Scientific Research Publishing

Open Journal of Business and Management, 2026, 14(1), 18-31
https://www.scirp.org/journal/ojbm
ISSN Online: 2329-3292
ISSN Print: 2329-3284

Digital Platform Design for Cultural Heritage Tourism Sites: A Case Study of Tianyi Pavilion in Ningbo

Yuting Wang

Ningbo University-University of Angers Joint Institute, Ningbo University, Ningbo, China
Email: wangyuting1@nbu.edu.cn

How to cite this paper: Wang, Y. T. (2026). Digital Platform Design for Cultural Heritage Tourism Sites: A Case Study of Tianyi Pavilion in Ningbo. *Open Journal of Business and Management, 14,* 18-31.
https://doi.org/10.4236/ojbm.2026.141002

Received: November 2, 2025
Accepted: December 2, 2025
Published: December 5, 2025

Abstract

Digital cultural heritage platforms play a crucial role in heritage preservation and enhancing tourist experiences. However, the challenge in designing such platforms lies in how to strike a balance between virtuality and authenticity to optimize the tourist experience. Taking the digital platform of Tianyi Pavilion in Ningbo as a case study, this research explores the integrated design of virtual and authentic elements from a tourist perspective, drawing upon cue consistency theory and process fluency theory. The study finds that the way platform design elements (including virtual elements and authentic elements) are combined has a significant impact on tourists' cognitive responses and experiences. Specifically, the consistency between virtual and authentic elements is a key factor influencing users' cognitive fluency. It is proposed that high cue consistency combinations can enhance users' cognitive fluency, thereby deepening the immersive experience, ultimately increasing the intention to visit in person. This research provides a theoretical basis for the practical design of digital cultural heritage platforms, aiming to improve the immersive experience of online platforms, thereby increasing tourists' willingness for offline visits.

Keywords

Cultural Heritage Tourism, Digital Platform Design, Process Fluency, Cue Consistency Theory

1. Introduction

In the current global digital era, the digitalization of cultural heritage for preservation and dissemination has become an inevitable trend of the times. Cultural heritage, as a treasure of human civilization, carries rich historical, cultural, and

artistic value. However, traditional methods of displaying and disseminating cultural heritage have certain limitations, making it difficult to meet the diverse needs of people in modern society for cultural heritage. The advent of digital technology has brought new opportunities for the preservation and dissemination of cultural heritage. By building digital platforms, it is possible to break through the limitations of time and space, allowing more people the opportunity to access and understand cultural heritage.

Tourism, as a modern service industry, is also undergoing digital transformation. Digital technologies are shaping entirely new types and forms of tourism experiences, driven by the core objectives of enhancing tourists' cognitive experiences, enriching contextual experiences, expanding sensory experiences, and creating social experiences. Innovations in digital tourism products based on tourist experience design, intelligent supervision and operation of scenic spots, and transformative human-computer collaboration are crucial supports for the high-quality development of the tourism industry (Sun & Guo, 2023; Zheng, Zhang, & Zhu, 2024).

The digital platform for cultural heritage plays a crucial role in heritage preservation and enhancing visitor experiences. A well-designed digital cultural heritage platform not only helps tourists obtain key information about the main attractions before their visit but also provides new types of experiential engagement. However, in practice, designing such platforms faces challenges: overemphasizing authenticity may lead to dull experiences, while excessive virtualization can weaken the sense of cultural reverence (Wong et al., 2023). How should virtual and authentic elements be combined to optimize tourist experience? This study aims to explore the design of cultural heritage digital platforms from the perspective of tourists, taking the specific context of the Tianyi Pavilion virtual reality cultural tourism experience platform as a case. Drawing on cue consistent theory and process fluency theory, the research integrates theoretical reasoning and case analysis to propose a comprehensive design framework, providing a theoretical basis for the practice of digital cultural heritage.

2. Literature Review

2.1. Digital Platform Experience of Cultural Heritage

The reality-virtuality continuum serves as the conceptual foundation for research on immersive digital platform experiences (Milgram & Kishino, 1994). This framework positions real and virtual environments along a continuous spectrum. The real environment refers to the physical world itself, which can be experienced either directly or indirectly through video displays (Milgram & Kishino, 1994). In contrast, a virtual environment is entirely computer-generated, displaying objects that do not physically exist but with which users can interact in real time through technological interfaces (Huang et al., 2012; Penfold, 2009). In practice, virtual reality (VR) technologies enable users to become immersed in digitally constructed spaces, while augmented reality (AR) overlays virtual content onto real-world

scenes, allowing users to interact with both realms simultaneously. Augmented virtuality (AV), on the other hand, involves incorporating real-world elements into virtual spaces, enabling the representation of real objects within virtual environments.

Building on this continuum, Flavián et al. (2019) further refined the conceptual understanding of the virtual-real interaction spectrum. They proposed that the real environment involves users interacting exclusively with physical elements, while the virtual environment entails interaction solely with computer-generated content. Between these two extremes lies a spectrum of mixed realities mediated by technologies such as AR and VR, which integrate the physical and virtual worlds to varying degrees. Specifically, AR overlays digital information onto users' real surroundings, whereas AV embeds real-world content within virtual contexts. In mixed reality (MR), users inhabit the real world while digital elements are seamlessly integrated into their environment, allowing reciprocal interaction between real and virtual entities.

Grounded in this framework, the present study focuses on digital platforms for cultural heritage, examining how virtual elements within virtual environments and real elements embedded through augmented reality influence tourists' experiences and behavioral intentions.

2.2. Cue Consistency Theory

Cue consistency theory posits that a set of consistent cues enhances individuals' confidence in making judgments. The use of congruent internal and external cues (e.g., a high price and a strong brand name) facilitates favorable product evaluations (Miyazaki, Grewal, & Goodstein, 2005; Slovic, 1966), whereas inconsistent cues tend to trigger cognitive dissonance, making it difficult for consumers to form judgments (Mitchell, Kahn, & Knasko, 1995). This theory underscores the importance of the synergistic effects among cues in cognitive processing, suggesting that when cues are mutually supportive and consistent, consumers are more likely to develop positive impressions of a brand or product, which in turn influences their purchase decisions. Moreover, research has shown that cue consistency not only affects consumers' cognitive evaluations but also shapes their emotional responses and subsequent behaviors.

Existing research in service marketing has examined how (in)consistency cues influence customers' responses to products. For instance, Hsieh (2023) demonstrated that the consistency between social media influencers' information and personal image strengthens followers' identification with the influencers. Similarly, Zhou et al. (2025) revealed that consistency between user-generated content (e.g., product and service quality reflected in online reviews) and seller-generated cues (e.g., geographical indication and seller reputation) significantly affects consumer purchase behavior. In the tourism and hospitality context, prior studies have also shown that consistent cues—such as a task-oriented communication style and a low-pitched voice—can enhance consumers' co-creation intentions

(Liu et al., 2024).

However, most empirical evidence based on cue consistency theory has focused on the influence of physical environment-induced consistency cues (e.g., products or influencers) on customers' behavioral intentions. Few studies have explored how virtual environment-induced consistency cues shape consumers' emotional responses. To address this research gap, our study investigates how the consistency between virtual voices, virtual landscapes, and human voices aligned with the physical environment can elicit positive customer responses, such as increased tourist engagement.

2.3. Processing Fluency Theory

Processing fluency refers to the ease with which individuals identify, categorize, or recognize a target stimulus. It can be divided into conceptual fluency—the ease of processing the semantic meaning of a target stimulus—and perceptual fluency—the ease of analyzing its structural or feature-related characteristics (Jacoby & Dallas, 1981; Jacoby & Hoyer, 1989). According to processing fluency theory, when a stimulus is easy to comprehend, consumers tend to exhibit more positive responses (Chan & Northey, 2021; Huang & Liu, 2020; Youn, 2024). High processing fluency helps reduce cognitive load and enhance immersion, whereas low fluency may lead to cognitive conflict and discomfort (Su & Li, 2024; Li & Ma, 2023). For example, the congruence between online advertisements and the promoted products can enhance the fluency of information processing, thereby improving consumers' positive attitudes toward the products (Jiang et al., 2020). Existing research in the tourism and hospitality field has examined the antecedents and consequences of processing fluency. For example, Youn (2024) found that processing fluency influences perceived risk and that the serial mediation between conceptual fluency and perceived risk explains the two-way interaction effect of ethnic food symbolism (high vs. low) and visual presentation (art vs. photo). Similarly, Li et al. (2023) revealed that in the context of tourism souvenirs, a social-oriented (vs. task-oriented) communication style positively affects tourists' perceived persuasiveness through enhanced processing fluency.

Building upon these insights, the present study investigates processing fluency as a psychological mechanism linking various stimuli (e.g., language style, product characteristics) to consequential outcomes (e.g., purchase intention). Specifically, this research draws on processing fluency theory to examine how visual and auditory cues on digital cultural heritage platforms influence tourists' processing fluency, which in turn fosters tourist engagement.

3. Research Methods

This study adopts a case study approach aimed at deeply exploring how virtual and authentic elements should be combined to optimize user experience (Yin, 2017; Corbin & Strauss, 2014). Unlike methods relying on external user data, the analysis in this study is primarily based on expert evaluation conducted by the

research team. The team members personally experienced the Tianyi Pavilion digital platform, systematically assessing the integration and presentation of virtual and authentic cultural elements. This approach is appropriate for our exploratory research because expert evaluation allows for a rich, informed understanding of the platform's design, functionality, and the interplay of virtual and authentic elements in a controlled, systematic manner. Given the current lack of extensive external user feedback and the complex nature of virtual cultural heritage environments, expert assessment provides a practical and effective means to generate initial insights and theoretical foundations. This approach is appropriate for our exploratory research because expert evaluation allows for a rich, informed understanding of the platform's design, functionality, and the interplay of virtual and authentic elements in a controlled, systematic manner. Given the current lack of extensive external user feedback and the complex nature of virtual cultural heritage environments, expert assessment provides a practical and effective means to generate initial insights and theoretical foundations.

In this study, the Tianyi Pavilion digital platform is selected as the research case. This platform is typical and representative in the field of cultural heritage digitalization, providing rich material for our research on the combination of virtual and authentic elements. As China's oldest surviving private library and one of the oldest libraries in Asia, Tianyi Pavilion in Ningbo possesses extremely high historical and cultural value. Its rich collection of books and unique architectural style are a brilliant pearl in the treasure trove of Chinese national culture. Tianyi Pavilion features three digital platforms: a panoramic tour on its WeChat official account, the Tianyi Pavilion Museum Ancient Books Digitalization Service Platform, and the Tianyi Virtual Reality Cultural Tourism Experience Platform. These platforms utilize technologies such as digital twin and virtual reality to construct a digital twin of the Tianyi Pavilion Museum in the virtual world, offering digital solutions for cultural tourism, exhibitions, and collection research of the Tianyi Pavilion Museum. Due to its innovation and demonstration effect, this project was successfully selected for the 2023 National Virtual Reality Pioneer Application Cases list, and it is the only project from the cultural and tourism sector in Zhejiang Province to be included.

During the specific data collection process, firstly, the research team members were organized to log into the platform as ordinary users to experience it, recording the modes of presentation, combination effects of the virtual and authentic elements, as well as their own feelings and feedback during the experience. Secondly, official documents, promotional materials, technical reports, and other relevant information related to the Tianyi Pavilion Virtual Reality Cultural Tourism Experience Platform were collected to understand the platform's design philosophy, technical architecture, functional modules, and other details, aiming to comprehensively grasp the platform's basic situation and the design ideas behind the combination of virtual and authentic elements.

For data analysis, we adopted a rigorous inductive approach. Data comprised

experiential evaluation data collected from the research team acting as end-users (via think-aloud protocols during platform exploration and subsequent post-session debriefs) and textual data from platform documentation. The researchers' experiences were collected through think-aloud sessions and brief semi-structured interviews, supplemented by field notes. Data were analyzed using a inductive coding strategy to capture emergent themes. Data from experiential evaluations and platform documentation were triangulated to identify patterns and themes relevant to the research objectives. Key information related to the combination of virtual and authentic elements was identified.

4. Findings

The design elements of the Tianyi Pavilion Virtual Reality Cultural Tourism Experience Platform can be categorized into virtual elements and authentic elements. Virtual elements include animation, virtual scene reconstruction, etc., with subjective experiences leaning towards fantasy and simulation. Authentic elements, namely real-scene images and physical object restoration, emphasize the cultural authenticity.

4.1. Authentic Elements

(1) Real-Scene Restoration. Real-scene restoration is the most direct and fundamental manifestation of authentic elements. Its core lies in presenting Tianyi Pavilion and its surrounding environment from the real world in a high-fidelity form within the virtual platform. This is not only a faithful record of the physical space but also a transmission of the historical architecture and the cultural information it carries. The current panoramic guided tour function of Tianyi Pavilion's WeChat official account serves as an initial attempt at real-scene restoration, providing users with a 360-degree, all-around virtual wandering experience (**Figure 1**). Users can observe the architectural exterior of Tianyi Pavilion from various angles by sliding the screen, allowing for detailed presentation from the majestic eaves and dougong (bracket system) to the exquisite wood carvings, and even the rustic bricks and tiles. By clicking on arrows, users can fluidly navigate between different spatial nodes, as if immersing themselves in a stroll through Tianyi Pavilion's courtyards, studies, and corridors. Clicking on attraction names brings up detailed introductions that further supplement relevant historical background, architectural features, and cultural anecdotes, combining the direct visual perception with knowledge acquisition, greatly enhancing the authenticity and information richness of the tourism experience.

(2) Historical Data Display. As an ancient library in China, Tianyi Pavilion houses a vast collection of rare and ancient books, with precious editions from the Song, Yuan, Ming, and Qing dynasties scattered throughout. In 2007, the General Office of the State Council issued the "Opinions on Further Strengthening the Protection of Ancient Books." Subsequently, the Tianyi Pavilion Museum began implementing a digitalization project for its ancient book collection. In 2009, the

Tianyi Pavilion Museum Ancient Books Digitalization Service Platform (https://gj.tianyige.com.cn/) was launched, continuously updating the digital images of Tianyi Pavilion's collection (Figure 2). As of May 2025, 3.4 million pages of ancient books have been digitized and scanned, with over 20,000 volumes of ancient book images uploaded online. Visitors can access and browse these precious ancient books, deep within Tianyi Pavilion's repository, through online inquiries. The display of historical data allows visitors to feel the authentic historical heritage of Tianyi Pavilion.

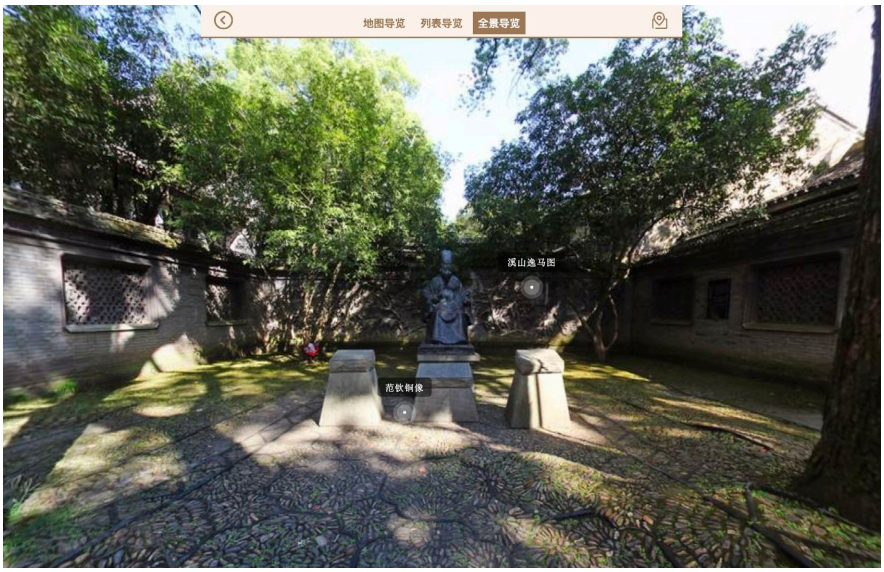

Figure 1. Real-scene display on the Tianyi Pavilion panoramic tour platform.

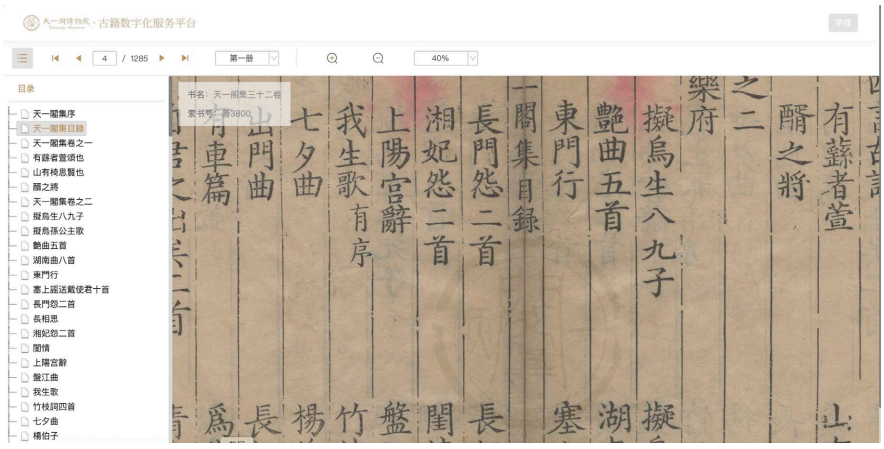

Figure 2. Images of ancient books from the Tianyi Pavilion Museum Ancient Books Digitalization Service Platform.

4.2. Virtual Elements

(1) VR Roaming Scenes. The Tianyi Pavilion Virtual Reality Cultural Tourism Experience Platform is the digital twin of the Tianyi Pavilion Museum. Based on methods such as 3D geographic information systems, oblique photography data,

and point cloud scanning, architectural model information of Tianyi Pavilion is obtained. High-precision modeling, light and shadow optimization, and rendering are performed on the surrounding and interior scenes to achieve full-view panoramic roaming for external and internal 3D visualization. Simultaneously, a digital twin scenario of the Tianyi Pavilion Museum is created, and VR scene roaming paths are designed. Overlaying interactive animations of the collections increases engagement and fun while reinforcing the realism of audiovisual feedback. The platform includes special effects for time and weather scene transitions. Wearing VR glasses and navigating through the virtual Tianyi Pavilion, visitors can hear the wind blowing, insects chirping, and birds singing. The scenery of the four seasons and the progression of time throughout the twelve hours are presented alternately, providing tourists with a first-person perspective roaming experience within the scene.

(2) Cultural Relic Simulation and Digitalization. The Tianyi Pavilion Virtual Reality Cultural Tourism Experience Platform digitally restores precious cultural relics and ancient books within Tianyi Pavilion using high-precision scanning and modeling technology, preserving their authentic texture and details. Multi-dimensional information, including the external appearance, material, characteristics, descriptions, and internal morphology of cultural relics, is digitally deconstructed to generate "digital twin" displays of the collections (Figure 3). Concurrently, a visualized 3D digital archive of Tianyi Pavilion's cultural relics is established, restoring the simulated appearance and materials of the museum's collection and retaining the details of the relics. By using multiple devices, users can zoom in and rotate to view details of the relics from any angle, achieving a comprehensive, all-around view without blind spots. Tagged information displays the historical stories, value, usage, characteristics, and structure of the relics. Users can gain a deeper understanding of the historical background and cultural value of each relic through the virtual exhibition hall, and can even "touch" virtual relics to experience their textures and details, thereby enhancing cultural authenticity.

Figure 3. "Digital twin" displays of the collections on the Tianyi Pavilion Virtual Reality Cultural Tourism Experience Platform.

(3) Virtual Tour Guide Narration. On the existing panoramic tour platform of the Tianyi Pavilion WeChat official account, clicking on the icons and names of each small attraction will bring up text and audio introductions for the attraction (Figure 4). The audio narration is available in four languages: Chinese, English, Japanese, and Korean. Through the virtual guide's audio narration and text prompts, tourists are introduced to Tianyi Pavilion's historical and cultural background, architectural features, and stories of its book collection. The virtual guide's narration is vivid and engaging, helping tourists better understand the cultural connotations of Tianyi Pavilion.

Figure 4. Virtual tour guide narration on the Tianyi Pavilion panoramic tour platform.

4.3. Authentic and Virtual Element Interaction Types

Based on the above analysis, the design elements of the Tianyi Pavilion digital platform can be summarized into authentic elements and virtual elements. Authentic elements include on-site scene restoration and historical data display, while virtual elements include VR roaming scenarios, artifact simulation restoration and digitization, and virtual guide explanations. Classified by user sensory experience, platform design elements can be further divided into visual elements and auditory elements. Visual elements include the authentic and virtual scenarios on the guided tour platform. Auditory elements encompass the sounds experienced by the user. Specifically, authentic voice refers to pre-recorded human speech. In contrast, virtual voice denotes synthesized speech generated by artificial intelligence text-to-speech technology. Based on user experience analysis, this study found that the design of the Tianyi Pavilion digital platform involves the interaction of authentic and virtual elements. In different platform designs, there are four types of interaction:

(1) Authentic Voice*Authentic Scene. In this interaction type, authentic human voice combined with authentic scenes provides users with an experience closest to an on-site visit. Authentic human voice can be recorded explanations from professional guides, who introduce the history, culture, and architectural features of Tianyi Pavilion in vivid and accurate language. Authentic scenes are displayed

through high-definition videos or images of the actual landscape of Tianyi Pavilion. By listening to the guide's explanation while viewing authentic scene footage, users can more intuitively feel the charm of Tianyi Pavilion, as if they were actually there. This interaction type is suitable for users who wish to deeply understand the history and culture of Tianyi Pavilion and have high demands for authenticity.

(2) Authentic Voice*Virtual Scene. The combination of authentic human voice and virtual scenes offers users a novel experience that is both familiar and new. Authentic human voice can still provide users with professional explanations and guidance, while virtual scenes can present richer and more diverse scenarios through virtual reality technology or 3D modeling technology. For example, users can travel through time in virtual scenes and return to the Tianyi Pavilion of ancient times to experience the cultural atmosphere of that era. This interaction type is suitable for users who enjoy exploring new things and want to gain more creativity and imagination during their visit.

(3) Virtual Voice*Authentic Scene. The interaction type of virtual human voice and authentic scenes provides users with a personalized tour experience. Virtual human voice can provide customized explanation services based on users' needs and interests. Users can select their preferred themes and content on the platform, and the virtual voice will provide targeted explanations based on their choices. The display of authentic scenes allows users to feel the historical reality, enhancing their trust in the platform. This interaction type is suitable for users who wish to control the pace of their tour and have high demands for personalized services.

(4) Virtual Voice*Virtual Scene. The combination of virtual human voice and virtual scenes is the most innovative interaction type. Virtual human voice can be interactively controlled in real-time through artificial intelligence algorithms, dynamically adjusting based on user behavior and feedback. Virtual scenes can create a completely virtual world for users through virtual reality and augmented reality technologies. In this virtual world, users can explore freely, interact, and communicate and collaborate with virtual characters. This interaction type is suitable for users who pursue extreme experiences and have high aspirations for technology and innovation.

4.4. The Impacts of Cue Consistency on User Experience and Behavioral Intention

The theory of cue consistency posits that when different sensory cues (e.g., visual, auditory) align coherently, users' cognitive processing may become more efficient. In the context of the Tianyi Pavilion digital platform, cue consistency could be interpreted as the harmonious integration of authentic and virtual elements. Drawing on processing fluency theory, it can be theorized that seamless cognitive processing might elicit positive emotional responses and potentially enhance users' evaluations of their experience.

Building on these theoretical frameworks, we propose that cue consistency (e.g.,

balancing authenticity and virtuality) may directly influence cognitive fluency. This suggests that high cue consistency could theoretically foster high processing fluency. For instance, when users perceive audiovisual coherence, their cognitive effort might decrease, potentially leading to heightened processing fluency. This theoretical chain implies that elevated fluency could facilitate immersive experiences, which might subsequently stimulate intentions to visit the physical site. Conversely, low cue consistency may disrupt cognitive fluency, potentially diminishing user experience and behavioral intentions.

(1) Positive Impact of High Cue Consistency. Based on our analysis of the Tianyi Pavilion digital platform, we propose that when the authentic and virtual elements within the platform are coordinated and cue consistency is high, users' cognitive processing may become easier and more natural, and processing fluency might be enhanced. For example, in the Authentic Voice*Authentic Scene interaction type, the authentic human voice and the authentic scene match each other, potentially allowing users to quickly and accurately understand and accept the information conveyed by the platform. We propose that this high cue consistency and high processing fluency could make it easier for users to have an immersive experience, as if they were truly in Tianyi Pavilion. We further propose that under the influence of an immersive experience, users might develop a stronger interest and liking for Tianyi Pavilion, thereby potentially generating the intention to visit the physical site. They may want to personally visit Tianyi Pavilion to experience its unique charm firsthand and gain a deeper understanding of its history and culture.

(2) Negative Impact of Low Cue Consistency. Conversely, based on our analysis, we propose that when the authenticity and virtuality elements within the platform are uncoordinated and cue consistency is low, users' cognitive processing may become difficult, and processing fluency might decrease. For example, in the Virtual Voice*Authentic Scene interaction type, if the virtual voice does not match the real scene, users may feel confused and uncomfortable. We propose that this low cue consistency and low processing fluency could affect the users' experience, potentially reducing their satisfaction and trust in the platform. Users might doubt the information conveyed by the platform and even abandon further use of the platform. Furthermore, we propose that low cue consistency could also affect users' behavioral intentions, potentially reducing their willingness to visit Tianyi Pavilion in person.

5. Conclusion and Discussion

A well-designed digital platform for cultural heritage plays a crucial role in realizing consumer experiential value and producer commercial value. The research findings indicate that platform design elements can be categorized into virtual elements (e.g., virtual reality, virtual guide explanations) and authentic elements (e.g., real scene restoration, historical data display). Different combinations of these elements different impact tourists' experience. Specifically, the perceptual

consistency of visual and auditory elements within the platform, i.e., the degree of cue matching achieved between the virtual or real, becomes a key factor influencing users' cognitive responses.

The case analysis provides support for the proposition that highly consistent cue combinations (e.g., virtual visual effects with virtual auditory experiences, or authentic visuals with authentic audio) could potentially enhance tourists' perception of processing fluency on the platform, which refers to users' sense of coherence and control during their interaction. This cognitive response is theorized to directly promote subsequent immersive experiences, increasing user engagement and emotional investment. More importantly, designs with high cue consistency significantly enhance users' sense of immersion, stimulating their cultural identification and desire for exploration, thereby prompting more positive behavioral responses, such as increased intention to revisit, recommend, and convert to on-site visits.

This study, as an exploratory research, offers significant theoretical contributions. By integrating the specific context of digital platform construction for cultural heritage tourism destinations, and drawing upon the theories of cue consistency and processing fluency, this research analyzes the impact of different combinations of real and virtual scene cues on tourist experiences. Unlike previous literature that has often focused on the isolated impact of authentic or virtual elements, this study's findings strongly suggest that cue consistency is a more critical design factor in the effective integration of virtual and authentic elements within digital heritage platforms. The proposition that cue consistency plays a core role in the integration of virtual and authentic elements, therefore, not only builds upon but also extends existing theoretical understanding. This study further enriches and advances the theory of digital transformation in cultural heritage tourism.

This research holds important practical implications. Digital platforms for cultural heritage should emphasize the coordination and consistency of multi-sensory interactions to achieve immersive experiences that blend the virtual and real, thereby promoting effective dissemination of cultural heritage and sustainable tourism development. The results of this study provide a theoretical foundation and practical guidance for optimizing digital platforms for cultural heritage, underscoring the importance of pursuing cue consistency in architectural design. Specifically, by considering the identified interaction types of authentic and virtual elements, design recommendations can be tailored for different user objectives. For educational goals, a strong emphasis on "Authentic Voice*Authentic Scene" is recommended. This combination leverages pre-recorded human narration and on-site scene restoration to foster a deeper understanding and direct engagement with historical context, akin to a live guided tour. For entertainment-focused experiences, "Virtual Voice*Virtual Scene" offers a compelling avenue. This approach, utilizing AI-generated narration within immersive VR environments, can enhance engagement through novelty and interactive exploration, ca-

tering to users seeking novel digital adventures. Pursuing cue consistency across these interaction types is crucial to achieve a win-win scenario with more efficient and meaningful user experiences and commercial value.

The limitations of this study lie in the limited empirical data on user experience. Future research could build upon tourist interviews and employ 2*2 scenario experiments to explore the impact of different combinations of visual and auditory cues of authenticity and virtuality in digital cultural heritage platforms on tourist experiences and behaviors.

Funding

This work was supported by the Ningbo Philosophy and Social Science Planning Project (JD6-387).

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Chan, E. Y., & Northey, G. (2021). Luxury Goods in Online Retail: How High/Low Positioning Influences Consumer Processing Fluency and Preference. *Journal of Business Research, 132,* 136-145. https://doi.org/10.1016/j.jbusres.2021.04.031

Corbin, J., & Strauss, A. (2014). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Sage Publications.

Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). The Impact of Virtual, Augmented and Mixed Reality Technologies on the Customer Experience. *Journal of Business Research, 100,* 547-560. https://doi.org/10.1016/j.jbusres.2018.10.050

Hsieh, J. (2023). The Impact of Influencers' Multi-SNS Use on Followers' Behavioral Intentions: An Integration of Cue Consistency Theory and Social Identity Theory. *Journal of Retailing and Consumer Services, 74,* Article ID: 103397. https://doi.org/10.1016/j.jretconser.2023.103397

Huang, H., & Liu, S. Q. (2020). "Donate to Help Combat COVID-19!" How Typeface Affects the Effectiveness of CSR Marketing? *International Journal of Contemporary Hospitality Management, 32,* 3315-3333. https://doi.org/10.1108/ijchm-05-2020-0462

Huang, Y., Backman, S. J., & Backman, K. F. (2012). Exploring the Impacts of Involvement and Flow Experiences in Second Life on People's Travel Intentions. *Journal of Hospitality and Tourism Technology, 3,* 4-23. https://doi.org/10.1108/17579881211206507

Jacoby, J., & Hoyer, W. D. (1989). The Comprehension/miscomprehension of Print Communication: Selected Findings. *Journal of Consumer Research, 15,* 434-443. https://doi.org/10.1086/209183

Jacoby, L. L., & Dallas, M. (1981). On the Relationship between Autobiographical Memory and Perceptual Learning. *Journal of Experimental Psychology: General, 110,* 306-340. https://doi.org/10.1037//0096-3445.110.3.306

Jiang, Z., Guan, C., & de Haaij, I. L. (2020). Congruity and Processing Fluency: An Analysis on the Effectiveness of Embedded Online Video Advertising. *Asia Pacific Journal of Marketing and Logistics, 32,* 1070-1088. https://doi.org/10.1108/apjml-03-2019-0128

Li, F., & Ma, J. (2023). The Effectiveness of the Destination Logo: Congruity Effect between Logo Typeface and Destination Stereotypes. *Tourism Management, 98,* Article ID:

104772. https://doi.org/10.1016/j.tourman.2023.104772

Li, Y., Chen, Z., & Zhang, C. (2023). Is the Salesperson Persuasive Enough? The Role of the Tourists' Perceived Time Adequacy and Processing Fluency. *Tourism Management Perspectives, 48,* Article ID: 101168. https://doi.org/10.1016/j.tmp.2023.101168

Liu, X., Yin, C., & Li, M. (2024). The Power of Voice! The Impact of Robot Receptionists' Voice Pitch and Communication Style on Customer Value Cocreation Intention. *International Journal of Hospitality Management, 122,* Article ID: 103819. https://doi.org/10.1016/j.ijhm.2024.103819

Milgram, P., & Kishino, F. (1994). A Taxonomy of Mixed Reality Visual Displays. *IEICE Transactions on Information and Systems, 77,* 1321-1329.

Mitchell, D. J., Kahn, B. E., & Knasko, S. C. (1995). There's Something in the Air: Effects of Congruent or Incongruent Ambient Odor on Consumer Decision Making. *Journal of Consumer Research, 22,* 229-238. https://doi.org/10.1086/209447

Miyazaki, A. D., Grewal, D., & Goodstein, R. C. (2005). The Effect of Multiple Extrinsic Cues on Quality Perceptions: A Matter of Consistency. *Journal of Consumer Research, 32,* 146-153. https://doi.org/10.1086/429606

Penfold, P. (2009). Learning through the World of Second Life—A Hospitality and Tourism Experience. *Journal of Teaching in Travel & Tourism, 8,* 139-160. https://doi.org/10.1080/15313220802634224

Slovic, P. (1966). Cue-Consistency and Cue-Utilization in Judgment. *The American Journal of Psychology, 79,* 427-434. https://doi.org/10.2307/1420883

Su, Q., & Li, F. (. (2024). Influence of Time Metaphor and Destination Image Proximity on Tourist Responses. *Tourism Management, 105,* Article ID: 104942. https://doi.org/10.1016/j.tourman.2024.104942

Sun, J., & Guo, Y. (2023). A Research on the Influence of the Digitization of Cultural Heritage Sites on National Heritage Responsibility—A Model Construction Based on TTF and TAM. *Tourism Science, 37,* 71-85.

Wong, I. A., Sun, D., Xiong, X., & Li, X. (2023). Craving Alterreal Authenticity through the Post-Postmodern Lens: An Experimental Inquiry. *Tourism Management, 94,* Article ID: 104654. https://doi.org/10.1016/j.tourman.2022.104654

Yin, R. K. (2017). *Case Study Research and Applications: Design and Methods* (6th ed.). Sage Publications.

Youn, H. (2024). The Influence of Ethnic Food and Its Visual Presentation on Customer Response: The Processing Fluency Perspective. *Journal of Hospitality and Tourism Management, 58,* 381-393. https://doi.org/10.1016/j.jhtm.2024.02.012

Zheng, C., Zhang, J., & Zhu, J. (2024). "Dialogue" through Time and Space: Imagination Inspiration and Travel Intentions in the Digitalization of Cultural Heritage. *Tourism Tribune, 39,* 127-140.

Zhou, H., Wu, J., Chen, T., & Xia, M. (2025). Synergy or Substitution? Interactive Effects of User-Generated Cues and Seller-Generated Cues on Consumer Purchase Behavior toward Fresh Agricultural Products. *Electronic Commerce Research*. https://doi.org/10.1007/s10660-025-09969-z