 0.110$). In addition, the interaction effects were used to determine the nature of the effects of

the moderating variables. The results of the interaction effects were significant at the 5% level (Figure 3 and Table 4).

[Insert Figure 3 and Table 4 about here]

4.4 Control variable analysis

The results indicated that socio-demographic dimensions significantly impacted visit intentions. The results showed that Millennials were more eagerly using different components of VR than other generations; gender had a significant impact on the selection of holiday destinations utilizing VR; and household income impacted the selection of holiday destinations.

5. Conclusions

The speedy advancement in information and communication technologies has provided new tools to marketers to attract and retain visitors. It is suggested that tech-oriented tourism experiences help tourists to co-create value through the different stages of travel (Buhalis, 2020). In compared with traditional advertising methods such as print and TV, VR content is more effective in arousing emotions and prompting emotional reactions. In response to calls for more tourism-related studies on the development of integrated models, this research aimed to analyze causal relationship between virtual reality experiences (VREs), emotional responses, and visit intentions based on the S-O-R framework.

This research contributes to the existing VR experience literature in tourism with a theoretical framework of VRE impacts on visit intentions via emotional responses. User interactivity and visual appeal were treated as significant psychological aspects forming VREs and influencing emotions and behavioural intentions. The proposed research model examined the relationships between virtual reality experience elements (user interactivity and visual appeal) and emotions (mental imagery, emotional experiences, and memorable tourism experiences); emotions and visit intentions; and amateur photography and visit intentions. The results demonstrated that generating

VREs arouse positive emotional reactions, including emotional experiences, mental imagery, and memorable tourism experiences, which eventually influence destination visit intentions.

Adopting the two dimensions of virtual reality as the stimuli from the study of Chung *et al*. (2015), this research attempted to measure the critical attributes of virtual reality affecting memorable experiences, emotional experiences, and mental imagery. The findings revealed that user interactivity and visual appeal are critical attributes of VR that influence emotions. User interactivity was the primary attribute that influenced memorable experiences. The reasons may be that different VR interactive features help participants to feel be more involved in tourism activities and better inform them about places and events to share their memorable and unique travel experiences with friends and connections. Moreover, interactive features also influenced emotional experiences and mental imagery.

VR's visual appeal was also an influential factor enhancing emotional experiences. The reason may be that attractive images and videos with 3D applications create emotional desires to visit destinations. Furthermore, by identifying individual tourist needs and issues and providing appropriate responses and services, visual appeal can be self-operated tour guides and encourage people to actively participate in activities.

Of the three significant emotional attributes (organism), mental imagery was the most significant contributor to visit intentions. The reason may be that various VR features offer real-life feelings of a destination that bridges the gap between the virtual and real worlds. People imagine destinations and how they will spend time and resources there. In addition, memorable experiences play an essential role in visit intentions.

The passion for amateur photography moderated the relationship between user interactivity, memorable experiences, and mental imagery. The findings showed that respondents who are passionate about photography use VR features to have more memorable experiences and to better predict the beauty of the destination than those not highly interested in photography. Furthermore, amateur photography moderated the relationship between visual appeal and emotional

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experiences. This finding implies that through the visual appeal of VR, respondents who want to take photos become emotionally more involved than others. As expected, findings also showed that the relationships between memorable experiences, mental imagery, and visit intentions were significantly moderated by amateur photography. High levels of interactivity lead to more memorable and enjoyable experiences, as well as deeper emotional connections with the destination. Similarly, visually appealing VR experiences lead to more engaging and enjoyable experiences, as well as a stronger emotional connection. Emotional experiences are shaped by several factors, including the quality of the VR experience, level of interactivity, and visual appeal. These factors impact emotional responses and ultimately determine intentions to visit the destination in the future.

6. Implications

6.1 Theoretical implications

This study adds to the literature by examining the variables associated with VR experiences (user interactivity and visual appeal), emotional responses (mental imagery, memorable tourism experiences, and emotional experiences), and visit intentions. Future intentions to use VR for choosing holiday destinations depends on emotional responses and the optimization of positive experiences. As an alternative to just seeing a screen in front of them, a virtual world is displayed where people can interact, communicate, or explore. Three important emotional factors, namely mental imagery, memorable experiences, and emotional experiences, influence the intent to visit destinations. Moreover, the outcomes validate the significant influence of VREs and provide significant theoretical evidence for capturing tourism motivation.

The results also suggest that the tourist decision-making process in destination choice is shifting its direction toward VR experiences. New features of VR are imminent that will further enhance human-computer interaction via gestures, looks, and voice. These will undoubtedly increase the power of VR in influencing travel decisions.

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The application of the S-O-R framework was traditionally focused on psychology and sociology. This research, along with several other recent studies, expands the use of the framework to tourism. In so doing, new constructs are added that fit better with the peculiarities of management and marketing in tourism.

Moreover, the previous research on tourism experiences has found that experiences prominently impact visit intentions (Prayag *et al*., 2017). Also, some researchers have argued that the effects of VR as a special aspect of tourism experiences have a more significant influence on intentions to visit destinations, and more future studies should contemplate the positive effects of VR. This research substantiated these arguments and suggestions. It presents the first attempt to integrate VREs, emotions, and visit intentions into an integrated theoretical model to be examined through empirical analysis. Therefore, it provides a fresh outlook and contributes to understanding the relationship between VR experiences, emotional responses, and visit intentions.

Sharma and Nayak (2019) argued that memorable tourist experiences significantly impact visitors' behavioural intentions. This research suggests that memorable tourist experiences influence user interactivity and visual appeal. Thus, the results provide insights into the existing theoretical concept in the pre-travel stages of choosing holiday destinations. The S-O-R framework can be particularly insightful for investigating behavioural intention while planning upcoming trips.

The findings showed that amateur photography has a meaningful impact as a moderator on tourists' visit intentions to destinations. Furthermore, this suggests that people interested in photography like to visit destinations to gain memorable experiences and improve their mental imagination through their photographs. Thus, the results add significant insight into existing theoretical concepts in the pre-travel stages of selecting destinations.

Ultimately, this research analytically examined the boundary conditions between emotional responses and visit intentions. Furthermore, the moderating role of amateur photography was

estimated for VR experiences, emotions, and visit intentions. This is one of the first empirical explorations of the moderating impacts of amateur photography.

6.2 Managerial implications

The results indicate that creators of VR communications should concentrate on producing interactive and visually striking VR content, as the research found that VR experiences with tourism-related activities have a significant impact on potential visitor emotions. Therefore, VR producers should incorporate authentic and distinctive elements into contents, giving viewers realistic and trustworthy VR tourism experiences. Destination marketers should evoke emotions in people to increase motivations to visit the VR-presented places. Destination marketers should create VR content with hedonic elements, fostering a connection and desire to visit the destination presented in the VR. For example, destination marketers can enhance the sensory aspects of VR content with audio, video, haptics, and artificial intelligence, encouraging people to be emotionally captivated and fully immersed.

The findings indicate that amateur photography has a significant moderating effect on prospective tourists' intentions to visit a place presented in VR. Thus, destination marketers are advised to provide photogenic and relevant content to users. By utilising amateur photography, destinations can market their attractions to potential visitors in a more interactive and relatable manner. Showcasing images taken by amateur photographers presents a genuine perspective of the offerings, thereby increasing visit intentions among prospective visitors. Additionally, amateur photography helps promote the destination in a positive light, emphasising the attractions and other offerings and this encourages potential visitors to consider the destination as a travel option, thereby increasing visit intentions. Encouraging amateur photographers to take and share images also increases their engagement with the destination, creating a sense of community and connection, and ultimately driving visit intentions.

Destination marketers should embrace VR tourism content as a means of promoting their destinations to potential customers by considering the three crucial elements of memorable

experiences, emotional experiences, and mental imagery. In essence, destination management organisations and other decision-makers should develop complete VR communication plans that incorporate interactive and visually striking activities. This can be done by creating VR experiences for prospective tourists, which will enable them to pick their preferred destinations at the pre-travel stage. Through this approach, an effective destination marketing strategy can be established.

7. Limitations and future research directions

Although this research offers some new insights relating to VR and visit intentions, it is not free from its limitations. First, the findings are based on Indian tourists, especially Indian digital natives, and the results may not apply to other cultural contexts. Thus, future research should assess visit intentions from multiple cultural contexts to offer more insights. Second, visit intentions may be influenced by multiple stimuli beyond the VR features of user interactivity and visual appeal. As such, it is suggested that future researchers incorporate multiple stimuli from diverse contexts, such as informativeness, accessibility, innovative technology, and augmented reality (AR). Third, the results based on the diverse respondent group who had basic knowledge about VR as a concept in the new era of Indian tourism. Future researchers should poll expert VR users who acquire sufficient knowledge regarding VR to provide more generalized results. Fourth, the research scope was limited to the implications of VR in tourism; however, many other new technologies are being applied. Therefore, future studies should utilise different contemporary technologies to investigate the behavioural intentions of tourists toward visiting destinations. Lastly, future research could consider experimental or longitudinal research designs to address the changing responses of consumers.

The Metaverse is being hailed as the next phase of virtual reality in tourism and hospitality. By utilizing 3D projection technology, it effectively extends the capabilities of augmented reality (AR) and VR into mixed reality (MR), merging the physical and virtual worlds. This revolutionizes the way customers and organizations co-create meaningful experiences and value. With its ability to integrate sensory feedback for sight, hearing, smell, taste, and touch, the Metaverse offers a near-realistic experience beyond traditional VR. As such, researchers studying consumer

behaviour should prepare to evaluate the acceptance, usefulness, and challenges associated with adopting the Metaverse. Such insights will be crucial in refining this new advancement of VR as the next stage in innovation.

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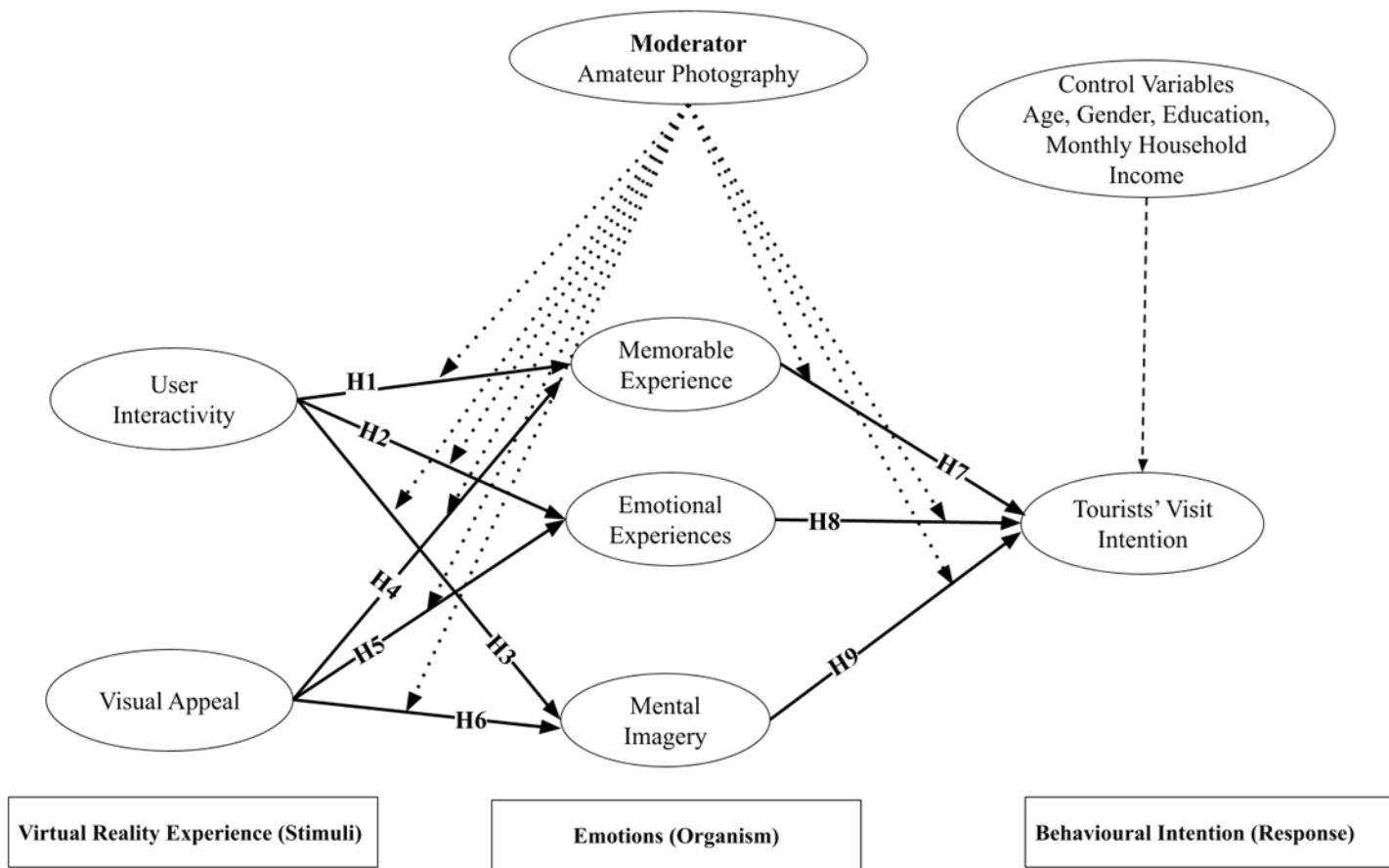
Figure 1 Proposed research model
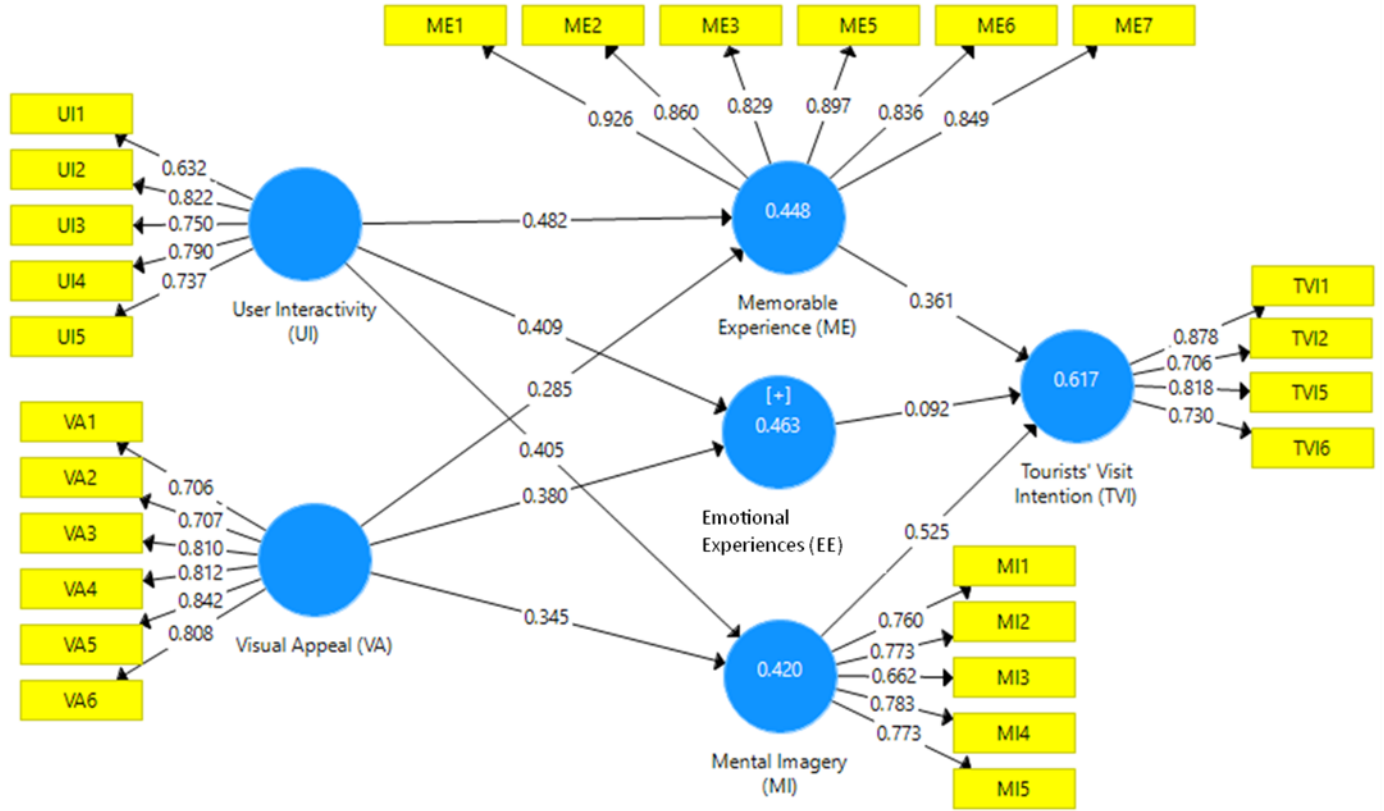
Figure 2 Hypothesis testing model

Table 1 Reliability and validity results

Constructs	Items	Loadings	Cronbach's alpha (α)	Composite reliability (CR)	Average variance extracted (AVE)
UI	UI1	0.632	0.815	0.864	0.561
	UI2	0.882			
	UI3	0.750			
	UI4	0.790			
	UI5	0.737			
VA	VA1	0.706	0.873	0.904	0.612
	VA2	0.707			
	VA3	0.810			
	VA4	0.812			
	VA5	0.842			
	VA6	0.808			

ME	ME1	0.926	0.934	0.948	0.752
	ME2	0.860			
	ME3	0.829			
	ME5	0.897			
	ME6	0.836			
	ME7	0.849			
EE	EE1	0.702	0.809	0.866	0.565
	EE2	0.812			
	EE4	0.747			
	EE5	0.783			
	EE6	0.712			
MI	MI1	0.760	0.910	0.933	0.735
	MI2	0.773			
	MI3	0.662			
	MI4	0.783			
	MI5	0.773			
TVI	TVI1	0.878	0.790	0.865	0.618
	TVI2	0.706			
	TVI5	0.818			
	TVI6	0.730			
AP	AP1	0.853	0.895	0.923	0.706
	AP2	0.918			
	AP3	0.801			
	AP4	0.844			
	AP5	0.779			

Note: UI = User interactivity; VA = Visual appeal; ME = Memorable experiences; EE = Emotional experiences; MI = Mental Imagery; TVI= Tourist visit intentions; AP= Amateur Photography

Table 2 Discriminant validity with the Heterotrait-Monotrait Ratio (HTMT)

Constructs	UI	VA	ME	EE	MI	TVI	AP
UI							
VA	0.509						
ME	0.652	0.566					
EE	0.629	0.621	0.348				
MI	0.651	0.622	0.619	0.580			
TVI	0.749	0.892	0.653	0.829	0.648		
AP	0.576	0.709	0.561	0.617	0.758	0.757	

Note: *UI = User interactivity; VA = Visual appeal; ME = Memorable experiences; EE = Emotional experiences; MI = Mental Imagery; TVI= Tourist visit intentions; AP= Amateur Photography*

Table 3 Results of the proposed research model using PLS.

Path	Path coefficient	t-value	Supported?
H1: User interactivity → memorable experiences	0.482	14.664	Yes
H2: User interactivity → emotional experiences	0.409	12.269	Yes
H3: User interactivity → mental imagery	0.405	14.805	Yes
H4: Visual appeal → memorable experiences	0.285	6.095	Yes
H5: Visual appeal → emotional experiences	0.380	9.897	Yes
H6: Visual appeal → mental imagery	0.345	13.215	Yes
H7: Memorable experiences → visit intentions	0.361	7.818	Yes
H8: Emotional experiences → visit intentions	0.092	2.993	Yes
H9: Mental imagery → visit intentions	0.525	14.867	Yes

Table 4 Moderation analysis results

Paths	Path coefficients	t-values	Moderation?
UI→ME	0.233	7.883	Yes
UI→EE	0.043	1.154	No
UI→MI	0.069	2.306	yes
VA→ME	0.05	1.261	No
VA→EE	0.188	5.660	Yes
VA→MI	0.029	0.923	No
ME→TVI	0.221	4.563	yes
EE→TVI	0.061	1.903	no
MI→TVI	0.110	2.086	Yes

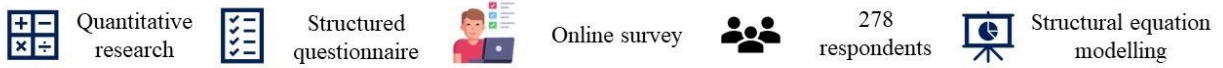| Constructs	Scales and items
User interactivity **UI**	UI1: I was able to interact with the VR device. UI2: I was able to do two-way communication with the VR device. UI3: I could operate the VR device without difficulty. UI4: I interacted with the VR device in various ways. UI5: The VR device reacted quickly to my operation. UI6: The tourism-related VR activity enables me to select the destination quickly. UI7: Using tourism-related VR activity helps me make decisions quickly.
Visual appeal **VA**	VA1: The VR experience has generated an attractive environment. VA2: The environment, as seen in the VR experience, is visually appealing. VA3: The VR experience has generated a lively environment. VA4: The destination, as seen through the VR experience, is quite attractive. VA5: The VR experience with the Oculus provided an easy way to experience the destination. VA6: I found the destination in VR visually appealing.
Mental imagery **MI**	MI1: The mental images that came to mind formed a series of events in my mind that I was a part of. MI2: The mental images that came to mind made me feel I was experiencing the destination featured in this service preview. MI3: This preview made me fantasize about having the opportunity to experience the destination. MI4: I could easily construct a story about myself and the featured destination experience based on the mental images that came to mind. MI5: It was easy for me to imagine being at the destination. MI6: Whilst reviewing this service preview, I daydreamed about the destination. MI7: Whilst reviewing this service preview, many images came to mind. MI8: The images that came to mind were a source of information about the destination. MI9: I could see myself in this scenario
Memorable tourism experiences **ME**	ME1: Exciting: Thrilled about having a new Experience. ME2: Hedonism: Enjoyed this tourism experience. ME3: Novelty: Unique experience. ME4: Local culture: Closely experienced the local features. ME5: Refreshment: I feel liberated and refreshing. ME6: Freedom: Enjoyed a sense of freedom ME7: Meaningfulness: I feel the experience is meaningful, and I learned about myself. ME8: Involvement: I visited a place where I wanted to go and enjoyed activities in which I was interested.

	ME9: Knowledge: The experience provided me with the chance to exploratory in knowledge.
Emotional experiences **EE**	EE1: I am completely involved in tourism-related VR activity. EE2: I am deeply impressed by the tourism-related VR activity. EE3: I feel total empathy for the tourism-related VR activity. EE4: When I am using tourism-related VR activity, I feel captivated. EE5; When using tourism-related VR activity, time seems to pass very quickly. EE6: When using tourism-related VR activity, I forget all concerns. EE7: Using tourism-related VR activity often makes me forget where I am.
Tourist visit intentions **TVI**	TVI1: I hope to visit the tourist attraction or destination where I experienced VR tourism. TVI2: If I have a chance, I want to go to the tourist attraction or destination I experienced in VR tourism. TVI3; I'd like to directly visit more of the tourist attraction or destinations that I experienced in VR tourism than other sights. TVI4: I plan to visit the place I observed in the tourism-related VR activity. TVI5: I intend to visit the place that I saw in the tourism-related VR activity shortly. TVI6: I am willing to visit the place that I saw in the tourism-related VR activity soon. TVI7: I intend to invest money and time to visit the place that I observed in VR tourism.
Amateur photography **AP**	AP1: To what extent did the pictures help you visualize a trip to these destinations? AP2: To what extent did the pictures contain information that helped you imagine a trip to those destinations? AP3: Browsing the photographs of the destination would make me feel good. AP4: Capturing the destination photographs is enjoyable to me. AP5: When I capture the photographs at the destination, I concentrate fully on the activity. AP6: When I capture the photographs at the destination, I am not aware of distractions.

Virtual reality's impact on destination visit intentions and the moderating role of amateur photography

Utilized S-O-R framework → Virtual Reality experiences and emotions → Intentions to visit destinations → Amateur photography

Research design

Quantitative research | Structured questionnaire | Online survey | 278 respondents | Structural equation modelling

Discussion

Positive emotions | Memorable experiences | Pre-travel decision making | Traditional experience shifted to VR experience | Provide guidelines for marketers

ME1 | ME2 | ME3 | ME5 | ME6 | ME7

0.926 0.860 0.829 0.897 0.836 0.849

UI1
UI2 0.632
UI3 0.822
UI4 0.750
UI5 0.790
     0.737

User Interactivity (UI)

0.482

Memorable Experience (ME) 0.448

0.409

0.285

0.361

TVI1
TVI2
TVI5
TVI6

0.878
0.706
0.818
0.730

Tourists' Visit Intention (TVI) 0.617

[+] 0.463

Emotional Experiences (EE)

0.092

0.405

0.380

VA1
VA2 0.706
VA3 0.707
VA4 0.810
VA5 0.812
VA6 0.842
     0.808

Visual Appeal (VA)

0.345

0.525

Mental Imagery (MI) 0.420

MI1
MI2 0.760
MI3 0.773
MI4 0.662
MI5 0.783
     0.773

Hypothesis testing model