Evaluation and Analysis of Residents' Subjective Perception of Digital Cultural Tourism: An Empirical Study Based on Structural Equation Model

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Abstract. The purpose of this study is to explore the factors that affect residents' subjective perception of digital cultural tourism, and to study the extent to which each factor shapes these perceptions by establishing a structural equation model. Focusing on Hangzhou, a city in Zhejiang Province renowned for its pioneering role in China's digital economy, the research leveraged a sample of 300 valid questionnaires. Hangzhou, with its advanced state of digital cultural tourism development, provided an ideal backdrop for this investigation. The findings reveal that cultural value identification exerts the most significant positive influence on individuals' subjective perception of digital cultural tourism. Additionally, the recognition of cost-effective and equipment identification were also found to positively affect these subjective assessments. The study also found that cost-effectiveness can elevate the public's cognitive engagement with digital cultural tourism, thereby influencing their willingness to participate. Based on our findings, we recommend enhancing the regulation of digital cultural tourism pricing at attractions, improving the cultural depth and quality of digital tourism content, and advancing digital technology to boost its benefits for cultural tourism. Through this study, we hope to foster the modernization and high-quality development of China's tourism industry.

Keywords: digital literature tourism, subjective perception, structural equation, modernization transformation.

1 Introduction

In the era of global Internet connectivity and intelligence, the digital cultural tourism industry has emerged. Leveraging the Internet as the carrier, digital cultural tourism integrates digital technology with the cultural tourism industry to achieve experience-oriented, immersive and scenario-based cultural tourism consumption [1]. For digital cultural tourism, it usually refers to the technology empowerment process with digital technology application and consumption data mining as the core and digital technology, smart products and intelligent platforms as the support. Nowadays, tourism is not only integrated with culture, but also uses information and communication technology (ICT) to improve its efficiency. [2] The progress of information technology has a profound

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impact on various modules of the tourism industry, such as transportation, sightseeing, entertainment and knowledge dissemination. [3]

Although digital cultural tourism relies on digital technology, it is not just a simple stack of related technologies, but the reconstruction of all levels and links [4]. In recent years, virtual exhibitions, as a part of digital cultural tourism, have become popular all over the world. Institutions like the British Museum have embraced this trend by collaborating with the metaverse platform 'The Sandbox' to offer virtual tours, while The Metropolitan Museum of Art in New York has introduced a digital open collection service, enabling visitors to freely download images from their extensive collection. Similarly, in China, Hangzhou, as a tourist destination, has firmly grasped the development opportunity of digital cultural tourism and actively promoted the digital transformation of cultural tourism industry.

Digital cultural tourism expands the scope of traditional practices by introducing digital expressions, yet it also faces more complex challenges. Li T. notes issues with the digital cultural industry, such as conceptual ambiguity and content homogenization [5]. Ichwan M. found that there is a positive relationship between the system quality, information quality and the level of visitors' satisfaction [6]. Davis's TAM model emphasizes that perceived usefulness and usability are key drivers of technology adoption in information systems (IS).[7]

Existing literature predominantly employs qualitative analysis to scrutinize potential issues in the digital transformation of cultural tourism, which may introduce subjectivity. As a vanguard in the digital economy, Hangzhou has reached a sophisticated level in digital cultural tourism, boasting a substantial user base that facilitates quantitative assessments of subjective experiences. Current research predominantly focuses on public perception as a solitary factor. Yet, the engagement with digital cultural tourism, as an emerging concept, can reshape cognitive understanding and subsequently influence subjective perceptions. Additionally, the literature lacks a quantitative examination of the cultural value's impact within digital cultural tourism. Hangzhou's rich historical and cultural tapestry plays a pivotal role in shaping digital cultural tourism offerings. Aiming to amplify digital cultural tourism's empowering effects and to construct a contemporary tourism framework in China, this study investigates the factors influencing Hangzhou residents' subjective perceptions of digital cultural tourism. By doing so, it aims to elucidate the existing developmental challenges and to catalyze the industry's modernization and evolution.

2 Model Preparation

In contemporary research, the Structural Equation Modeling (SEM) has become a predominant approach for investigating social science issues [8]. SEM is particularly adept at handling latent variables—those unobservable constructs that frequently emerge in social problem studies and whose relationships cannot be adequately addressed by standard regression techniques. SEM extends the traditional linear model to model the interplay between latent and observed variables, as well as among latent variables themselves, while accounting for measurement errors [9]. The structural relationships within

the model are revealed through the estimation of path coefficients; the larger the absolute value of these coefficients, the more significant the influence between the variables. The model can be visualized as the path diagram shown in Fig 1.

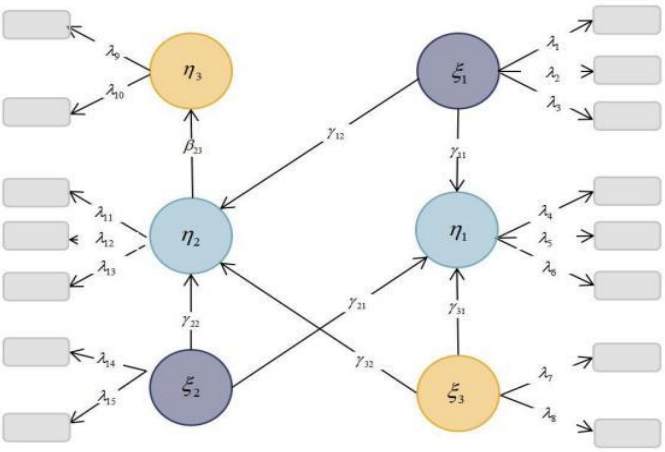

Fig. 1. Path diagram

In this paper, we use structural equation to analyze the factors that affect the subjective perception of digital literature tourism, and reveal the direct effects among the factors.

2.1 Research variables

We identified several study variables for testing and analysis. The study variables included exogenous latent variables, namely subjective perception (SP), cognitive level (CVI), equipment identification (DI), cost-performance identification (CPI), cultural value identification (CVI), public participation (PU),a nd observed variables as indicated in Table 1.

Table 1. Model variable table

Latent Variable	Observed Variable
Subjective perception	SP1: Construction attitude
	SP2: Overall satisfaction
	SP3: Service satisfaction
Cultural-value Identification	CVI1: Can bring immersive feeling
	CVI2: Can deepen the understanding of traditional culture
Cost-performance Identification	CPI1: Digital scenarios charge reasonable fees
	CPI2: The smart tourism platform offers good value for money

Device Identification	DI1: Digital scene has good interactivity
	DI2: High level of digital scene construction
	DI3: The smart tourism platform is easy to use
Public Participation	PU1: I often visit online blogs
	PU2: I often experience digital scenes offline
	PU3: I often use smart travel platforms
Cognitive level	CL1: Cultural level
	CL2: Understanding degree

2.2 Method of collecting data

Data collection will be accomplished by developing and distributing a 15-question questionnaire using a 1 to 5 likert scale in Hangzhou, Zhejiang Province.

Considering the difference of economic level and scientific and technological development level among the main urban areas of Hangzhou, multi-stage stratified sampling was selected during the sampling survey. Firstly, with K-means clustering, the ten urban areas of Hangzhou are divided into three layers according to the level of technological and economic development from high to low. PPS unequal probability sampling is used for each layer, and finally 3 urban areas are selected. According to the population of each urban area, according to the principle of proportional distribution, a certain number of streets are drawn proportionally from the main urban area. Finally, 300 questionnaires were distributed.

2.3 Model assumption

The model has 10 hypotheses, hypothesis 1 to hypothesis 7 represents the direct influence between latent variables, hypothesis 8 to hypothesis 9 represents the indirect influence between variables, that is, the intermediate variable indirectly affects the third variable. When the P-value of the path coefficient is less than 0.05, it indicates that the hypothesis is significant and acceptable.

1. Hypothesis 1: Public participation -> Cognitive level
2. Hypothesis 2: Cost-effective identification -> subjective perception
3. Hypothesis 3: Cost-effective identification -> Public participation
4. Hypothesis 4: Cultural value identification -> subjective perception
5. Hypothesis 5: Cultural value identification -> Public participation
6. Hypothesis 6: Device identification -> Subjective perception
7. Device identification -> Public participation
8. Cost-effective identification -> Public participation -> cognitive level
9. Hypothesis 9: Device identification -> Public participation -> cognitive level
10. Hypothesis 10: Device identification -> Public participation -> cognitive level

2.4 Data description and normality test

It can be seen from the Fig 2 that there is a certain correlation between the observed variables. Among them, the subjective perception has a strong positive correlation with cultural value identification and equipment identification, which can provide reference and verification for the subsequent establishment of the model.

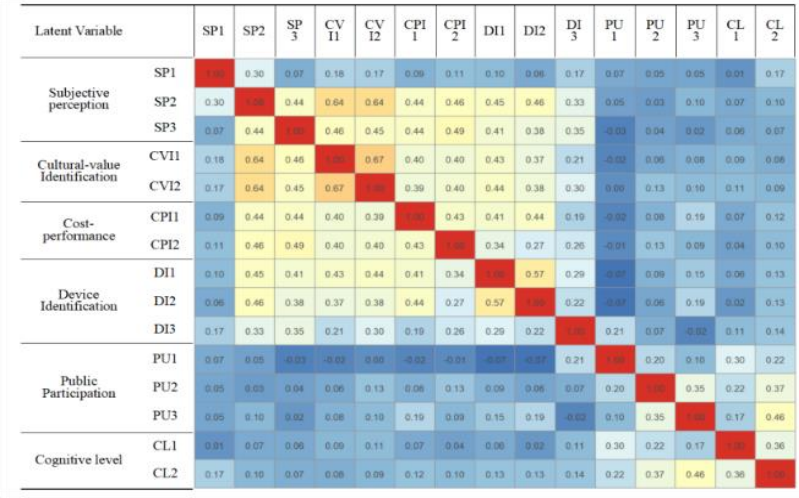

Fig. 2. Correlation Heat Map

The normality test was conducted on the sample data. According to the results of Kolmogorov-Smirnov and Shapiro-Wilk tests, the P-value of each variable was <0.05, so the hypothesis of normality was rejected, indicating that the data did not meet the normal distribution. Structural equation usually requires a priori theoretical model as the basis. In the investigation of Zhejiang residents' subjective perception of digital cultural travel, there is no relevant theoretical support for the factors affecting the subjective perception of digital cultural travel. At the same time, since the sample data did not meet the normality test, we chose partial least squares (PLS) method to solve the model. PLS is not only applicable to the research lacking theoretical basis, but also avoids the assumption of normality of latent variables and error terms, making the model more robust.

3 Model Results

3.1 Measurement model

The measurement model is evaluated by investigating internal consistency, convergence validity and discriminant validity [10]. Table 2 shows the solution results and evaluation results of the measurement model. It can be seen from Table 2 that all latent variables pass the internal consistency and compound validity tests as a whole. The outer loading of most observed variables exceeded 0.7, and through the significance

test ($p < 0.05$), it could be seen that all latent variables' AVE were greater than 0.50. Hair[11] believes that HTMT is more suitable for measuring discriminant validity than cross-load. As shown in Table 2, HTMT of all variables in the test is less than 0.9.

Table 2. Measurement Model Evaluation

Latent Variable	Observed Variable	Convergent Validity		Internal Concistency		
		Outer Loading	AVE	Composite Reliability	Rho-a	HTMT
Subjective perception	SP1	0.391				
	SP2	0.883	0.734	0.749	0.655	<0.9
	SP3	0.787				
Cultural-value Identification	CVI1	0.915	0.845	0.912	0.827	<0.9
	CVI2	0.914				
Cost-performance Identification	CPI1	0.833	0.715	0.843	0.621	<0.9
	CPI2	0.856				
Device Identification	DI1	0.839				
	DI2	0.805	0.679	0.811	0.649	<0.9
	DI3	0.625				
Public Participation	PU1	0.516				
	PU2	0.765	0.556	0.735	0.647	<0.9
	PU3	0.775				
Cognitive level	CL1	0.714	0.665	0.800	0.635	<0.9
	CL2	0.908				

3.2 Structural model

In order to evaluate the structural model, starting with the significance level of fitting index and path coefficient, the model SAMR=0.090<0.1, which met the criteria of Hu and Bentler, and the other fitting index passed the test (χ^2/df=2.112, GFI=0.927, CFI=0.928, RMSEA=0.061)[12]. Fig 3 shows the path diagram1 for the structural model.

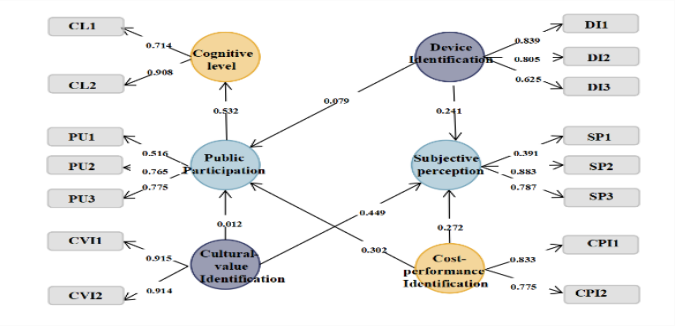

Fig. 3. Path Diagram Model With Estimation

The significance of the paths within the structural model was assessed using a T-test. To perform this analysis, 5,000 subsamples were drawn from the data using the bootstrapping method, with the significance level established at 10%. The path coefficients that met the criteria for statistical significance are presented in Table 3.

Table 3. Structural Model

Hypothesis	Path	Parameter Estimation	p-value	conclusion
1	PU->CL	0.532	.000	significant
2	CPI->SP	0.272	.000	significant
3	CPI->PU	0.302	.000	significant
4	CVI->SP	0.449	.000	significant
6	DI->SP	0.241	.000	significant
8	CPI->PU->CI	0.110	.000	significant

4 Conclusions

This study delves into the elements that shape the subjective perception of digital cultural travel, with Hangzhou in Zhejiang Province as the focal point, a region noted for its thriving digital economy and rich cultural heritage. The findings indicate that the identification with cultural value markedly enhances individuals' subjective perception of digital literary travel. Additionally, device identification positively affects these perceptions, and there is a positive correlation between cost-effectiveness recognition and subjective perception. Cost-effectiveness recognition also plays a role in influencing public engagement, which in turn affects the cognitive understanding of digital cultural travel. Ultimately, this research aspires for local governments to prioritize the management of cultural content quality, digital equipment excellence, and product cost-performance within the realm of digital cultural tourism, leveraging public engagement to deepen public understanding of the field. It is our expectation that the insights from this study will serve as a benchmark for advancing the modernization and quality growth of tourism in Zhejiang Province, as well as inform cultural tourism development in other regions.

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