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Research on the Key Factors Affecting Geny's Willingness to Participate in Virtual Reality Tourism: Evidence from Hainan Yalong Rainforest Cultural Tourism Area

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Abstract

This study utilizes Hainan's Yanoda Rainforest Cultural Tourism Zone as a case study. Grounded in the Technology Acceptance Model (TAM), we developed a research framework encompassing perceived usefulness (PU), perceived ease of use (PEOU), and VR travel intention (IVT), incorporating demographic factors as control variables. This framework systematically investigates the mechanisms influencing Generation Y tourists' willingness to engage in VR tourism. The findings demonstrate that both perceived usefulness and perceived ease of use significantly and positively influence VR travel intention. Demographic factors such as age, income, and place of origin exhibit moderating effects on this intention. Accordingly, the paper proposes strategies for scenic areas to enhance Gen Y travelers' VR tourism experience and revisit intention through the following measures: Optimizing VR equipment usability; Strengthening content value delivery; Implementing differentiated marketing approaches. These recommendations provide practical guidance for the digital transformation of ecotourism destinations.

Keywords: Gen Y; Technology Acceptance Model; Perceived Usefulness; Perceived Ease of Use; VR tourism

Introduction

As a vital engine of global economic growth, tourism plays a pivotal role in driving economic expansion, facilitating cultural exchange, and supporting sustainable development. According to the UN World Tourism Organization (UNWTO) 2024 report, international tourist arrivals worldwide are projected to reach 1.4 billion visits in 2024 (Figure 1), generating approximately $1.6 trillion in direct tourism GDP, accounting for over 10% of global GDP. Beyond being a key driver of the worldwide economy, tourism also serves as a vital catalyst for cross-cultural communication and regional socioeconomic advancement.

Figure 1 Total global tourist visits

Source: World Tourism Cities Federation (WTCF) (2024)

According to China's tourism sampling survey results, domestic tourist trips in China reached 5.615 billion in 2024, an increase of 724 million trips (a 14.8% rise) compared to 2023. This steady growth in domestic tourism volume is illustrated in Figure 2:

Figure 2 Size of China's tourism market from 2011 to 2024

Source: China Tourism Academy and Data Center of the Ministry of Culture and Tourism 2025

As China's international tourism hub, Hainan has actively driven digital innovation in its tourism sector in recent years, particularly within ecotourism and cultural tourism. The province is committed to enhancing visitor experiences through technological solutions (Wang et al., 2024). Numerous scenic areas have adopted emerging technologies, including VR immersive experiences, intelligent navigation systems, and digital interactive displays, to meet modern travelers' demand for high-tech tourism options (Gong & Li, 2024).

For example, Yalong Rainforest Cultural Tourism Zone, as an ecotourism destination, leverages VR technology to provide immersive and interactive experiences. This approach enhances tourists' understanding of tropical rainforest culture and natural ecology while maintaining visitor engagement during off-seasons and boosting the scenic area's competitiveness (Cui & Jiang, 2023).

The Hainan Provincial Government outlined key objectives in its "14th Five-Year Plan for Tourism, Culture, Radio, Television, and Sports Development":

Expanding and upgrading tourist attractions and resorts

Deepening tourism-technology integration

Encouraging scenic areas to adopt digital technologies for creating immersive experiences Establishing demonstration projects for all-for-one tourism to advance Hainan International Tourism and Consumption Center development (Hainan Provincial People's Government, 2021). As a nationally renowned 5A-level scenic area, Yalong Rainforest Cultural Tourism Zone boasts abundant tropical rainforest resources and is hailed as a "natural museum of tropical rainforests," ranking among China's best-preserved pristine rainforest landscapes (Hainan Provincial Department of Tourism, Culture, Radio, Television, and Sports, 2023). Advancing tourism technology, the zone has embraced digital trends through immersive technologies like VR, AR, and holographic projection to: Enhance visitors' understanding of tropical ecosystems; Boost engagement; Strengthen market competitiveness.

This study analyzes factors influencing Generation Y's willingness to adopt VR tourism and proposes optimization strategies for VR applications in Hainan's ecotourism contexts. The research aims to fill knowledge gaps while providing practical guidance for digital transformation in ecotourism destinations.

Research Objectives

1. This study aims to explore the key factors affecting Gen Y tourists' participation in VR virtual tourism in the Yandao Tropical Rainforest Tourism Area.

2. Based on the statistical analysis of data, this paper puts forward the VR experience optimization strategy for Yalong Bay Scenic Area to improve the tourist experience and the competitiveness of the scenic area.

Literature Review

Technology Acceptance Model (TAM) Theory

The Technology Acceptance Model (TAM) was first proposed by Davis in 1989, primarily for studying users' adoption behavior towards new technologies. Davis's TAM model indicates that technology acceptance is influenced by "perceived usefulness" and "perceived ease of use", which in turn affect "intention to use" through "attitude towards use", thereby further influencing "behavioral adoption". The TAM model suggests that users' willingness to adopt new technologies depends on perceived ease of use and perceived usefulness. Perceived ease of use represents how much effort is required to operate a technology; perceived usefulness indicates the extent to which the technology can improve work or life efficiency, as shown in Figure 3:

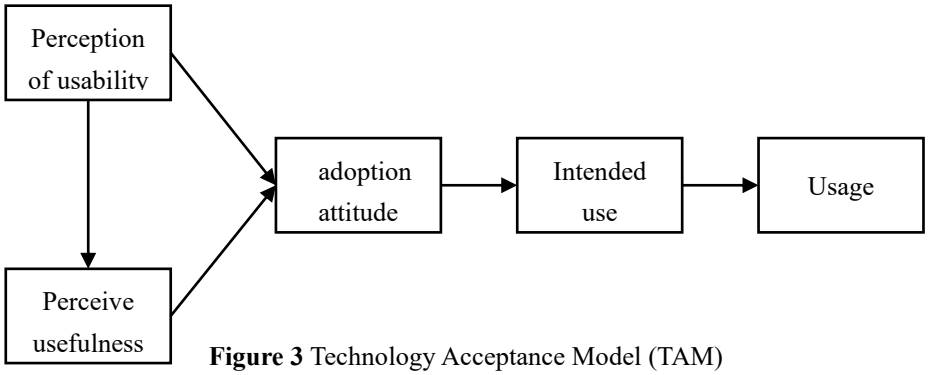

Figure 3 Technology Acceptance Model (TAM)

Related Literature Review

In the post-pandemic era, consumer-centric tourism models and growth engines are poised for a significant transformation. (Bai & Shao, 2021) posits that leveraging virtual reality (VR) technology to empower the tourism industry for the protection and sustainable utilization of cultural heritage has now become a crucial task for heritage destinations. Virtual reality (VR) tourism is defined as providing virtual tourism experiences through VR technology, enabling tourists to perceive the destination's landscape, culture, and activities in a simulated environment. VR tourism primarily embodies three core attributes: immersion, where tourists can experience a sense of presence comparable to on-site visits through VR devices, thereby enhancing realism and attraction; interactivity, where users can choose routes, retrieve information, and manipulate virtual elements, thereby enhancing engagement and entertainment; and personalization, where content can be customized according to individual interests and preferences, meeting the needs of different travelers (Chen & Lou, 2024). Therefore, VR tourism provides tourists with novel experiential pathways and creates new development opportunities for the industry when constrained by time, space, or economy (Ma et al., 2024). As a key area of computer visualization technology, virtual reality (VR) has increasingly been integrated into cultural heritage tourism, playing a crucial role in protection, management, and marketing. However, research on tourists' perception of VR is still in its infancy. As users gradually adapt to this new VR technology, deeper exploration is warranted

on the effective deployment of VR technology in tourism. By conducting in-depth research on the determinants of tourists' attitudes and behavioral intentions towards VR, VR technology can be leveraged to promote the development of heritage tourism.

Conceptual framework

This study refers to the TAM theoretical model, as shown in Figure 4: Core path: PU and PEOU affect VR travel intention (IVT).

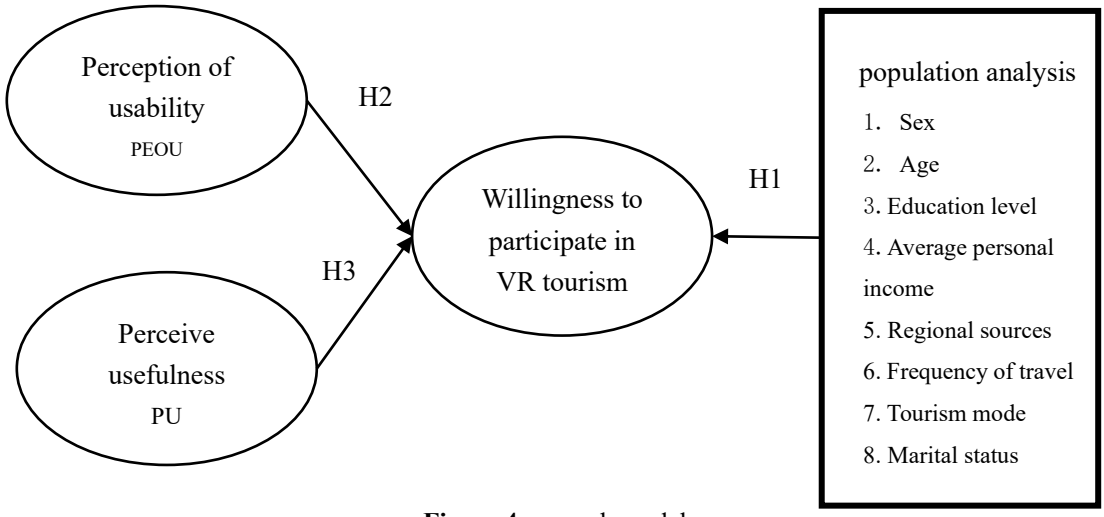

Figure 4 research model

Research Significance

Driven by the digital wave, virtual reality (VR) technology is rapidly penetrating fields such as culture, tourism, and education. Conducting VR research in Hainan holds significant both theoretical value and practical significance.

From a practical perspective, Hainan is at a critical stage in building its Free Trade Port and urgently needs to leverage emerging technologies to drive industrial upgrading. Introducing VR technology can provide new marketing models and immersive experiences for Hainan's tourism industry such as virtual scenic tours, digital museums, and immersive displays of ethnic cultures thereby enhancing tourist satisfaction and travel intent. Simultaneously, VR applications in education, healthcare, urban planning, and other fields will contribute to building Hainan's innovative city ecosystem. For instance, VR-assisted simulation teaching and remote rehabilitation training can improve the efficiency and quality of public services. Crucially, these research findings offer replicable technological pathways and development models for similar regions, promoting high-quality growth in regional digital economies.

Theoretical Significance: As China's sole tropical island province, Hainan boasts abundant natural resources and a rich tapestry of ethnic cultures. Integrating VR technology into regional studies here helps establish a theoretical framework for synergistic "technology + culture" development. This research not only expands VR application models for regional cultural dissemination, advancing immersive experience theories, but also deepens understanding of user engagement and cultural identity mechanisms through the virtual reconstruction of Hainan's ethnic minority cultures and tropical landscapes. Furthermore, it

addresses critical gaps in research on VR applications within specific Chinese regional contexts, particularly Hainan. The findings will boost local digital tourism upgrades, enrich interdisciplinary frameworks like innovative education, and provide transferable technical pathways for comparable regions nationwide. Ultimately, this study injects technological innovation into the construction of the Hainan Free Trade Port, accelerating its evolution into an internationally recognized smart tourism demonstration zone.

Research Methodology

Research Hypotheses

Based on the theoretical model, the following hypotheses are proposed:

H1: Demographic factors have a significant impact on VR travel intention (IVT)

H2: Perceived usefulness (PU) positively influences VR travel intention (IVT)

H3: Perceived ease of use (PEOU) positively influences VR travel intention (IVT)

This study focuses on Generation Y tourists in China, specifically analyzing visitors to Hainan's Yalong Bay Rainforest Cultural Tourism Area who have experienced or are considering VR tourism services. According to 2024 visitor statistics, Generation Y accounts for approximately 45% of visitors. Through stratified random sampling, we selected 410 participants representing diverse subgroups across gender, income levels, and travel motivations (including tech experiences and ecological exploration), ensuring comprehensive sample representation.

The research scope and core are to identify the key factors affecting the willingness of Gen Y to participate in rainforest VR tourism, and put forward optimization strategies to improve tourist experience satisfaction and scenic spot competitiveness.

Sampling scope and object

Abstract: This study was conducted exclusively at the Hainan Yanoda Rainforest Cultural Tourism Area and targeted Generation-Y tourists born between 1980 and 1999 who either had already experienced or intended to experience VR tourism. Two strata were sampled: (1) visitors leaving the on-site VR zone, who completed a dedicated questionnaire link, and (2) visitors elsewhere in the park who declared a plan to try the VR attraction.

Sampling method

This study employed a hybrid of stratified random and convenience sampling. Electronic questionnaires were distributed at the entrance of the Hainan Yanoda Rainforest Cultural Tourism Area via the Questionnaire Star platform to ensure both scientific rigour and collection efficiency.

Variable design proceeded in three steps. Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Virtual-Reality Tourism Intention (IVT) were operationalised on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), as detailed in Table 1.

Table 1 Variable definitions and sources

Variable name	Definition	Literature reference
Perceive usefulness (Perceived Usefulness, PU)	Users' perception of the extent to which VR tourism services can improve their travel efficiency, effectiveness, or experience value.	Davis's (1989) Technology Acceptance Model (TAM), the items were adapted from the classic TAM scale, and combined with the localization of VR scenarios.
Perception of usability (Perceived Ease of Use, PEOU)	Users' subjective evaluation of the operation convenience of VR tourism services includes device usability, learning cost, etc.	Davis (1989) TAM model, items refer to Venkatesh & Davis (2000) extended research.
VR willingness to travel (Intention to VR Tourism, IVT)	Users' willingness to use VR tourism services in the future, including willingness to pay, time investment, and recommendation behavior.	Ajzen's (1991) Theory of Planned Behavior (TPB), behavioral intention scale, combined with VR scenario adjustment.

Research Results

Descriptive statistical analysis

Data were collected through a questionnaire survey designed and distributed via Wenjuanxing and supplemented by social-media channels. The sample comprised 410 valid responses from Chinese Generation Y individuals (born 1980-2000) surveyed on-site at the Hainan Yanoda Tropical Rainforest Cultural Tourism Zone, a representative VR-tourism setting. Basic demographic characteristics are summarised in Table 2.

Table 2 Sample basic information statistics

Basic background information	Class	Frequency	Proportion
Sex	Man	216	52.7%
	Woman	194	47.3%
Age	Age 18-25	85	20.7%
	26-30 years old	239	58.3%
	31-35 years old	22	5.4%
	36-40 years old	24	5.9%
	Age 41-45	20	4.9%
	Age 46-50	13	3.2%
	Over 50	7	1.7%
Educational attainment	High school or below	27	6.6%
	Secondary vocational/college	90	22%
	Undergraduate course	273	66.6%
	Master's degree or above	20	4.9%

Basic background information	Class	Frequency	Proportion
Average monthly income (Yuan)	Less than 2000 yuan	79	19.3%
	2001-5000 yuan	176	42.9%
	5001-8000 yuan	102	24.9%
	8001-11000 yuan	17	4.1%
	11,001-14,000 yuan	15	3.7%
	14001-17000 yuan	9	2.2%
	More than 17,000 yuan	12	2.9%
Regional sources	Provincial (Hainan)	259	63.2%
	outside the province	151	36.8%
Tourism frequency	Rarely (1-2 times per year)	284	69.3%
	Generally (3-5 times per year)	105	25.6%
	Frequently (6 or more times per year)	21	5.1%
Marital status	Unmarried	253	61.7%
	Married	151	36.8%
	Bereft of one's spouse	6	1.5%
The way to choose travel	Package tour	35	8.5%
	Free walker	294	71.7%
	Self-driving travelling	75	18.3%
	Backpacker	6	1.5%

Table 2 shows a male-skewed sample (52.7 %), suggesting males may be more receptive to VR tourism. Respondents are concentrated in the 25-35 age bracket, with the 26-30 cohort being the largest. Most hold a bachelor's degree, followed by vocational-college diplomas. Monthly incomes cluster between CNY 2,001-5,000 and CNY 5,001-8,000. Geographically, 63.2 % are intra-province visitors, ensuring adequate coverage. The majority travel 1-2 times per year, are single, and prefer independent travel.

Descriptive statistics for the demographic variables (Table 3) reveal means, standard deviations, skewness, and kurtosis all within acceptable ranges, with no outliers, thus providing a robust foundation for further analysis.

Table 3 Demographic analysis descriptive statistics

	Least value statistics	Crest value statistics	Mean statistics	Standard deviations statistics	Variance statistics	Skewness		Kurtosis	
						Statistics	Standard error	Statistics	Standard error
Sex	1	2	1.53	0.5	0.25	-0.108	0.121	-1.998	0.24
Age	1	7	2.39	1.87	3.496	1.031	0.121	-0.1	0.24
Educational attainment	1	4	2.25	0.647	0.418	0.795	0.121	0.983	0.24
Average income per person	1	7	2.37	1.374	1.887	1.626	0.121	2.753	0.24
Area	1	2	1.37	0.483	0.233	0.548	0.121	-1.708	0.24
Tourism frequency	1	3	1.36	0.577	0.333	1.373	0.121	0.886	0.24
Marital status	1	4	1.41	0.575	0.331	1.509	0.121	3.649	0.24
Tourism options	1	4	2.13	0.558	0.312	0.547	0.121	1.426	0.24

Reliability Test

To evaluate internal consistency, this study applied Cronbach's α to each latent variable. As reported in Table 4, all dimensions exceeded the 0.80 benchmark, and the overallα reached 0.975, well above the 0.90 threshold, demonstrating strong internal consistency and high reliability of the survey instrument.

Table 4 Reliability analysis

Measurement dimensions	Heading	Average value	Standard deviations	Kreuzbach Alpha	Number of terms
Functional value (PU1)	PU1Q9	3.34	1.188	0.968	3
	PU1Q10	3.43	1.147		
	PU1Q11	3.42	1.159		
Value recognition (PU2)	PU2Q12	3.48	1.158	0.984	3
	PU2Q13	3.52	1.147		
	PU2Q14	3.5	1.128		
Improved convenience (PU3)	PU3Q15	3.52	1.166	0.983	3
	PU3Q16	3.55	1.169		
	PU3Q17	3.54	1.14		
Efficiency optimization (PU4)	PU4Q18	3.52	1.141	0.974	3
	PU4Q19	3.62	1.121		
	PU4Q20	3.6	1.132		
Ease of use (PEOU1)	PEOU1Q21	3.56	1.096	0.977	3
	PEOU1Q22	3.55	1.112		
	PEOU1Q23	3.53	1.119		
Cost of learning (PEOU2)	PEOU2Q24	3.58	1.114	0.961	3
	PEOU2Q25	3.62	1.088		
	PEOU2Q26	3.55	1.08		
Flow clarity (PEOU3)	PEOU3Q27	3.56	1.075	0.954	3
	PEOU3Q28	3.66	1.077		

Measurement dimensions	Heading	Average value	Standard deviations	Kreuzbach Alpha	Number of terms
Comprehensive evaluation (PEOU4)	PEOU3Q29	3.6	1.07	0.966	3
	PEOU4Q30	3.61	1.078		
	PEOU4Q31	3.56	1.124		
	PEOU4Q32	3.6	1.07		
Use intention (IVT1)	IVT1Q33	3.63	1.076	0.984	3
	IVT1Q34	3.62	1.077		
	IVT1Q35	3.54	1.119		
Willingness to invest (IVT2)	IVT2Q36	3.56	1.107	0.966	3
	IVT2Q37	3.51	1.119		
	IVT2Q38	3.4	1.119		
Recommendation (IVT3)	IVT3Q39	3.53	1.106	0.99	3
	IVT3Q40	3.53	1.106		
	IVT3Q41	3.54	1.119		
Kronbach's alpha total: 0.975 Total items: 33 Cases: 410					

Effectiveness test

Validity was assessed via the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity. For the 33 items distributed across 11 dimensions (Table 5), the KMO value was 0.878, indicating an excellent level of sampling adequacy. Bartlett's test was statistically significant ($\chi^2 = 38{,}657.69$, df = 528, $p < 0.001$), confirming substantial inter-item correlations and thereby justifying the use of factor analysis and structural equation modeling.

Table 5 KMO and Bartlett test

KMO and Bartlett test		
KMO sampling appropriateness measure		0.878
Bartlett's test for sphericity	Approximate chi-square	38657.689
	Free degree	528
	Conspicuousness	0

Related analysis

This study employs the Pearson correlation coefficient in SPSS to examine the relationships among key variables. As shown in Table 4-5, perceived usefulness (PU) is strongly and positively correlated with virtual-reality travel intention (IVT) ($r = 0.899$, $p < 0.001$), indicating that higher perceived usefulness significantly increases Gen Y tourists' intention to adopt VR travel. Similarly, perceived ease of use (PEOU) exhibits a strong positive association with IVT ($r = 0.935$, $p < 0.001$), demonstrating that enhanced usability markedly elevates Gen Y's willingness to engage in VR-based tourism.

Table 6 Pearson correlation analysis

Relativity				
		PU	PEOU	IVT
Perceive usefulness PU	Pearson correlation	1		
	Sig. (double tail)	.000		
	Number of cases	410		
Perception of usability PEOU	Pearson correlation	.895**	1	
	Sig. (double tail)	.000	.000	
	Number of cases	410	410	
VR willingness to travel IVT	Pearson correlation	.899**	.935**	1
	Sig. (double tail)	.000	.000	.000
	Number of cases	410	410	410

** At the 0.01 level (double-tailed), the correlation is significant.

Regression Analysis

This study conducted a multiple linear regression analysis with VR travel intention (IVT) as the dependent variable and perceived usefulness (PU) and perceived ease of use (PEOU) as independent variables. The results are as follows:

The model was significant overall ($F = 869.643$, $p < 0.001$), with a coefficient of determination $R^2 = 0.810$ and adjusted $R^2 = 0.809$, indicating that PU and PEOU could jointly explain 81% of the variation of VR travel intention, and the model fitting degree was high.

The standardized regression coefficient of PU was $\beta = 0.377$, $t = 9.570$, $p < 0.001$;

The standardized regression coefficient of PEOU was $\beta = 0.560$, $t = 14.213$, $p < 0.001$;

Both of them have a significant positive effect on IVT, which verifies hypotheses H2 and H3.

The collinearity diagnosis results show that the tolerance of PU and PEOU is 0.300, and the VIF value is 3.337, which is within the acceptable range, indicating that there is no serious collinearity problem in the model, and the independence between variables is good.

In conclusion, perceived usefulness and perceived ease of use significantly affect the VR travel intention of Gen Y tourists, which further verifies the applicability of the technology acceptance model in ecotourism scenarios. As shown in Table 7, 8, 9:

Table 7 Model summary b

Model	R	R square	Adjusted R-squared	Error in standard estimate	Changing the stats				
					R-squared change	F variable quantity	Freedom 1	Freedom 2	Significance F change
1	.900a	.810	.809	.43865	.810	869.643	2	407	.000

a. Predictive variables: (constant), PEOU, PU

b. Dependent variable: IVT

Table 8 ANOVAa

Model		Quadratic sum	Free degree	Mean square	F	Conspicuousness
1	Regression	334.665	2	167.333	869.643	.000b
	Residual	78.313	407	.192		
	amount to	412.978	409			

a. Dependent variable: IVT

b. Predictors: (Constant), PEOU, PU

Table 9 Coefficient a

Model		Non-standardized coefficients		Standardization coefficients	t	Conspicuousness	B is the 95.0% confidence interval		Correlation Statistics	
		B	Standard error	Beta			Lower limit	Superior limit	Tolerance	VIF
1	(constant)	.274	.082		3.355	.001	.113	.434		
	PU	.357	.037	.377	9.570	.000	.283	.430	.300	3.337
	PEOU	.559	.039	.560	14.213	.000	.482	.637	.300	3.337

a. Dependent variable: IVT

Discussions

This study investigates the factors influencing Generation Y's willingness to engage in virtual-reality (VR) tourism, using the Hainan Yanoda Rainforest Cultural Tourism Zone as a case study. We constructed and validated a Technology Acceptance Model (TAM). Through quantitative methods—including questionnaire surveys and SPSS-based data analysis—the study yielded the following key conclusions:

Perceived ease of use (PEOU) exerts a direct effect on VR-tourism intention (IVT). The results show a significant positive relationship between PEOU and IVT ($\beta = 0.560$, $p < 0.001$), indicating that user-friendly VR devices effectively lower adoption barriers. Moreover, ease of use reduces cognitive load during the experience, thereby enhancing satisfaction and strengthening users' willingness to adopt VR technology.

Perceived usefulness (PU) also has a direct impact. PU significantly and positively affects IVT ($\beta = 0.377$, $p < 0.001$), revealing that Generation Y users are more inclined to adopt VR-tourism services when they believe these services enhance travel efficiency or experiential value.

Conclusion

The results of objective 1 research showed that: Population factors have an impact on VR tourism willingness.

The results of objective 2 research showed that: Perceived ease of use has a significant impact on VR travel willingness.

The results of objective 3 research showed that: Perceived usefulness has a significant

impact on VR travel willingness.

Suggestion

Based on the conclusions of this study and future research prospects, the following recommendations are proposed:

Strengthen interdisciplinary collaboration. Researchers from tourism, psychology, communication, computer science, and other fields should be encouraged to engage in joint investigations of the complex mechanisms underlying VR-tourism user behaviour. Keep abreast of technological developments. With the continuous innovation of VR technology and the expansion of its application scenarios, scholars should closely monitor the latest technological trends and update or optimise their research models and methods accordingly. This will enable them to optimise product design. Introduce perceived-entertainment variables and quantify the weight of perceived entertainment (PE) on VR-tourism intention to provide clear guidance for product development. Adjust operational strategies. By encouraging users to share VR experiences on platforms such as Xiaohongshu and TikTok, a closed-loop mechanism of “experience–creation–dissemination” can be established, effectively enhancing user engagement and brand communication. Refine market positioning and targeted marketing. This study clarifies Generation Y’s behavioural characteristics and demand preferences as the core VR-tourism consumer group, providing a foundation for market positioning and precision marketing. Enterprises can formulate targeted strategies—for example, launching VR-travel packages aligned with Gen Y’s consumption capacity and interests and organising exclusive experiential events—thereby improving market responsiveness and user-conversion rates.

New Knowledge

This study is the first to embed the Technology Acceptance Model (TAM) into a tropical ecotourism destination in China, using Hainan's Yanoda Rainforest as a case study. The study constructs and validates a path from perceived usefulness to perceived ease of use to virtual reality (VR) tourism willingness. New findings include: under hot and humid rainforest conditions, perceived ease of use explains 81% of Generation Y's VR willingness, which is significantly higher than reported results in urban or museum environments, revealing a previously undocumented boundary condition of climate technology; demographic variables such as age, income, and origin have a moderating effect, indicating that Generation Y groups with different backgrounds have varying degrees of acceptance towards VR tourism, providing a basis for differentiated marketing. This study is the first to validate the applicability and explanatory power of the TAM model in a tropical rainforest cultural tourism scenario, expanding the model's scope of application in the context of ecotourism and regional cultural backgrounds, and filling a gap in related empirical research. A closed-loop marketing strategy of "experience-creation-dissemination" is proposed, emphasizing the use of user-generated content (UGC) to stimulate user engagement and brand dissemination, providing new ideas for the operation of VR projects in cultural tourism scenic spots.

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