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Exploring the Influence of Virtual Reality and Augmented Reality on User Satisfaction in Virtual Tourism

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Abstract

Purpose: This study aims to measure how information quality, system quality, security, usefulness, and ease of use of Augmented Reality (VR) and Virtual Reality (AR) influence user satisfaction, motivating intelligent travel technology developers to improve VR/AR quality to meet customer requirements. **Research design, data and methodology:** This study investigates users interested in travelling in Ho Chi Minh City and Nha Trang City, Vietnam. The research model was implemented using an online questionnaire and face-to-face from 405 valid samples. To evaluate the scale's reliability, the study used the software SPSS 20. Test research hypotheses and evaluate measurement and structural models. This research uses AMOS 20 software. The proposed model is firmly grounded in the Information System Success model (ISS) and the Technology Acceptance Model (TAM), providing a solid theoretical foundation for our research. **Results:** Results show that consumer perceptions of information quality, system quality, security, usefulness, and ease of use have a positive impact on the perceived quality of VR/AR, thereby influencing tourists' travel intention. **Conclusions:** The results of this research enrich the theoretical understanding of consumer behaviour toward intelligent technology products in tourism, providing management implications for manufacturers to improve the quality of tourism products and satisfy user requirements in experience before considering choosing a destination.

Keywords: Augmented Reality, Virtual Reality, Satisfaction, Tourism, Distribution Science

JEL Classification Code: C38, M31, M37

1. Introduction

Many studies show growing interest in applying VR and AR technology in various tourism sectors, highlighting their potential to enhance tourist experiences, promote destinations, and adapt to changing circumstances such as the COVID-19 pandemic (Wei, 2019). The COVID-19 pandemic has dramatically affected the global economy, along with the impact of many industries, and the tourism industry has also suffered huge losses. To attract tourists, businesses need to have specific strategies that combine many solutions and policies effectively. With the vigorous development of information technology today, applying VR/AR to develop the tourism industry in the post-COVID-19 context is an inevitable trend (Tussyadiah et al., 2018).

VR/AR can be considered one of the superior solutions

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that have the ability to significantly change the way destination marketing is done (Huang et al., 2013). Numerous studies have been on the influence of VR/AR technology on user behaviour toward tourist destinations (Wang & Dunston, 2012); or a direct role (Chung et al., 2015; Haugstvedt & Krogstie, 2012; Jung et al., 2015). Several mobile augmented reality applications for tourist sites were assessed by (Linaza et al., 2012), who focused primarily on how customers perceived the apps' utility and opportunities for future development.

Investigations into the perceived quality of VR/AR within tourism have revealed several gaps that necessitate attention. First, there is a pressing need for forthcoming studies that undertake a comparative analysis of consumer behaviour when utilizing VR/AR within the tourism domain. Such a comparative assessment is imperative for travel-related enterprises to adeptly harness the potential of AR, VR, and Mixed Reality (MR) technologies. Additionally, it is crucial to evaluate the efficacy of VR in furnishing alternative travel experiences and influencing consumer perceptions toward travel destinations. Moreover, deficiencies in the utilization of AR applications within the tourism sector have been identified, indicating the exigency for further investigation in this domain. The existing research group accentuates the necessity to augment the foundational knowledge about the theoretical advancements in VR/AR research within the hospitality, tourism, and distribution science domain. The perceived quality of VR/AR technologies can significantly impact user satisfaction and usage intentions. Research has indicated that factors like perceived ease of use, usefulness, enjoyment, and subjective norms influence customer satisfaction and intention to use brands that utilize AR technology (Wang et al., 2022). Additionally, the perceived quality of AR has been linked to enhancing the attitudinal aspects of experiences, such as in museum visits, where inspiration and perceived quality of AR are critical (Wu et al., 2023).

The extant literature on VR/AR within tourism is deficient in comprehensiveness, underscoring a hiatus in the current research landscape. Lastly, exploring wearable technology and AR within the context of the tourism and travel industry is an inadequately explored terrain, warranting additional research endeavours and the implementation of AR applications using wearable smart glasses, especially within the museum and art gallery settings. Studies have indicated that VR enhances overall satisfaction, enjoyment, engrossment, creativity, sound, and graphics quality, which are key factors contributing to user satisfaction (Shelstad et al., 2017). Furthermore, understanding individuals' perceptions regarding AR/VR content services is essential for predicting users' switching intentions (Kim et al., 2019). Users' perceptions of technological features in AR and VR in various contexts, such as fashion retailing, can significantly impact their satisfaction levels (Wu & Kim, 2022).

Although much research focuses on the technical applications of AR/VR, there is still a gap in exploring users' perception, impact, and perception of products that are both tangible (VR/AR) is both an intangible product (its attributes such as information, system, security, usefulness, ease of use, etc...). Furthermore, perceived quality has been proposed as a measure for VR users immersed in virtual worlds, suggesting its importance in understanding user satisfaction (Xu et al., 2022). AR and VR have unique characteristics that affect user perception, in which AR allows real and virtual elements to coexist, impacting user satisfaction differently from VR (Yuen et al., 2011).

In response to the research gap, our team has developed a model that quantifies the user experience of VR/AR technology through their perception of its quality. This model encompasses crucial attributes such as information, system, security, usefulness, and ease of use, providing a comprehensive understanding of user satisfaction and the potential for improvement in VR/AR technology. This study contributes to the understanding of VR/AR smart tourism technology and the theory of its perceived quality.

The next part of the study will present background theories related to the research topic, hypotheses, a proposed research model, research methods, research results, and a discussion. The final part is the conclusion and management implications.

2. Literature Review and Research Model

2.1. The Information System Success Model (ISS)

DeLone and McLean (1992) proposed an ISS model and identified six factors that attributed to IS success: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. DeLone and McLean developed an updated model, including service quality (DeLone & McLean, 2003). ISS model explains why users adopt different information systems and have been used in situations. Some studies on consumer behavioral intentions in tourism have applied the ISS model. Among these applications were augmented reality (Kim & Hyun, 2016), a smartphone application (Wang et al., 2019), and an online retail platform (Wang et al., 2018).

2.2. The Technology Acceptance Model (TAM)

The TAM has been widely applied in the tourism industry to understand and predict tourists' acceptance and usage of various technologies. TAM has been extended and

used in various contexts within tourism, mobile technology (Kim et al., 2008), mobile augmented reality apps (Do et al., 2020), and short video apps (Wang et al., 2022). These studies have shown that factors like perceived usefulness, ease of use, and behavioral intention are crucial in determining tourists' acceptance and usage of technology in the tourism sector. Moreover, the TAM model has been used to explore different aspects of tourism, including social media marketing, digital content marketing, outbound leisure travel, and intelligent tourism technology.

2.3. Stimulus–Organism–Response Model (SOR)

The SOR model states that people's perceptions of their surroundings (stimulus) and experiences (process) shape their behavioral reactions (Mehrabian & Russell, 1974). Numerous researchers have used the SOR model to examine consumer behavior, including (Jacoby, 2002). User behavior when utilizing online services, communications, and information technology, such as user auction behavior on mobile devices, has been studied using the SOR model (Chen & Yao, 2018). Additionally, in the context of tourism, the SOR model is utilized to describe the behavioral responses of consumers. In virtual reality tourism marketing, visit intention is the behavioral intention, planning, and willingness to visit a destination promoted in a virtual reality platform (Tussyadiah et al., 2018).

2.4. The Perceived Quality of VR/AR in Tourism

The theoretical background of the perceived quality of VR/AR is a multifaceted study area encompassing various aspects such as user experience, human perception, and technological advancements. Research has delved into understanding the theoretical underpinnings of VR and AR behaviors/experiences, aiming to provide a comprehensive background for studying perception in these domains (Wei, 2019). The development of a quality VR perception experience model based on structural similarity index (SSIM) and video multi-method assessment fusion (VMAF) has been proposed, highlighting the significance of technological models in understanding perceived quality in VR (Xu et al., 2022). The impact of integrating the inspiration model with AR technology application has been discussed, emphasizing the role of perception and perceived augmentation quality in influencing attitudes toward AR applications in the tourism and hospitality industry (Wu et al., 2023).

VR/AR is applied in many different types of tourism, such as heritage tourism, health tourism, ecotourism, etc. These technologies have been explored for various applications, including enhancing visitor experiences in cultural tourism (Han et al., 2019), museums and art galleries (Dieck et al., 2016), heritage tourism (Poux et al., 2020), ecotourism (Huang & Wang, 2022). Research has delved into the intersection of VR and AR in tourism, exploring methodologies, contexts, and impacts on user experiences (Yung & Khoo, 2019). These technologies have influenced both the supply side of tourism and tourists, presenting new engagement and immersion opportunities (Beck et al., 2019). AR is an emerging experience-enhancing technology that overlays computer-generated content in the real world, enriching specific locations and activities (Yuen et al., 2011). Although VR/AR technology plays a vital role in the tourism sector, research exploring its attributes, such as security attributes, information, system, and user emotions, still needs to be improved, especially in the context of tourism in Vietnam. Therefore, this study approaches the ISS and TAM models to explore further how the perceived quality of VR/AR affects visitors' satisfaction.

2.5. Satisfaction in Experience VR/AR

In tourism, traveler’s satisfaction is the psychological state when perceiving various tourism activities, including good quality tourism services, attractive destinations, etc. The role of VR/AR technology is not only evident in the context of tourist destinations but also extends to online shopping. VR/AR technologies have garnered significant attention in the tourism industry. Studies have shown that user satisfaction influences tourism's behavioral intentions and visitation patterns (Atzeni et al., 2022; Utami et al., 2022). VR and AR applications have been found to enhance user satisfaction by providing unique, authentic, and enjoyable experiences (Sobarna, 2023). Additionally, immersive technologies like VR and AR have improved tourists' overall experience in various tourism contexts (Moro et al., 2019).

2.6. The Relationship between Attributes of VR/AR and Perceived Quality of AR/VR

Information can be defined as processed and organized data that provides meaning and value (Li & Lin, 2006). Quality of information in the context of technology refers to the accuracy, reliability, relevancy, completeness, and timeliness of the information (DeLone & McLean, 2003). Whether a product's quality is perceived as reasonable depends on many factors the system provides, such as information factors. In their study of IS success, DeLone and McLean (2003) emphasised the importance and applicability of content quality. The information quality of VR/AR in tourism has been explored by many previous studies, such as tourism destination descriptions, including information contained in VR tourism content (Lee et al., 2020). During the travel experience, active AR/VR

technology will present images, sounds, and interactive effects. Quality, high resolution, and beautiful images, such as 3D images; Sound is an element that shows liveliness and attraction; Interactive effects bring a sense of thrill and excitement, and users will be immersed in the experience. In their study, Dieck et al. believe that the information quality factor will make users curious and intend to use AR (Dieck et al., 2016). Additionally, Du et al. emphasized that the information quality of VR technology positively influences teachers' perceived usefulness, although it does not influence perceived ease of use (Du et al., 2022).

Technology system quality encompasses various aspects such as system performance, reliability, security, usability, and scalability. A high-quality technological system is characterized by its ability to trace transactions, ensuring transparency and accountability in operations (Behkamal et al., 2009). In their research, VR/AR system quality significantly affects user perception; this was confirmed by DeLone and McLean (2003). Several studies have investigated the relationship between system quality and user perception within AR and VR, and in a study examining VR applications, Seo and Lee explored the impact of system quality on user happiness (Lee et al., 2018). Their findings indicated that overall VR technology experience and user happiness were greatly influenced by system quality, encompassing speed, graphics quality, and reliability. Similarly, Wang et al.'s study in 2019 delved into how system quality affected the user experience of AR applications (Wang et al., 2019). Jung et al. emphasized how system quality affects customer responses and how important it is for consumers' pleasure and loyalty when they use augmented reality technologies (Jung et al., 2015). Information technology systems are essential tools that integrate information inside to help users use and interact. The effectiveness and user experience of VR/AR technologies are significantly influenced by system quality.

A security system encompasses a comprehensive set of measures, protocols, and technologies to protect information, data, assets, and systems from unauthorized access, breaches, and cyber threats (MAHNAMFAR & ÜNLÜ, 2022). Because security affects users' personal information when they use technology, it is a significant issue that system users are concerned about (Huang et al., 2017). Users will not use it if they feel unsafe. Conversely, people will feel more at ease utilising technology if it increases their sense of security. Travelers will not finish the transaction out of fear for their safety and privacy if they believe that the security of their personal information is in jeopardy (Jeong et al., 2019; Lee et al., 2018).

Perceived usefulness is the degree of confidence a user feels that technology can increase efficiency (David, 1989). Research and interest in the relationship between the perceived quality and usefulness of VR and AR in the travel industry are expanding. According to studies, travellers' intentions can be influenced by how much they think they enjoyed their virtual reality travel experiences (Leung et al., 2023). Flow experience and visitor engagement are directly impacted by how VR technology is perceived, with flow experience acting as a partial mediator between the two (Xie et al., 2022). User satisfaction and usage intention in retail settings are influenced by the perceived ease of use, usefulness, and enjoyment of AR technology (Wang et al., 2023).

Perceived ease of use of a new technology is the degree to which users perceive the difficulty or ease of using that new technology (Venkatesh et al., 2003). One important factor influencing user adoption and involvement in VR and AR tourism is the correlation between the technology's perceived quality and ease of use. The effect of perceived ease of use on user satisfaction and engagement has been explored in various studies. For instance, the relationship between the perceived ease of use of mobile AR apps and user satisfaction was mediated by the flow experience, highlighting the importance of ease of use in enhancing user satisfaction (Do et al., 2020). Studies show that accepting information technology strongly correlates with perceived usefulness and ease of use (Davis, 1989). In adopting virtual tourism technology, perceived ease of use positively affects perceived usefulness, highlighting their interplay in shaping users' intentions to adopt new technologies in the tourism sector (Senalasari et al., 2022). Additionally, the perceived ease of use and usefulness have been shown to significantly influence consumers' online experience and brand loyalty in tourism (Xie & Yuan, 2021). Based on the above arguments, the following hypothesis is proposed:

H1: Information has a positive impact on the perceived quality of VR/AR
H2: System has a positive impact on the perceived quality of VR/AR
H3: Security has a positive impact on the perceived quality of VR/AR
H4: Usefulness has a positive impact on the perceived quality of VR/AR
H5: Ease of use has a positive impact on the perceived quality of VR/AR
H6: Ease of use has a positive impact on the usefulness

2.7. The Relationship between the Perceived quality of VR/AR and the Experiencer's Satisfaction

In the relationship between producers and distributors, the issue of product quality is critical, positively affecting satisfaction (Russo et al., 2019). Some past studies confirm the positive relationships between perceived quality and user satisfaction (Baumgarth & Binckebanck, 2011). Tourists' perceptions positively influence their satisfaction (Geng et al., 2021). VR in tourism has been associated with

unique, authentic, and enjoyable activities, increasing satisfaction and intention to visit travel destinations (Sobarna, 2023; Lee, 2020). Furthermore, the significance of preserving authenticity in AR tourism experiences is highlighted because, in the context of AR, the experience's authenticity positively predicts visitor pleasure (Zhu et al., 2023). Based on the above arguments, the following hypothesis is proposed:

H7: Perceived quality of AR/VR positively affects user satisfaction

The theoretical framework of the research model is based on the technology acceptance model (TAM) and the information system success model (ISS). DeLone and McLean (1992) proposed the ISS model and identified six factors that lead to IS success: system quality, information quality, usage, user satisfaction, personal impact, and organizational impact. DeLone and McLean developed an updated model that includes service quality (DeLone & McLean, 2003). The ISS model explains why users adopt and use different information systems in various situations.

The TAM model (Venkatesh & Davis, 2000) is built on the relationship between user attitudes, experiences, and actual use of consumer technology products and services. TAM has been widely applied in the tourism industry to understand and predict tourists' acceptance and use of various technologies. TAM has been used to explore multiple aspects of travel, including social media marketing, digital content marketing, foreign leisure travel, and intelligent travel technology.

Based on TAM and ISS foundation theories, inheriting relevant previous research, and developing hypotheses, the authors have proposed a research model (Figure 1):

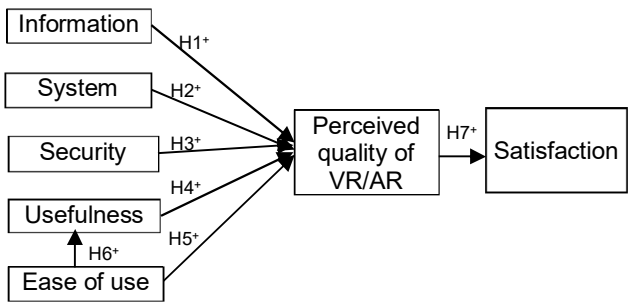

Figure 1: Proposed research model

3. Research Methods

3.1. Instrument Development

Based on a review of research related to the topic, the authors inherited and synthesized the scales and then proceeded to the following steps: data analysis and testing of research hypotheses. The measurement constructs use a 5-point Likert scale, from 1, strongly disagree, to 5, strongly agree. Appendix 1 shows the measurement scales inherited from previous studies.

3.2. Data Collection

The surveyed participants are individuals aged 18 to 60 who currently reside in Ho Chi Minh City and Nha Trang City and are interested in travel. Kline (2011) proposed ten samples for an observed variable. The theoretical model includes 29 observed variables, so the minimum number of samples for the study is 290, and the number of survey samples collected for analysis is 405, meeting the requirements. Data was collected through direct and online survey methods using a convenient sampling approach. Six hundred survey samples were sent, of which 500 were online surveys, 100 were face-to-face surveys, and 425 were received. After cleaning and eliminating 20 invalid response samples, the remaining survey samples included in the official study were 405.

3.3. Data Analysis

This study uses Covariance-Based Structural Equation Modeling (CB-SEM) to test the proposed research model. Linear structural models represent cause-and-effect relationships between independent and dependent constructs (Hair et al., 2021). Moreover, CB-SEM is particularly valuable for examining causal relationships between latent variables and constructs, assessing model feasibility, and confirming theoretical frameworks (Munoz et al., 2016). Therefore, using CB-SEM is entirely suitable for this study. The tool used to perform the analysis is AMOS 20 software, which uses a maximum likelihood estimation method. SPSS 20 was used for exploratory factor analysis (EFA). The research diagram and hypothesis will be analyzed based on the main data collected. Confirmatory factor analysis (CFA) and average variance extracted (AVE) were used to evaluate the measurement model.

4. Research Results

4.1. Profile of the Sample

Table 1 provides an overview of the demographic characteristics of the study sample. Notably, the female demographic, comprising 55.1% of the sample, significantly shapes the tourism landscape. The male demographic, making up 44.9%, also contributes to this dynamic. This data

underscores that women are often more inclined to travel than men. Regarding age distribution, individuals from 18 to 30 years old account for 31.1%, 31 to 40 years old account for 52.3%, and individuals from 41 to 60 years old account for 16.5%.

Regarding educational level, the number of people with a high school degree accounts for 20.5%, and the number of people with a university degree accounts for the highest proportion, 46.2%. Regarding income, the number of people with low income under 10 million VND accounts for the lowest proportion, 11.9%, and those with incomes from 15 to 20 million account for the highest proportion, 45.4%. This data clearly shows that customers are more likely to travel when income is stable, a reassuring factor for our audience to consider.

For the question 'Have you ever used VR/AR?', the number of people answering Yes was 348, accounting for 85.9%, and the number of people answering No was 57, accounting for 14.1%. This robust usage rate of VR/AR demonstrates the growing trend of VR/AR technology among tourists. However, the number of people who have not used VR/AR accounts for a small percentage (14.1%), which shows that, although VR/AR is an intelligent technology in tourism, a small number of users still do not have the opportunity to experiment with it. Businesses will be encouraged to promote this technology to everyone vigorously. For the question' Are you satisfied with VR/AR technology after using it?', the number of people who answered Yes was 319, accounting for an impressive 91.7%, and the number of people who answered No was 29, accounting for 8.3%. This high satisfaction rate underscores the potential of VR/AR technology to enhance the tourism experience.

Table 1: Research Sample Size and Structure

No	Characteristics	Frequency	Percentage
1	Gender		
	Male	182	44.9
	Female	223	55.1
2	Age		
	18-30 years old	126	31.1
	31-40 years old	212	52.3
	41-60 years old	67	16.5
3	Education		
	High school	83	20.5
	Undergraduate	187	46.2
	Graduate	100	24.7
	Others	35	8.6
4	Income (million VND)		
	Under 10	48	11.9
	From 10 to under 15	82	20.2
	From 15 to 20	184	45.4
	Over 20	91	22.5
5	Have you ever used VR/AR?		
	Yes	348	85.9
	No	57	14.1
6	Are you satisfied with VR/AR technology after using it?		
	Yes	319	91.7
	No	29	8.3

4.2. Assessment of Measurement Model

The analysis was performed in two steps. Step one analyzes each independent factor to more clearly determine the contents that must be considered in testing the scale's reliability. Step two uses the oblique rotation method to test the convergent and discriminant validity of all variables in the model. The criteria for calculating the reliability of variables are as follows: the threshold value of Cronbach's Alpha coefficient and composite reliability is 0.7 (Hair et al., 2014).

Initially, the analysis encompassed 32 variables. However, after a meticulous examination of Cronbach's Alpha reliability, it was found that the values of the three variables SYS1, PEU1, and SAT5 were all small and unreliable. Consequently, these variables were eliminated from the model, resulting in a refined structural model analysis with 29 variables. Notably, the smallest alpha value is 0.711, corresponding to the smallest value of CR, which is 0.811. All of these elements adhere to the standard, further validating the model.

For convergent validity, the AVE threshold is 0.5, and the minimum factor loading is 0.6 (Hair et al., 2019). The EFA results of all variables show that the research model's concepts achieve convergent and discriminant validity. The results of the variance analysis extracted using EFA for the scales are presented in a summary in Table 2.

Table 2: Reliability and Validity Measures

Variables	Items	Loading	C.A	CR	AVE
Information (INF)	INF1	0.791	0.885	0.862	0.57
	INF2	0.763			
	INF3	0.824			
	INF4	0.871			
	INF5	0.837			
System (SYS)	SYS2	0.774	0.711	0.811	0.51
	SYS3	0.773			
	SYS4	0.726			
	SYS5	0.788			
Security (SEC)	SEC1	0.685	0.820	0.821	0.53
	SEC2	0.826			
	SEC3	0.780			
	SEC4	0.746			
Usefulness (PU)	PU1	0.779	0.838	0.838	0.56
	PU2	0.803			
	PU3	0.792			
	PU4	0.833			
Ease of use (PEU)	PEU2	0.917	0.761	0.872	0.64
	PEU3	0.912			
	PEU4	0.786			
	PEU5	0.721			

Variables	Items	Loading	C.A	CR	AVE
Perceived quality of VR/AR (PEQ)	PEQ1	0.797	0.812	0.812	0.51
	PEQ2	0.838			
	PEQ3	0.830			
	PEQ4	0.726			
Satisfaction (SAT)	SAT1	0.761	0.738	0.844	0.57
	SAT2	0.877			
	SAT3	0.847			
	SAT4	0.800			

The results of the CFA analysis presented show that the critical model is suitable because the general goodness-of-fit indexes are: Chi-Square/df =1.881 (<3); GFI = 0.9 is within the acceptable limits; CFI = 0.957 (>0.9); TLI = 0.951 (>0.9); RMSEA = 0.047 (<0.08) meets the requirement (Figure 2).

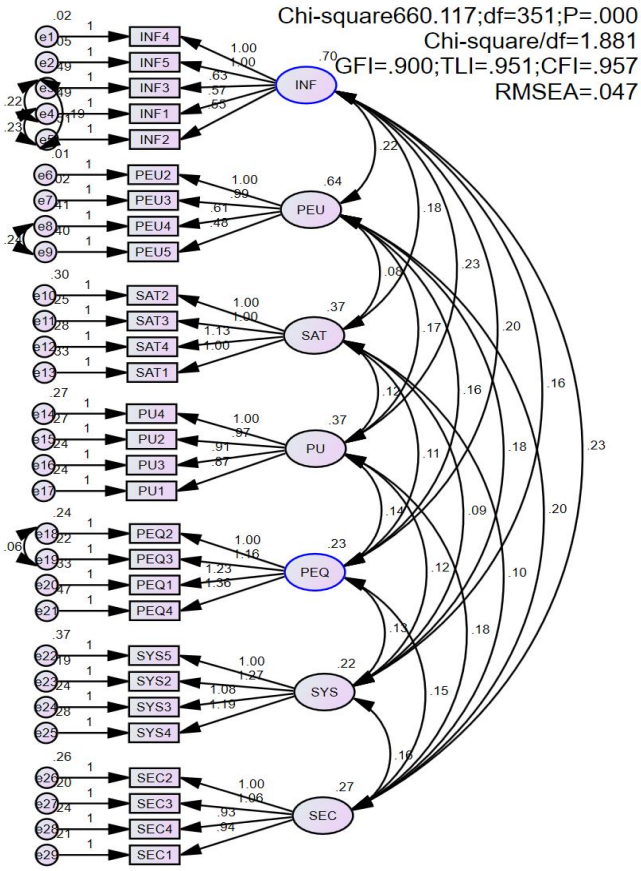

Figure 2: CFA Model

The results of the discriminant validity test are presented in Table 3; the square root of AVE is larger than the correlation value in the rows and columns. Therefore, according to Fornell-Larcker criteria (Fornell & Larcker, 1981), the theoretical model's research concepts meet the discriminant validity requirement.

Table 3: Discriminant Validity Test

Items	INF	SYS	SEC	PU	PEU	PEQ	SAT
INF	7.577						
SYS	0.415	7.207					
SEC	0.525	0.665	7.313				
PU	0.448	0.428	0.578	7.513			
PEU	0.330	0.469	0.490	0.345	8.047		
PEQ	0.480	0.552	0.595	0.485	0.419	7.209	
SAT	0.347	0.327	0.321	0.311	0.163	0.361	7.587

4.3. Structural Model and Hypotheses Test

Seven hypotheses were developed to validate the conceptual framework of the study. The results of the analysis are presented in Figure 3. The overall fit values of the model all meet technical requirements: GFI = 0.885 (smaller than the standard of 0.9 and within the acceptable limits); TLI = 0.935 (>0.9); CFI = 0.943 (>0.9); RMSEA = 0.053 (<0.08) meets the requirements.

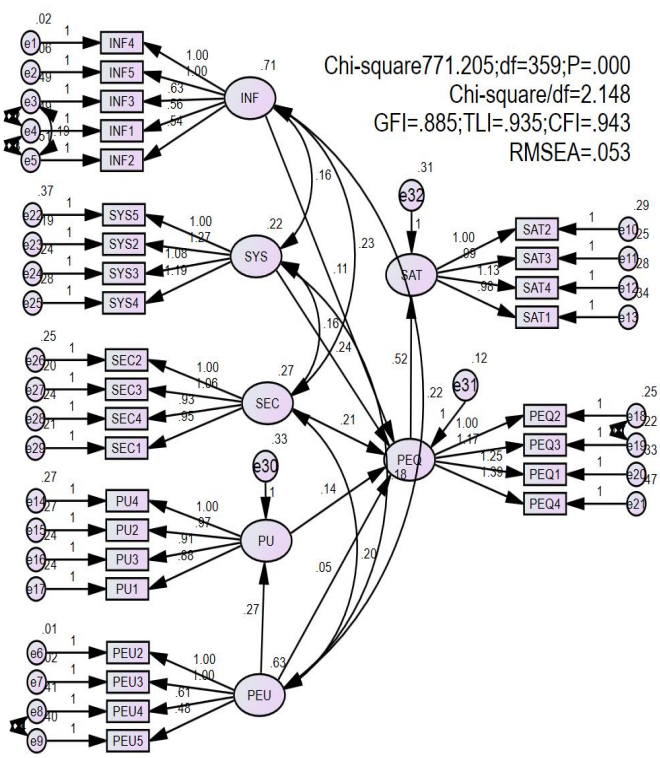

Figure 3: Test Research Hypotheses Using SEM

Research results show that the factors of INF, SYS, SEC, and PU have a positive impact on the PEQ, PEU has a positive effect on the PU, and PEQ has a positive impact on SAT (Table 4).

Table 4: Regression Weights of Theoretical Relationships

Hyp	Relationship	Wei	S.E	C.R	p	Conclusion
H1	INF → PEQ	0.106	0.032	3.339	***	Accepted
H2	SYS → PEQ	0.236	0.079	2.98	0.003	Accepted
H3	SEC → PEQ	0.206	0.078	2.651	0.008	Accepted
H4	PU → PEQ	0.138	0.042	3.276	0.001	Accepted
H5	PEU → PEQ	0.046	0.034	1.329	0.184	Rejected
H6	PEU → PU	0.269	0.041	6.478	***	Accepted
H7	PEQ → SAT	0.521	0.085	6.115	***	Accepted

5. Discussion

The results show that the attributes that affect VR/AR perceived quality are in the same direction as information, system, security, and usefulness, and ease of use affects usefulness in the same direction. This pivotal test supports previous studies (Dieck et al., 2016; Du et al., 2022; Jung et al., 2015; Jung et al., 2016; Lee et al., 2020), which shows the importance of VR/AR technology information system quality on user perception in pre-trip experience.

Although the PEU factor does not directly affect the PEQ factor, the regression weight value is 0.046, and the p-value is 0.184 > 0.05, so hypothesis H5 is rejected. This differs from previous research results (Davis, 1989; Dieck et al., 2016). However, PEU indirectly affects PEQ through the intermediate role of the PU factor. Survey data show that users between 31 and 40 account for the highest proportion, at 52.3%. This indicates that in the context of virtual tourism in Vietnam, young people do not have much difficulty accessing new technology, so the ease-of-use factor plays a vital role in the quality perception of users, especially the younger generation.

The perceived quality of VR/AR is a significant determinant of satisfaction, with a value of 0.521. This critical test supports previous studies (Russo et al., 2019; Sobarna, 2023; Zhu et al., 2023), affirming that users will be satisfied if the system has good quality. This reiterates that product quality, particularly in VR/AR, is pivotal in user satisfaction. This study reinforces VR/AR's impact on tourism and identifies critical factors influencing satisfaction. Importantly, it empirically confirms the effectiveness of using VR/AR in tourism. The findings reveal a significant positive impact between VR/AR quality and satisfaction.

Previous studies suggest enhancing perceived quality in VR/AR systems can directly affect user satisfaction. Managers can utilize these findings by improving service quality, aligning AR experiences with customer values, and creating engaging VR environments to improve user satisfaction and loyalty (Wang et al., 2022). introduce a model that examines the impacts of human value orientation and consumption value on perceived AR values and customer satisfaction. This research emphasizes the role of human values in shaping user perceptions and satisfaction, offering insights for managers to customize AR experiences to align with customer values. Customers feel engaged in real-world situations through VR services; their satisfaction and purchase intentions increase in VR shopping contexts (Lu & Hsiao, 2022). This implies that creating immersive and engaging VR experiences can positively impact user satisfaction. The results of this research contribute to helping VR/AR technology developers evaluate products and improve quality to give users an experience that enhances realistic travel intentions, especially Vietnam tourism.

6. Conclusions

As our research findings underscore, the quality of VR/AR technology is a significant determinant of consumer satisfaction. We have identified essential attributes of VR/AR, including information, system, security, usefulness, and ease of use, that directly impact the quality of VR/AR; the ease of use influences the usefulness. The quality of VR/AR, in turn, plays a pivotal role in shaping user satisfaction. These findings emphasize the crucial role of perceived VR/AR quality and satisfaction in boosting destination intention and compelling users to plan their trips. This research offers valuable insights for VR/AR product manufacturers. It aids in evaluating user experience, overcoming limitations, and leveraging the unique advantages of innovative VR/AR tourism technology that traditional technology lacks. It also significantly contributes to the theoretical understanding of consumer behavior toward innovative technology products in tourism, providing actionable management implications for manufacturers.

Besides academic and practical contributions, the study has some limitations. The survey sample was small, so representativeness was low. The study only surveyed users between 18 and 60 in Ho Chi Minh City and Nha Trang City, Vietnam, so the results only achieved a certain level of reliability. Therefore, the following research direction will expand the survey scope nationwide instead of only surveying users in Ho Chi Minh City and Nha Trang. Broaden the demographic range, such as a more diverse survey age group, instead of limiting the age range to 18 to 60. The study expanded to investigate the factors that influence travel intention instead of just examining the factors that influence user satisfaction. This study only considered technical factors and emotional states that influence intention. As technology develops, other factors will influence user intention.

References

Atzeni, M., Del Chiappa, G., & Mei Pung, J. (2022). Enhancing visit intention in heritage tourism: The role of object-based and existential authenticity in non-immersive virtual reality heritage experiences. *International Journal of Tourism Research, 24*(2), 240-255. https://doi.org/10.1002/jtr.2497

Baumgarth, C., & Binckebanck, L. (2011). Salesforce impact on B-to-B brand equity: conceptual framework and empirical test. *Journal of product & brand management, 20*(6), 487-498. https://doi.org/10.1108/10610421111166630

Bayraktar, E., Tatoglu, E., Turkyilmaz, A., Delen, D., & Zaim, S. (2012). Measuring the efficiency of customer satisfaction and loyalty for mobile phone brands with DEA. *Expert Systems with Applications, 39*(1), 99-106. https://doi.org/10.1016/j.eswa.2011.06.041

Beck, J., Rainoldi, M., & Egger, R. (2019). Virtual reality in tourism: a state-of-the-art review. *Tourism Review, 74*(3), 586-612. https://doi.org/10.1108/TR-03-2017-0049

Behkamal, B., Kahani, M., & Akbari, M. K. (2009). Customizing ISO 9126 quality model for evaluation of B2B applications. *Information and software technology*, *51*(3), 599-609. https://doi.org/10.1016/j.infsof.2008.08.001

Chung, N., Han, H., & Joun, Y. (2015). Tourists' intention to visit a destination: The role of augmented reality (AR) application for a heritage site. *Computers in Human Behavior, 50*, 588-599. https://doi.org/10.1016/j.chb.2015.02.068

Chung, N., Lee, H., Kim, J.-Y., & Koo, C. (2018). The role of augmented reality for experience-influenced environments: The case of cultural heritage tourism in Korea. *Journal of travel research, 57*(5), 627-643. https://doi.org/10.1177/0047287517708255

Davis, F. D. (1989). Technology acceptance model: TAM. *Al-Suqri, MN, Al-Aufi, AS: Information Seeking Behavior and Technology Adoption*, 205-219.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems, 19*(4), 9-30. https://doi.org/10.1080/07421222.2003.11045748

Dieck, M. C., Jung, T., & Han, D.-I. (2016). Mapping requirements for the wearable smart glasses augmented reality museum application. *Journal of Hospitality and Tourism Technology, 7*(3), 230-253. https://doi.org/10.1108/JHTT-09-2015-0036

Do, H.-N., Shih, W., & Ha, Q.-A. (2020). Effects of mobile augmented reality apps on impulse buying behavior: An investigation in the tourism field. *Heliyon, 6*(8). https://doi.org/10.1016/j.heliyon.2020.e04667

Du, W., Liang, R.-y., & Liu, D. (2022). Factors influencing school teachers' continuous usage intention of using VR Technology for classroom teaching. *Sage Open, 12*(3), 21582440221114325. https://doi.org/10.1177/21582440221114325

Elci, A., Abubakar, A. M., Ilkan, M., Kolawole, E. K., & Lasisi, T. T. (2017). The impact of travel 2.0 on travelers booking and reservation behaviors. *Business Perspectives and Research, 5*(2), 124-136. https://doi.org/10.1177/2278533717692909

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research, 18*(1), 39-50. https://doi.org/10.1177/002224378101800104

Garvin, D. A., & Quality, W. D. P. (1984). Really mean. *Sloan management review, 25*, 25-43.

Geng, D. C., Innes, J. L., Wu, W., Wang, W., & Wang, G. (2021). Seasonal variation in visitor satisfaction and its management implications in Banff National Park. *Sustainability, 13*(4), 1681. https://doi.org/10.3390/su13041681

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review, 31*(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Hair Jr, J., Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage publications. https://doi.org/10.1108/EBR-11-2018-0203

Hair Jr, J. F., da Silva Gabriel, M. L. D., & Patel, V. K. (2014). Modelagem de Equações Estruturais Baseada em Covariância (CB-SEM) com o AMOS: Orientações sobre a sua aplicação como uma Ferramenta de Pesquisa de Marketing. *REMark-Revista Brasileira de Marketing, 13*(2), 44-55. https://doi.org/10.5585/remark.v13i2.2718

Han, D.-I. D., Weber, J., Bastiaansen, M., Mitas, O., & Lub, X. (2019). Virtual and augmented reality technologies to enhance the visitor experience in cultural tourism. *Augmented reality and virtual reality: The power of AR and VR for business*, 113-128. https://doi.org/10.1007/978-3-030-06246-0_9

Haugstvedt, A.-C., & Krogstie, J. (2012). *Mobile augmented reality for cultural heritage: A technology acceptance study.* Paper presented at the 2012 IEEE international symposium on mixed and augmented reality (ISMAR). https://doi.org/10.1109/ISMAR.2012.6402563

Huang, C. D., Goo, J., Nam, K., & Yoo, C. W. (2017). Smart tourism technologies in travel planning: The role of exploration and exploitation. *Information & Management, 54*(6), 757-770. https://doi.org/10.1016/j.im.2016.11.010

Huang, G., & Wang, Z. (2022). The Application of Virtual Reality Technology in the Coordination and Interaction of Regional Economy and Culture in the Sustainable Development of Ecotourism. *Mathematical Problems in Engineering, 2022*. https://doi.org/10.1155/2022/9847749

Huang, H., Gong, T., Ye, N., Wang, R., & Dou, Y. (2017). Private and secured medical data transmission and analysis for wireless sensing healthcare system. *IEEE Transactions on Industrial Informatics, 13*(3), 1227-1237. https://doi.org/10.1109/TII.2017.2687618

Huang, Y.-C., Backman, S. J., Backman, K. F., & Moore, D. J. T. M. (2013). Exploring user acceptance of 3D virtual worlds in travel and tourism marketing. *36*, 490-501. https://doi.org/10.1016/j.tourman.2012.09.009

Jacoby, J. (2002). Stimulus-organism-response reconsidered: an evolutionary step in modeling (consumer) behavior. *Journal of consumer psychology*, *12*(1), 51-57. https://doi.org/10.1207/S15327663JCP1201_05

Jeong, J., Mihelcic, J., Oliver, G., & Rudolph, C. (2019). *Towards an improved understanding of human factors in cybersecurity.* Paper presented at the 2019 IEEE 5th International Conference on Collaboration and Internet Computing (CIC). https://doi.org/10.1109/CIC48465.2019.00047

Jung, T., Chung, N., & Leue, M. C. (2015). The determinants of

recommendations to use augmented reality technologies: The case of a Korean theme park. *Tourism management, 49*, 75-86. https://doi.org/10.1016/j.tourman.2015.02.013

Jung, T., tom Dieck, M. C., Lee, H., & Chung, N. (2016). *Effects of virtual reality and augmented reality on visitor experiences in museum.* Paper presented at the Information and Communication Technologies in Tourism 2016: Proceedings of the International Conference in Bilbao, Spain, February 2-5, 2016. https://doi.org/10.1007/978-3-319-28231-2_45

Kim, D. Y., Park, J., & Morrison, A. M. (2008). A model of traveller acceptance of mobile technology. *International Journal of Tourism Research*, *10*(5), 393-407. https://doi.org/10.1002/jtr.669

Kim, H.-C., & Hyun, M. Y. (2016). Predicting the use of smartphone-based Augmented Reality (AR): Does telepresence really help? *Computers in Human Behavior*, *59*, 28-38. https://doi.org/10.1016/j.chb.2016.01.001

Kim, S., Choi, M. J., & Choi, J. S. (2019). Empirical study on the factors affecting individuals' switching intention to augmented/virtual reality content services based on push-pull-mooring theory. *Information, 11*(1), 25. https://doi.org/10.3390/info11010025

Kline, R. B. (2011). Principles and Practice of Structural Equation Modeling-thirded. *The Guildford Press, New York, NY*

Lee, H., Seo, H., & Geum, Y. (2018). Uncovering the topic landscape of product-service system research: From sustainability to value creation. *Sustainability, 10*(4), 911. https://doi.org/10.3390/su10040911

Lee, J. G., Seo, J., Abbas, A., & Choi, M. (2020). End-Users' augmented reality utilization for architectural design review. *Applied Sciences, 10*(15), 5363. https://doi.org/10.3390/app10155363

Lee, M., Lee, S. A., Jeong, M., & Oh, H. (2020). Quality of virtual reality and its impacts on behavioral intention. *International Journal of Hospitality Management, 90*, 102595. https://doi.org/10.1016/j.ijhm.2020.102595

Lee, W.-J. (2020). Use of immersive virtual technology in consumer retailing and its effects to consumer. *Journal of Distribution Science*, *18*(2), 5-15. http://dx.doi.org/10.15722/jds.18.2.202002.5

Leung, W. K., Chang, M. K., Cheung, M. L., & Shi, S. (2023). VR tourism experiences and tourist behavior intention in COVID-19: an experience economy and mood management perspective. *Information Technology & People, 36*(3), 1095-1125. https://doi.org/10.1108/ITP-06-2021-0423

Li, S., & Lin, B. (2006). Accessing information sharing and information quality in supply chain management. *Decision support systems*, *42*(3), 1641-1656. https://doi.org/10.1016/j.dss.2006.02.011

Li, Y., Song, H., & Guo, R. (2021). A study on the causal process of virtual reality tourism and its attributes in terms of their effects on subjective well-being during COVID-19. *International Journal of Environmental Research and Public Health, 18*(3), 1019. https://doi.org/10.3390/ijerph18031019

Linaza, M. T., Marimón, D., Carrasco, P., Álvarez, R., Montesa, J., Aguilar, S. R., & Diez, G. (2012). Evaluation of mobile augmented reality applications for tourism destinations. In *Information and communication technologies in tourism 2012* (pp. 260-271): Springer.

Lu, X., & Hsiao, K.-L. (2022). Effects of diffusion of innovations, spatial presence, and flow on virtual reality shopping. *Frontiers in Psychology, 13*, 941248. https://doi.org/10.3389/fpsyg.2022.941248.

MAHNAMFAR, A., & Nafiz, Ü. (2022). Cyber-Physical Systems and their Security Issues. *Savunma Bilimleri Dergisi*, *1*(41), 97-118. https://doi.org/10.17134/khosbd.1100660

Munoz, R. T., Hellman, C. M., Buster, B., Robbins, A., Carroll, C., Kabbani, M., Cassody, L., Brahm, N., & Fox, M. D. (2016). Life satisfaction, hope, and positive emotions as antecedents of health related quality of life among homeless individuals. International Journal of Applied Positive Psychology, 1, 69-89.

Moro, S., Rita, P., Ramos, P., & Esmerado, J. (2019). Analysing recent augmented and virtual reality developments in tourism. *Journal of Hospitality and Tourism Technology, 10*(4), 571-586. https://doi.org/10.1108/JHTT-07-2018-0059

Nguyen, T. D., & Nguyen, T. T. (2011). Enhancing relationship value between manufacturers and distributors through personal interaction: Evidence from Vietnam. *Journal of Management Development, 30*(4), 316-328. https://doi.org/10.1108/02621711111126800

No, E., & Kim, J. K. (2015). Comparing the attributes of online tourism information sources. *Computers in Human Behavior, 50*, 564-575. https://doi.org/10.1016/j.chb.2015.02.063

Oh, H., Fiore, A. M., & Jeoung, M. (2007). Measuring experience economy concepts: Tourism applications. *Journal of travel research, 46*(2), 119-132. https://doi.org/10.1177/0047287507304039

Poux, F., Valembois, Q., Mattes, C., Kobbelt, L., & Billen, R. (2020). Initial user-centered design of a virtual reality heritage system: Applications for digital tourism. *Remote Sensing, 12*(16), 2583. https://doi.org/10.3390/rs12162583

Russo, I., Confente, I., Gligor, D., & Cobelli, N. (2019). A roadmap for applying qualitative comparative analysis in supply chain research: The reverse supply chain case. *International Journal of Physical Distribution & Logistics Management, 49*(1), 99-120. https://doi.org/10.1108/IJPDLM-02-2018-0056

Senalasari, W., Setiawati, L., & Wibisono, N. (2022). *The Role of Technology Acceptance and Readiness on Intention to Adopt Virtual Tourism Technology during The New Normal Era.* Paper presented at the International Conference on Applied Science and Technology on Social Science 2022 (iCAST-SS 2022). https://doi.org/10.2991/978-2-494069-83-1_38

Sharma, A., & Sharma, R. (2019). Influence of Marketing Mavens on Consumer Switching: Role of Personality. *Journal of Marketing Development and Competitiveness, 13*(2). https://articlearchives.co/index.php/JMDC/article/view/4525

Shelstad, W. J., Smith, D. C., & Chaparro, B. S. (2017). *Gaming on the rift: How virtual reality affects game user satisfaction.* Paper presented at the Proceedings of the human factors and ergonomics society annual meeting. https://doi.org/10.1177/1541931213602001

Sobarna, A. (2023). Virtual Reality Tourism: Linkage Tourist Intention, Satisfaction, and Quality: Moderating Role of Gender and Visiting Experience. *Journal of Marketing Innovation (JMI), 3*(1). https://doi.org/10.35313/jmi.v3i1.58

Tussyadiah, I. P., Wang, D., Jung, T. H., & Tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism management*, *66*,

140-154. https://doi.org/10.1016/j.tourman.2017.12.003

Utami, M. P., Priyambodo, T. K., & Reksoatmodjo, W. (2022). The Effects of Virtual Reality Use On Millenials' On Intention to Visit Travel Destination. *Indonesian Journal of Tourism and Leisure, 3*(2), 58-70. https://doi.org/10.36256/ijtl.v3i2.268

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science, 46*(2), 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478. https://doi.org/10.2307/30036540

Wang, C., Cui, W., Zhang, Y., & Shen, H. (2022). Exploring short video apps users' travel behavior intention: Empirical analysis based on SVA-TAM model. *Frontiers in Psychology, 13*, 912177. https://doi.org/10.3389/fpsyg.2022.912177

Wang, W.-T., Ou, W.-M., & Chen, W.-Y. (2019). The impact of inertia and user satisfaction on the continuance intentions to use mobile communication applications: A mobile service quality perspective. *International Journal of Information Management, 44*, 178-193. https://doi.org/10.1016/j.ijinfomgt.2018.10.011

Wang, W., Cao, D., & Ameen, N. (2023). Understanding customer satisfaction of augmented reality in retail: a human value orientation and consumption value perspective. *Information Technology & People, 36*(6), 2211-2233. https://doi.org/10.1108/ITP-04-2021-0293

Wang, X., & Dunston, P. S. (2012). A framework for designing mobile virtual training systems through virtual modeling technology. *Mobile and pervasive computing in construction*, 37-53. https://doi.org/10.1002/9781118422281.ch4

Wang, Y.-S., Lin, S.-j., Li, C.-R., Tseng, T. H., Li, H.-T., & Lee, J.-Y. (2018). Developing and validating a physical product e-tailing systems success model. *Information Technology and Management*, *19*, 245-257. https://doi.org/10.1007/s10799-017-0286-8

Wang, Y.-S., Tseng, T. H., Wang, W.-T., Shih, Y.-W., & Chan, P.-Y. (2019). Developing and validating a mobile catering app success model. *International Journal of Hospitality Management*, *77*, 19-30. https://doi.org/10.1016/j.ijhm.2018.06.002

Wei, W. (2019). Research progress on virtual reality (VR) and augmented reality (AR) in tourism and hospitality: A critical review of publications from 2000 to 2018. *Journal of Hospitality and Tourism Technology, 10*(4), 539-570. https://doi.org/10.1108/JHTT-04-2018-0030

Wu, C.-H., Lin, Y.-F., Peng, K.-L., & Liu, C.-H. (2023). Augmented reality marketing to enhance museum visit intentions. *Journal of Hospitality and Tourism Technology, 14*(4), 658-674. https://doi.org/10.1108/JHTT-05-2022-0129

Wu, Y. F., & Kim, E. Y. (2022). Users' perceptions of technological features in augmented reality (AR) and virtual reality (VR) in fashion retailing: A qualitative content analysis. *Mobile Information Systems, 2022*. https://doi.org/10.1155/2022/3080280

Xie, S., & Yuan, Y. (2021). *An Empirical Study on the Impact of Online Travel Consumers' Brand Loyalty: The Mediating Effect of Flow Experience.* Paper presented at the E3S Web of Conferences. https://doi.org/10.1051/e3sconf/202125303043

Xie, S., Yuan, Y., & Li, W. (2022). *Research on the Impact of Virtual Reality Technology Perception on Tourist Engagement in the Context of Smart Tourism.* Paper presented at the Proceedings of the International Conference on Information Economy, Data Modeling and Cloud Computing, ICIDC 2022, 17-19 June 2022, Qingdao, China. http://dx.doi.org/10.4108/eai.17-6-2022.2322871

Xu, M., Niyato, D., Kang, J., Xiong, Z., Miao, C., & Kim, D. I. (2022). *Wireless edge-empowered metaverse: A learning-based incentive mechanism for virtual reality.* Paper presented at the ICC 2022-IEEE International conference on Communications. https://doi.org/10.1109/ICC45855.2022.9838736

Yuen, S. C.-Y., Yaoyuneyong, G., & Johnson, E. (2011). Augmented reality: An overview and five directions for AR in education. *Journal of Educational Technology Development and Exchange (JETDE), 4*(1), 11. https://doi.org/10.18785/jetde.0401.10

Yung, R., & Khoo-Lattimore, C. (2019). New realities: a systematic literature review on virtual reality and augmented reality in tourism research. *Current issues in tourism, 22*(17), 2056-2081. https://doi.org/10.1080/13683500.2017.1417359

Zheng, Y., Zhao, K., & Stylianou, A. (2013). The impacts of information quality and system quality on users' continuance intention in information-exchange virtual communities: An empirical investigation. *Decision support systems, 56*, 513-524. https://doi.org/10.1016/j.dss.2012.11.008

Zhu, C., Io, M.-U., Ngan, H. F. B., & Peralta, R. L. (2023). Understanding augmented reality marketing in world cultural heritage site, the lens of authenticity perspective. *Journal of Vacation Marketing, 29*(2), 242-255. https://doi.org/10.1177/13567667221090990

Appendix

Appendix 1: Instruments Development

Variables	Instruments	References
Information (INF)	INF1: Timeliness of information	Dieck et al. (2016); Sharma and Sharma (2019)
	INF2: Relevance of information	
	INF3: Attractiveness of information	
	INF4: Provides accurate information	
	INF5: Provides complete information	
System (SYS)	SYS1: VR can be used to find information on travel destinations	Dieck et al. (2016); Elci, Abubakar, Ilkan, Kolawole, and Lasisi (2017); Sharma and Sharma (2019); Zheng, Zhao, and Stylianou (2013)
	SYS2: Accuracy of the system	
	SYS3: Navigation Quality	
	SYS4: Personalization according to interests	
	SYS5: Has fast response to my requests	
Security (SEC)	SEC1: Smart tourism technologies protect my personal and sensitive information	C. D. Huang, Goo, Nam, and Yoo (2017); No and Kim (2015)
	SEC2: Smart tourism technologies respect my privacy and the safety of my transactions.	
	SEC3: Smart tourism technologies are trustworthy and reliable	
	SEC4: Smart tourism technologies adequate security to protect my personal information	
Usefulness (PU)	PU1: Alternative to traditional visit	Dieck et al. (2016); Do et al. (2020)
	PU2: Convenience of gathering information	
	PU3: Using Mobile AR apps while traveling enables me to find the travel product easily	
	PU4: Product information on Mobile AR apps while traveling is clear and understandable.	
Ease of use (PEU)	PEU1: Costs of effort	Dieck et al. (2016); Do et al. (2020)
	PEU2: Instructions needed to facilitate handling	
	PEU3: Learning to use Mobile AR apps would be easy for me	
	PEU4: It would be easy for me to become skillful at using Mobile AR apps	
	PEU5: I find the Mobile AR apps easy to use	
Perceived quality of VR/AR (PEQ)	PEQ1: Manufacturer X provides us with high-quality products	Bayraktar, Tatoglu, Turkyilmaz, Delen, and Zaim (2012); Garvin and Quality (1984); Nguyen and Nguyen (2011)
	PEQ2: Manufacturer X always satisfies our quality standards	
	PEQ3: Manufacturer X's products are very reliable	
	PEQ4: Appropriateness to intent of use	
Satisfaction (SAT)	SAT1: I am satisfied with the quality of information provided by the AR	Chung, Lee, Kim, and Koo (2018); Li, Song, and Guo, (2021); Oh, Fiore, and Jeoung (2007)
	SAT2: I am satisfied with the visual interface design (such as graphics) of the AR	
	SAT3: The AR service makes my tourist experience more interesting	
	SAT4: Using VR will help me choose my destination in a better and more comfortable way	
	SAT5: I am satisfied with the system stability and speed of the AR	