

Research on Enhancing the Cultural Experience of Digital Tour Guide System in Scenic Spots

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Abstract: More and more scenic spots are relying on digital tour guides. Digital tour guides can bring convenience to tourists during their travel process, but they cannot provide them with a good cultural experience. By utilizing digital navigation systems, researchers are able to analyze design features and develop an initial functional architecture. Offline research helps in comprehending user requirements and enhancing the functional layout of the tour guide system. A survey questionnaire was designed to assess the significance of various functions in cultural experiences. The study identified the functional framework of a tour guide system that impacts tourists' cultural experiences, along with the importance ratings of each function. Additionally, recommendations were provided for enhancing the cultural experience of digital tour guide system. The digital tour guide system should enhance the application of cultural elements at scenic spots and improve online and offline interactive design to enhance tourists' cultural experience. The functional framework and design suggestions of the digital navigation system can serve as a valuable design reference for similar systems in other scenic spots.

Keywords: Digital Tour Guide System; Functional Framework; Online and Offline Interactive Activities; Cultural Experience

1. Introduction

Smart tourism emphasizes the use of information technologies such as cloud computing, big data, the Internet and mobile communications in the development of the tourism industry to meet the personalized needs of tourists [1-2]. With mobile devices pervading our lives in several cases, tourism apps have grown significantly in popularity [3]. By utilizing digital tools and content, it will

offer new opportunities for the scenic spot to showcase its distinct culture and offer tourists a comprehensive insight into the area, ultimately enhancing their cultural experience. The main ways to enhance the accessibility and exhibition of "culture" include museum mode (material heritage), theatrical mode (intangible heritage), theme block (display of life culture), and creative display mode centered on technological means [4]. The integration of new technologies, culture, and tourism promotes the transformation of traditional tourism business models, resulting in new tourism services and profit models [5]. Upgrading the cultural experience of scenic spots is a multidimensional and systematic process, involving tourism psychology, scenic spot planning, digital tour guide system, cultural and creative product design, service design, marketing, and surrounding commercial cooperation. Taking advantage of internet technology to develop intelligent tourism products is an important measure to break the bottleneck of traditional tourism and promote the development of tourism in the new era [6].

The purpose of this article is to enhance tourists' cultural experiences through the implementation of a digital tour guide system in scenic spots. This study employs four research methods: literature review, product usage experience, offline interviews, and questionnaire surveys. The functional framework of the digital tourism system has been established and the importance of each function in relation to tourists' cultural experience has been determined. The findings of this research can serve as a valuable reference for scenic spots seeking to improve their tour guide systems.

2. Literature Review

2.1 The Functions and Carriers of Digital Tour Guide System

The digital tour guide system provides detailed historical backgrounds, cultural stories, and interactive learning experiences through digital technologies such as audio, video, animation, and interactive games, allowing tourists to have a deeper understanding of the culture and history of the scenic area [7]. The digital tour guide system increases the fun of the tourism process and makes cultural heritage more vivid and easy to understand. The digital tour guide system of scenic spots can not only provide traditional tour services, but also link tourists with various cultural and tourism resources provided by scenic spots and cities.

Smart devices are increasingly researched in mixed-reality environments [8]. Various hardware carriers of scenic spot guide systems will gradually transform into portable devices, such as mobile scans and glasses (as shown in Figure 1).



Figure 1-1. Handheld AR Navigation Device



Figure 1-2. AR Guide Glasses

Figure 1. Hardware of the Current Scenic Spot Tour Guide System

2.2 Current Research on Strengthening Cultural Experience in Digital Tour Guide System

The functional framework of a navigation system with augmented reality capabilities has been studied in previous work [9]. The design of digital tour guide system in scenic areas should not be limited to frameworks, interactive design, and digital content, but should be innovatively designed in combination with the cultural characteristics and services of the scenic area, in line with the direction of cultural and tourism digital transformation [10]. Tourists have three

interaction modes when using digital navigation systems: text and reading, history and contemporary, and virtual and real [11]. At the same time, there is an interaction of simulation, coexistence, and substitution among these three interaction modes, which gradually changes tourists' understanding of scenic area culture from shallow to deep. The interaction between immersion in digital tour guide systems and real-life activities in scenic areas is a research hotspot. Tourists should not be overly immersed in digital tour guides. The participation of tourists in offline activities in the scenic area is very important, otherwise it is meaningless to visit the scenic area [12]. A good digital tour guide system for scenic spots should serve two purposes: (1) attracting the attention of tourists through the internet, attracting them to visit and participate in activities in the scenic area. (2) Guide tourists to explore the scenic area space and traditional culture, and deepen their understanding of the scenic area culture through the interaction between virtual and real spaces.

Wang and song [13] conducted research on the design of a Luoyang urban tourism APP based on Luoyang culture. Combining the characteristics of Luoyang culture, they proposed a design framework for an urban tour guide system based on Luoyang culture, but ignored the integration of offline tourism resources. Peng et al. [14] combined interactive narrative technology with SNS platform to form a new type of interactive narrative technology, making the functions of tour guide system specific, simple, and clear. Yang [15] and Zhao [16] respectively studied the cultural characteristics and tourism process of Zhenjiang Grand Canal and Xi'an, and designed a tour guide system for verification. The above research has conducted design research and practice based on the characteristics of scenic spots, attempting to design from the perspective of "highlighting the cultural experience of scenic spots". However, the above research has not formed a functional framework for digital tour guide systems with reference value, nor has it clearly stated the importance of various functions of digital tour guide system for cultural experience.

3. Materials and Methods

3.1 Study Flow Chart

The study flow chart is illustrated in Figure 2. The research team used the existing digital tour guide system, including independent applications, WeChat official account and WeChat mini program. The article further outlines the special functions of APPs with superior cultural experiences, establishes a functional framework for scenic tour guide systems, and clarifies the commonly used primary and secondary functions of such

systems. Through conducting offline research at scenic spots, new functions required by users are added to the functional framework of the system. Functions in digital tour guide system that directly enhance tourists' cultural experience are selected, and an importance survey questionnaire is developed. Users are invited to rate and assess the importance of each function in relation to cultural experience. Lastly, design recommendations for digital tour guide system are proposed.

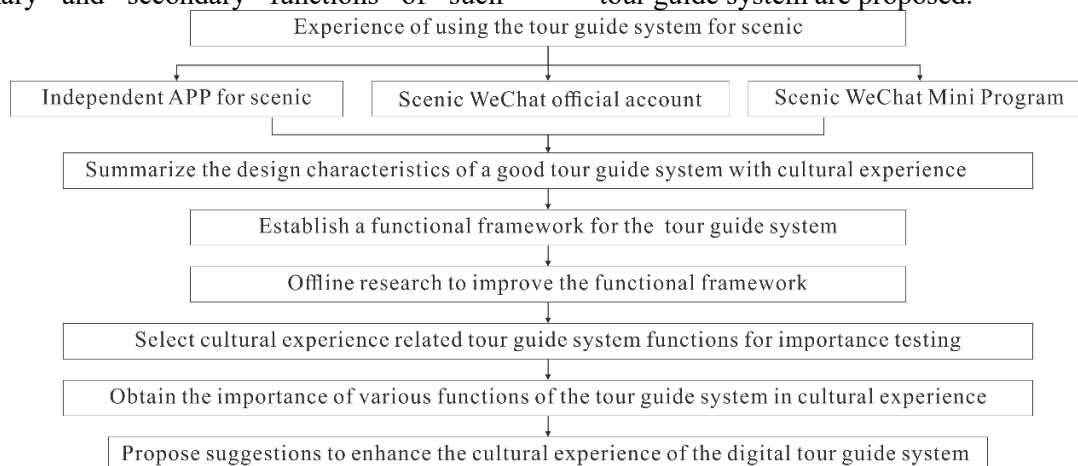


Figure 2. Study Flow Chart

3.2 Experience of Using the Scenic Spot Tour Guide System

3.2.1 Independent APP for scenic spots

During the research process, APPs from 10 well-known scenic spots were collected and used, including National Museum of China,

Forbidden City 365, Forbidden City Exhibition, Daily Forbidden City, Ningxia Museum, British Museum, Mobile Technology Museum, Mobile Museums, Chinese Treasure Museum, and Dayunhe Cloud Platform, as shown in Figure 3.



Figure 3. 10 Apps for Experience

While most apps can fulfill the basic needs of tourists during their travels, not all of them offer a rich cultural experience. It is worth noting that the explanation service at the British Museum requires payment to access, which may not align with the common expectation of free app usage among mobile phone users. The top three apps that provide an exceptional cultural experience are Daily Forbidden City, National Museum of China,

and Dayunhe Cloud Platform.

The screenshots of Daily Forbidden City APP were displayed in Figure 4. This application incorporates traditional Chinese utensils, patterns, and colors in graphic design, accompanied by Chinese folk music for background sounds and prompts. This combination enhances the cultural experience for tourists, providing a visually and auditorily immersive experience.



Figure 4. The Screenshots of the Daily Forbidden City interface

Forbidden City 365 is an application that focuses on presenting architectural knowledge of the Forbidden City, as shown in Figure 5. The app simulates the imperial examination system of ancient China by providing questions and answers related to the architecture of the Forbidden City. Visitors can enhance their understanding of the Forbidden City's architecture by participating in these quizzes.

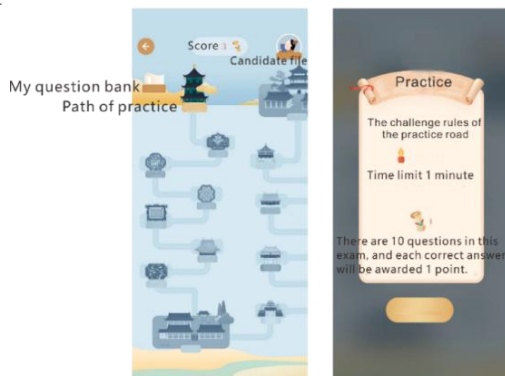


Figure 5. Answer Game of Forbidden City 365

3.2.2 Wechat official account

Most scenic spots have created WeChat public

accounts on the WeChat platform. Through the use experience of public accounts such as Longmen Grottoes, Henan Museum, Badaling Great Wall, Qin Shihuang Mausoleum Museum, and Long live Mountain Martial Arts City, it was observed that there is little variation in the interface layout and main functions among them. For instance, the interface of the WeChat public account for Badaling Great Wall in Beijing follows the standardized layout of the WeChat system, which may not effectively showcase the unique features of the scenic spot, as shown in Figure 6. The primary function micro-impression offers secondary functions like VR panoramic Great Wall, Great Wall military, and Great Wall poetry to highlight the characteristics of the scenic spot. Although WeChat-based public accounts for scenic spots have predetermined levels and functions that cater to basic ticket booking and tour guide services, they may fall short in fully capturing the cultural essence of the respective destinations.

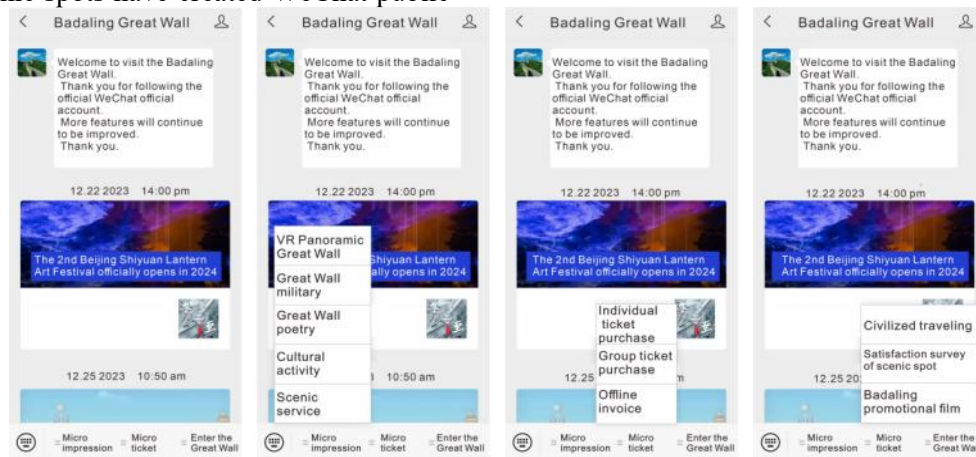


Figure 6. Badaling Great Wall Wechat Official Account

3.2.3 WeChat mini program

Visitors can use WeChat mini-programs by scanning the QR code, achieving the goal of instant use and reducing the download process.

The Zhiyou Longmen Grottoes Mini Program incorporates Buddha statues, colors and patterns unique to Longmen, enhancing the design of icons and interfaces to better

represent the cultural essence of the Longmen Scenic Area. The mini program offers tour route planning, interactive dialogue, audio explanations, and other features that cater to tourists' needs, enhancing the overall cultural experience, as shown in Figure 7. There is a

virtual character Ananda in the interactive dialogue function, who is one of the ten disciples of Sakyamuni. This virtual character can communicate and interact with tourists. It is an interactive innovation based on the characteristics of the scenic spot.

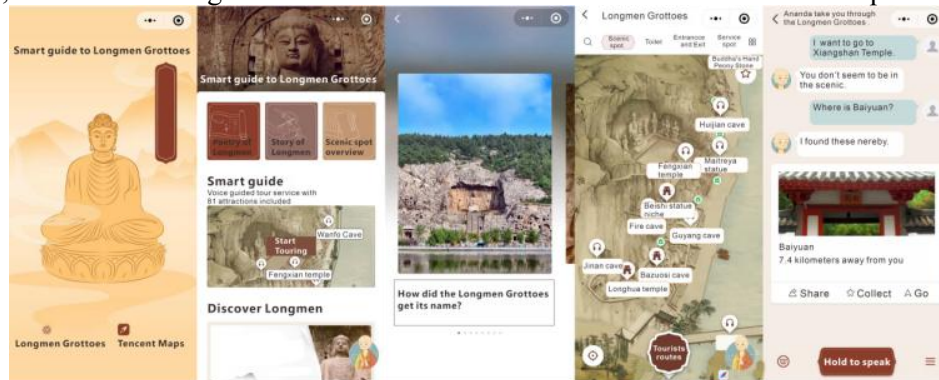


Figure 7. Part of the interface of Zhiyou Longmen Grottoes

3.3 Establish a Functional Framework for Digital Tour Guide System

The functional framework of digital tour guide system was summarized based on the experience of different digital tour guide systems. The framework consists of 7 primary functions and 26 secondary functions, as detailed in Table 1.

The survey discovered that digital tour guide systems in popular tourist destinations like the Forbidden City and the Great Wall have recently introduced AR experience features, offering visitors unique immersive tourism experience [17]. During the development process, several interconnected elements, such as tourists' demand collection, iterative prototype development, user evaluation, and continuous improvement, can be employed to ensure that the final augmented reality tourism application meets the actual needs of users and delivers a positive user experience [18]. These AR applications are dependent on the mobile phone operating system and are expected to become more prevalent in upcoming digital tour guide system [19].

In the functional framework, the visual design specification for the digital tour guide system is considered as an independent functional component. Based on the research team's

experience, visual design plays a crucial role in reflecting the cultural characteristics of the scenic spot. The digital tour guide system with excellent visual design allows tourists to experience the traditional culture of the scenic spot through the internet before entering the scenic spot.

3.4 Offline Research

In a series of offline interviews, 30 young tourists aged 20-30 were surveyed. The survey revealed that besides traditional tour guide services, interactive games, participatory activities, scenic shopping, and social functions are gaining popularity among young tourists. Many survey participants expressed interest in incorporating highly interactive and immersive experiences, such as virtual displays using VR technology, offline activities with AR technology, participatory activity showcases and reservations, into the digital tour system. Young female tourists specifically mentioned a desire for photography services and scenic photo guide functions. By enhancing the digital tour guide system with digital display technology, e-commerce, and social functions, it can effectively leverage the strengths of all three components and contribute to the overall development of tourist attractions [20].

Table 1. Functional Framework of Scenic Navigation System

Primary function	Secondary function	Daily forbidden city	Forbidden city exhibition	Forbidden city 365	National museum	Ningxia museum	Dayunhe cloud platform	Wansui Mounta Wuxia City	Badaling great wall	Longmen grottoes
Visual Design	APP icon design	√	√	√	√	√	√	√	√	√
Specification	APP color design	√	√	√	√	√	√			√

for Digital tour guide System	APP button, font, pattern and switch symbol design	√	√	√	√	√	√			√
	APP prompt sound and background music design	√				√	√			√
Scenic Guide	Scenic introduction				√		√	√	√	√
	Scenic information		√		√		√	√	√	√
	Scenic tour route				√			√	√	√
	Virtual map of scenic spots			√	√	√	√	√	√	√
	Introduction of cultural relics and scenic spots	√	√	√	√	√	√	√	√	√
	Cartoon characters with scenic features									√
Scenic scene display	The historical appearance of the scenic spot						√			
	Current scenery of Scenic Spot			√			√	√	√	
	Scenic spot four seasons beauty			√					√	
	Scenic spot display based on VR and AR			√					√	
Scenic spot cultural service	Performance show and reservation		√				√	√	√	
	Display and purchase of special food				√		√		√	
	Scenic spot culture class				√		√		√	√
	Exhibition and reservation of research and learning activities						√		√	
Scenic spot interactive game	Scenic spot knowledge Q&A			√						√
	Scenic spot interactive games						√			√
Scenic spot sharing and feedback	Scenic spot tour guide						√	√	√	
	Scenic spot sharing and feedback			√					√	
Public services in scenic spots	Introduction of accommodation, catering and transportation						√	√	√	
	Medical assistance and other public services				√				√	
	Personal data center		√		√		√		√	√
	Display and purchase of tourist souvenirs				√		√		√	√

3.5 Questionnaire on the Importance of Functions in Cultural Experience

After conducting offline interviews, the functional framework of the digital tour guide system was revised. Functions related to tourists' cultural experience at the scenic spot

were categorized into 8 primary functions and 26 secondary functions. Four new functions were introduced: scenic spot photo guide, photography and other special services, scenic spot participatory activity display and booking, and immersive activity display and booking using VR and AR technology. Functions that

were not directly related to cultural experiences, such as public services, were streamlined.

A questionnaire was created for users to rate their cultural experience with various functions while using the digital tour guide system. The ratings were collected using a 5-point Likert scale. A total of 91 questionnaires were

received. After excluding 7 questionnaires with 5 points for all options, 84 valid questionnaires remained. The standardized Cronbach α coefficient was calculated to be 0.92, indicating good reliability of the questionnaire. The statistical findings are presented in Table 2.

Table 2. The Statistical Table of the Importance of Various Functions of Digital Tour Guide System in Cultural Experience

Primary function	Secondary function	Expert scoring situation (number of people)					Average score	Standard deviation	Variance
		5	4	3	2	1			
Visual design specification for digital tour guide system	APP icon design	34	33	15	1	1	4.2	0.8	0.7
	APP color design	28	41	12	2	1	4.1	0.8	0.7
	APP button, font, pattern and switch symbol design	32	30	17	3	2	4.0	1.0	0.9
	APP prompt sound and background music design	16	40	22	5	1	3.8	0.9	0.7
Scenic guide	Scenic introduction	28	30	15	9	2	3.9	1.1	1.1
	Scenic information	20	28	28	5	3	3.7	1.0	1.0
	Scenic tour route	45	23	12	3	1	4.3	0.9	0.8
	Virtual map of scenic spots	43	26	13	1	1	4.3	0.9	0.7
	Introduction of cultural relics and scenic spots	33	32	14	5	0	4.1	0.9	0.8
	Cartoon characters	30	28	19	6	1	4.0	1.0	1.0
Scenic scene display	The historical appearance of the scenic spot	22	35	24	3	0	3.9	0.8	0.7
	Current scenery of Scenic Spot	27	42	10	5	0	4.1	0.8	0.7
	Scenic spot four seasons beauty	26	27	23	7	1	3.8	1.0	1.0
	Scenic spot display using VR and AR	40	25	15	1	3	4.2	1.0	1.0
Scenic spot cultural service	Performance show and reservation	32	30	14	6	2	4.0	1.0	1.0
	Display and purchase of special food	28	35	13	6	2	4.0	1.0	1.0
	Scenic spot culture class	22	33	17	9	3	3.7	1.1	1.1
	Scenic spot photo guide	32	33	13	4	2	4.1	1.0	0.9
	Photography and other other special services	25	27	25	5	2	3.8	1.0	1.0
Scenic spot interactive game	Scenic spot knowledge Q&A	14	32	22	10	6	3.5	1.1	1.2
	Scenic spot interactive games	26	27	21	8	2	3.8	1.1	1.1
Scenic spot real scene activities	Scenic spot participatory activity display and booking	25	33	20	5	1	3.9	0.9	0.9
	Immersive activity using VR and AR display and booking	34	31	14	3	2	4.1	1.0	0.9
	Exhibition and reservation of research and learning activities	22	33	20	7	2	3.8	1.0	1.0
Scenic spot sharing and feedback	Scenic spot sharing and feedback	21	29	26	5	3	3.7	1.0	1.0
Scenic spot online store	Display and purchase of tourist souvenirs in scenic spots	24	31	25	1	3	3.9	1.0	0.9

4. Result and Discussion

4.1 Result

It can be seen from the survey results that in the visual design specification for digital tour guide system, APP icon design, APP color

design, APP buttons and other graphic design with scenic spot characteristics have higher scores. Designers should focus on visual design of the tour guide system that aligns with the scenic spot's characteristics to create a positive first impression for tourists. Through the use of the digital tour guide system, tourists

are able to further enhance their understanding of the scenic spot.

Scenic tour guide plays a crucial role in digital tour guide system. Through this function, tourists are provided with information about the culture and history of the scenic spot. The functions of scenic tour route, virtual map of scenic spots, and introduction of cultural relics and scenic spots have received high scores.

In the two functional modules of scenic scene display and scenic spot real scene activities, it can be observed that the scenic display and interactive functions developed using VR and AR technology perform better.

In the scenic spot cultural service module, the highest-rated options are the performance show and reservation, the display and purchase of special food, and the scenic spot photo guide. These options provide tourists with the most direct ways to immerse themselves in the culture of the scenic area.

4.2 Discussion

4.2.1 Enhance online and offline interaction

To enhance the cultural experience of digital tour guide system in scenic spots, the integration of technical features with the local scenic spot culture can create a more immersive and interactive tourism experience for visitors. Interactive games and tasks tailored to the cultural features of the scenic spot can be incorporated into the digital tour guide system. Online guidance can be utilized to encourage offline visits, allowing tourists to engage in exploring the cultural heritage of the destination through activities such as online tasks, offline puzzle solving, and treasure hunting. This approach enables tourists to learn about the scenic spot's culture while actively participating in tasks and activities.

4.2.2 Rich content display methods

Scenic spots should develop new tourism products based on digital technology to meet the needs of young consumers. For instance, AR technology can be harnessed to enable tourists to view restored or virtually recreated scenic views and cultural artifacts through mobile phones or specialized devices, enhancing the immersive experience. The digital tour guide system can integrate various multimedia resources, including video, audio, and 3D models, to offer tourists diverse cultural interpretations from multiple

perspectives, enhancing the overall experience of the tour.

Scenic spots should collaborate with schools and research institutions to create educational digital content and online games that reflect the cultural essence of the location. Regularly hosting online expert lectures and other activities can attract tourists to maintain their interest in the scenic spot and further enhance their understanding of the cultural significance of the location.

4.2.3 Personalized recommendations

Digital tour guide systems should provide personalized tour routes and cultural content recommendations based on tourists' interests and behavioral data. The tour guide system should create tour routes with various themes like historical exploration, art appreciation, and folklore experiences to cater to the diverse needs of tourists.

4.2.4 Online communities and socializing

Create an online community for scenic spots where tourists can share their experiences and engage with each other. Implement a check-in points system at the scenic spots to incentivize participation and interaction. Encourage tourists to engage in interactive activities through a digital tour system and share their experiences on social media to enhance the visibility and popularity of the scenic spots.

4.2.5 Diversified application of cultural elements

Scenic spots should pay attention to the refinement of the cultural elements of the scenic spots, and diversify the application of cultural elements in the design of digital tour guide systems and cultural creative products. During the tour, tourists can not only see cultural elements in the digital tour system, but also find prototypes of cultural elements in the scenic spot, and purchase souvenirs with cultural elements when leaving the scenic spot.

4.2.6 Continuous improvement

Scenic area staff should consistently update the guide content to ensure the accuracy of information. By monitoring online feedback from tourists, scenic spots can promptly identify issues and enhance the overall user experience.

5. Conclusions

The design of the digital tour guide system in scenic spots is a comprehensive system project. Collaboration between tourism psychology,

graphic design, functional design and offline experience design is essential in providing tourists with an optimal cultural experience at scenic spots. This article highlights the significance of incorporating cultural elements of scenic spots in the design of digital tour guide systems and establishes a functional framework for such systems. A questionnaire survey revealed the importance of different functions of the tour guide system in tourists' cultural experience, leading to design recommendations to enhance the overall cultural experience of the guide system.

By incorporating the design framework and suggestions proposed in this article, the digital tour guide system for scenic spots can enhance traditional navigation functions while also serving as a platform for cultural dissemination and education. However, there is still a lack of direct guidance on how to conduct design practice, and further in-depth research is needed. Traditional tour guide products are an effective way for scenic spots to generate revenue. After fully adopting digital tour guide systems, scenic spots will lose this portion of their revenue. How to provide tourists with a good cultural experience while effectively increasing the revenue of scenic spots through digital tour guide system is a hot research topic in the future.

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