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Review

Cultural Creative Design and Virtual Technology in Digital Cultural Tourism: A Conceptual Framework

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Abstract

Digital cultural tourism refers to an emerging field that integrates cultural heritage, creative content, and immersive technology. It is increasingly influenced by both cultural creative design and virtual technology. Yet, existing reseARch tends to examine content-related design factors and immersive technology factors in isolation, which leaves the mechanism of tourist satisfaction formation insufficiently explained. This article develops an integrated conceptual framework to bring these two sides together. It focuses on two research domains, cultural creative design and virtual technology, and keeps five design-related factors and three virtual technology factors within them. Rather than reducing these domains to higher-order variables, the article keeps the eight factors analytically separate while showing how they work together. Their combined influence is expressed through tourist cultural experience, which serves as the key mediating mechanism linking external inputs to tourist satisfaction. This experience is defined as holistic cognitive, emotional, and sensory engagement with cultural meaning. From this perspective, tourist satisfaction in digital cultural tourism is shaped not by design or technology alone, but by the meaningful interaction between cultural expression, experiential design, and immersive technological support. By integrating fragmented literature and centering the mediating role of tourist cultural experience, this study articulates novel theoretical contributions to digital cultural tourism and experience research while also offering practical insights for destination management, cultural interpretation, and tourism innovation.

Keywords

Cultural creative design, Immersive technology, Tourist cultural experience, Tourist satisfaction, Digital cultural heritage tourism

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1. Introduction

In recent years, digital cultural tourism has transcended its former model of resource display and service provision, evolving into an experience-oriented form centered on cultural interpretation, active participation and immersive engagement [1]. In this context, tourists are no longer limited to the expectation of simply "going to" places with culture. In addition, they also expect richer cultural meanings, more interactive experiences, and stronger emotional engagement [2]. Therefore, tourist satisfaction in digital cultural tourism has gradually become an important research issue and a practical concern for researchers and practitioners.

In this area, cultural creative design and virtual technology have emerged as two important research domains. Cultural creative design reshapes the presentation and experiential value of cultural resources through cultural content innovation, brand visual image, user experience design, innovative design, and cultural symbol expression [3]. Virtual technology, represented by virtual reality (VR), augmented reality (AR), and mixed reality (MR), opens new possibilities for immersive interpretation, interactive engagement, and multisensory cultural communication [4].

Existing studies have provided useful insights into design-related and technology-related factors in tourism development. However, they often discuss content-related factors and technology-related factors in isolation, thereby limiting a holistic understanding of their combined effects [1,2]. Research on cultural creative design tends to focus on symbolic expression, product innovation, or destination image. Studies on virtual technology usually emphasize immersion, interactivity, and technological novelty. This fragmented perspective leaves the mechanism of tourist satisfaction formation insufficiently explained in digital cultural tourism.

According to the experience economy paradigm and tourist experience theory, satisfaction is largely mediated by how tourists perceive, interpret, and emotionally engage with cultural meaning, which this article refers to as tourist cultural experience. Another problem is that tourist cultural experience has not received enough attention as a mediating mechanism. Tourist satisfaction in digital cultural tourism is not directly the result of external design features or technological applications. Instead, these factors first shape tourists' cognitive, emotional, and sensory engagement with cultural meaning and symbolic elements, as well as their participatory behaviors. Tourist cultural experience functions as the mediating process through which content-related factors and technology-related factors are translated into satisfaction outcomes [5].

Therefore, a critical gap remains: existing studies do not explain how design-related and technology-related factors jointly influence tourist satisfaction through the mediating mechanism of tourist cultural experience. To address this gap, this article attempts to construct an integrated conceptual framework by integrating two research fields, namely cultural creative design and virtual technology, while keeping eight specific factors within them. Instead of considering these two fields as two higher-order variables, this article keeps the eight factors as complementary variables. Furthermore, the article positions tourist cultural experience as the central mediating variable in the integrated model linking these elements to tourist satisfaction.

The rest of this article proceeds as follows. The next section reviews the literature on cultural creative design and virtual technology in digital cultural tourism. The following section then develops the integrated conceptual framework. Afterwards, the article discusses how the eight specific factors affect tourist cultural experience and tourist satisfaction. Finally, the theoretical and practical implications are discussed in the last section.

2. Literature Review

2.1 Cultural Creative Design in Digital Cultural Tourism

This study draws on the experience economy framework and tourist experience theory [6]. These perspectives suggest that memorable tourism experiences are co-created through interpretation, emotional engagement, and symbolic interaction. In digital cultural tourism, cultural creative design primarily supports the educational and esthetic

dimensions of experience, while virtual technology enhances the escapist and entertainment dimensions.

Because cultural creative design plays an important role in shaping people's understanding, presentation, and experience of cultural resources in digital cultural tourism, tourists in cultural tourism are not only exposed to sites or cultural resources but also immersed in associated stories, symbols, images, and designed experiences that make a place attractive. Therefore, cultural creative design is closely related to tourist cultural experience and tourist satisfaction [7].

In this article, cultural creative design is positioned as a research area rather than a higher-order variable. Based on previous studies, cultural creative design contains five factors in total, which are cultural content innovation, brand visual image, user experience design, innovative design, and cultural symbol expression. These five factors reflect different ways to transform cultural resources into tourism experiences [8].

To ensure conceptual clarity, each factor is defined as follows:

(1) Cultural content innovation: the renewal and reinterpretation of cultural narratives, stories, or artifacts to make them relevant and accessible to contemporary tourists. It focuses on what cultural meaning is conveyed.

(2) Brand visual image: the set of visual identifiers (e.g., logos, color schemes, and typography) that convey destination identity and perceived attractiveness [9]. It focuses on overall visual coherence.

(3) User experience design: the usability, accessibility, and interaction quality of digital interfaces or spatial arrangements that facilitate tourist engagement [10]. It focuses on process and ease of use.

(4) Innovative design: the introduction of novel, creative, or unexpected elements in tourism products or services that generate curiosity and memorability. It focuses on formal novelty and distinctiveness.

(5) Cultural symbol expression: the representation of local cultural meanings (e.g., rituals, motifs, and heritage symbols) through design elements to evoke emotional attachment and place identity. It focuses on specific semantic symbols.

These factors are conceptually distinct. Cultural content innovation differs from innovative design: the former changes the narrative or interpretive content, while the latter changes the form or presentation style. Brand visual image differs from cultural symbol expression: the former creates a unified visual identity across touchpoints, while the latter highlights specific heritage-related symbols to convey deep cultural meanings.

Combined, the above five factors indicate that cultural creative design is not only about visual decoration and styling of products but also provides a content-based and meaning-oriented basis for digital cultural tourism. It does this by shaping how culture is renewed, represented, organized and symbolized [11].

2.2 Virtual Technology in Digital Cultural Tourism

Alongside cultural creative design, virtual technology has become another significant research field in digital cultural tourism [12]. With the increasing application of immersive and interactive technologies, tourists' experience of encountering cultural resources and destinations and perceiving their cultural value has been greatly transformed. Virtual technology is no longer a complementary tool, but it also plays a direct role in shaping the depth and intensity of tourists' experience. In this article, virtual technology is also taken as a research field instead of a single abstract variable. It involves three specific factors: VR, AR and MR. These three technologies differ in their technical form and level of immersion, but they all play the same role in digital cultural tourism [13]. That is, they all enrich the ways tourists perceive, interpret and engage with cultural content [14].

VR generates simulated digital space that may reconstitute heritage scenes, visualize inaccessible space and even give a fully immersed experience of culture [15]. AR enhances the real-world environment with additional digital information and allows real-time interaction. MR enables greater integration of virtual and real worlds and offers more continuous, participatory and multisensory interaction.

The value of VR, AR, and MR does not lie in the technology itself or in its novelty [16]. Rather, it is because they can

enhance immersion, interactivity, interpretation and experiential richness [17]. According to technology-mediated experience theory [18], immersive technologies do not directly determine satisfaction; rather, they shape satisfaction by enhancing interpretive depth, sensory immersion, and interactive participation. Hence, virtual technology is closely related to tourist cultural experience and tourist satisfaction.

2.3 Toward an Integrated Understanding

The existing literature clearly shows that both cultural creative design and virtual technology matter in digital cultural tourism. However, most existing studies examine only one domain in isolation. For example, research on cultural creative design [19] rarely considers how immersive technologies might amplify or alter the interpretation of cultural symbols. Conversely, studies on virtual technology [20] often treat technology as a direct determinant of satisfaction, without sufficiently considering the cultural meaning-making process.

This fragmented approach has two major limitations. First, it cannot explain how content-related and technology-related factors jointly influence tourist satisfaction. Second, it overlooks the mediating role of tourist cultural experience–the process through which external design and technology inputs are transformed into cognitive, emotional, and sensory outcomes. Few studies have explored the joint mechanisms or interactive effects of these two domains [17].

Therefore, an explicit theoretical gap exists: no integrated framework connects these two research domains while retaining the specificity of their eight constituent factors and positioning tourist cultural experience as the central mediator. To address this gap, the next section develops such a framework.

3. Integrated Conceptual Framework

3.1 Research Domain and Factor Composition

In digital cultural tourism, tourist satisfaction is rarely formed by a single factor. Instead, it emerges through the joint influence of multiple content-related and technology-related factors that shape how tourists perceive, interpret, and engage with cultural resources [21]. Reliance on either design or technology alone cannot fully explain how tourist satisfaction is formed. Therefore, an integrated conceptual framework is needed to explain how cultural creative design and virtual technology work together to enhance tourist cultural experience and tourist satisfaction. This framework is derived from a critical synthesis of the existing literature (Sections 2.1-2.3), which identifies eight distinct factors and their hypothesized mediating pathways.

This article develops such a framework by connecting two research domains, namely cultural creative design and virtual technology, while retaining eight specific factors within them. The cultural creative design domain includes cultural content innovation, brand visual image, user experience design, innovative design, and cultural symbol expression. The virtual technology domain includes VR, AR, and MR. These domains are not treated as higher-order variables. Instead, the framework treats the eight factors as distinct but complementary elements.

3.2 Mediating Role of Tourist Cultural Experience

Digital cultural tourism should not be understood only in terms of design features or technological novelty. The critical issue is whether these design and technological features help make tourist cultural experience more meaningful, immersive, and in-depth. External design and technology inputs matter because they can enhance tourist cultural experience. Notably, tourist cultural experience serves as the core mediating mechanism in the entire framework. For this reason, tourist cultural experience is positioned at the center of the framework as the main mediating mechanism. Tourist cultural experience is defined here as a multidimensional construct comprising cognitive (understanding of cultural meanings), emotional (affective attachment to place and heritage), sensory (perceptual immersion), symbolic (identification with cultural symbols), participatory (active engagement), and memorable dimensions.

More precisely, the five factors within the cultural creative design domain influence the content and meaning structure of digital cultural tourism. The three factors within the virtual technology domain influence the interactive and experiential dimensions of tourism. The major value of this framework is that it brings content-related factors and technology-related factors into the same explanatory structure. The two domains present an inherently complementary relationship. Without virtual technology, cultural creative design may lack interactivity and experiential depth. Without cultural creative design, virtual technology may provide novelty but still lack sufficient cultural content and symbolic meaning [22]. Isolated research therefore cannot adequately explain how these two domains jointly shape tourist cultural experience and tourist satisfaction.

In this framework, tourist cultural experience links together related external inputs and evaluative outcomes. It shows how tourists experience design features, symbolic content, and immersive technologies as meaning, emotional engagement, and experiential value [23]. Once tourist cultural experience is strengthened, tourist satisfaction is more likely to increase. In this sense, tourist cultural experience is the core process through which the eight specific factors are translated into satisfaction outcomes.

3.3 Logical Relationship of the Framework

Based on this logic, this article proposes that cultural creative design and virtual technology should be understood as mutually reinforcing research domains in digital cultural tourism. Their eight specific factors do not operate in isolation. Rather, they work together to shape tourist cultural experience and, through it, tourist satisfaction. Overall, this framework presents a clear sequential path from the eight factors to tourist cultural experience and, ultimately, tourist satisfaction. The conceptual relationships discussed above are summarized in Figure 1, which provides a simplified overview. The detailed causal pathways and mediating mechanisms are set out in Propositions 1a-5.

Based on the above reasoning, the following propositions are formulated:

Proposition 1a: Cultural content innovation positively influences tourist cultural experience.

Proposition 1b: Brand visual image positively influences tourist cultural experience.

Proposition 1c: User experience design positively influences tourist cultural experience.

Proposition 1d: Innovative design positively influences tourist cultural experience.

Proposition 1e: Cultural symbol expression positively influences tourist cultural experience.

Proposition 2a: VR positively influences tourist cultural experience.

Proposition 2b: AR positively influences tourist cultural experience.

Proposition 2c: MR positively influences tourist cultural experience.

Proposition 3: Tourist cultural experience positively influences tourist satisfaction.

Proposition 4: Tourist cultural experience mediates the relationships between the eight factors and tourist satisfaction.

Proposition 5: The effects of cultural creative design and virtual technology are mutually reinforcing; the presence of one domain strengthens the positive impact of the other on tourist cultural experience.

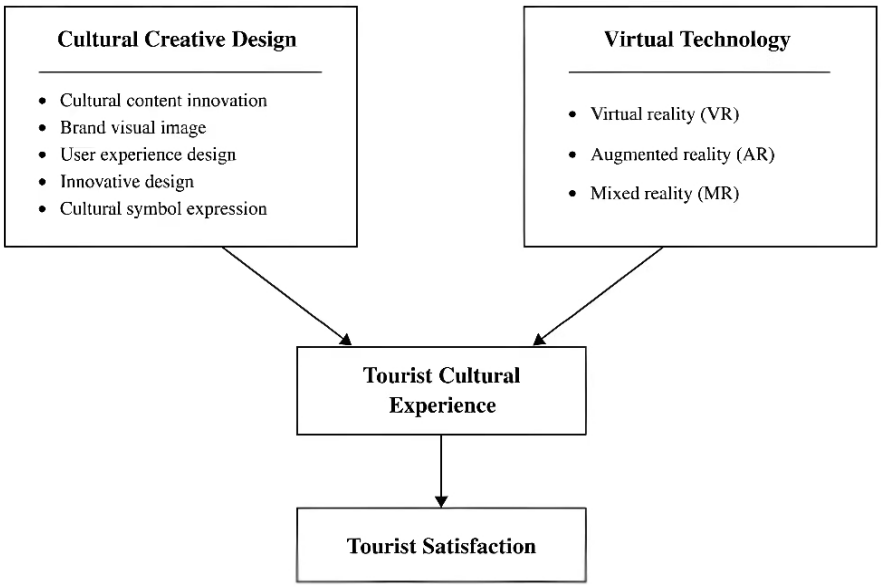

Figure 1. Integrated conceptual framework of cultural creative design and virtual technology in digital cultural tourism.

Note: Cultural creative design and virtual technology are treated as two research domains. The framework retains eight specific factors and positions tourist cultural experience as the key mediating mechanism linking content-related and technology-related factors to tourist satisfaction. Each of the eight factors independently influences tourist cultural experience (see Propositions 1a-2c), and the two domains exhibit mutual reinforcement (see Proposition 5). The figure conceptually groups the factors within each domain for visual clarity; detailed relationships are specified in the propositions. All framework content in this figure is independently designed and originally summarized by the author.

4. Results

4.1 Cultural Creative Design and Tourist Cultural Experience

The five design-related factors (see Section 2.1 for definitions) influence tourist cultural experience through distinct mechanisms, as proposed in Propositions 1a-1e.

Cultural content innovation enhances interpretive involvement and perceived novelty by transforming static cultural resources into dynamic, narratively engaging formats [24]. Brand visual image improves first impressions and destination attractiveness through coherent visual identity, strengthening tourists' intuitive recognition [25]. User experience design increases usability, participation, and experiential fluency, reducing barriers to engagement [26]. Innovative design generates curiosity, distinctiveness, and memorability by introducing creative and unexpected elements [27]. Cultural symbol expression facilitates emotional attachment and place identity by conveying deep and meaningful local symbols [28].

Collectively, these factors operate sequentially: they first shape tourists' cognitive and emotional engagement with cultural meaning, which then enhances overall cultural experience and, ultimately, tourist satisfaction [5].

4.2 Virtual Technology and Tourist Cultural Experience

The three technology-related factors (VR, AR, MR) influence tourist cultural experience through immersion, interactivity, and interpretive richness, as proposed in Propositions 2a-2c.

VR constructs fully simulated environments that enable presence and sensory immersion, allowing tourists to experience reconstructed or inaccessible cultural scenes [29,30]. With stronger presence, sensory input, and immersion, tourists move beyond being passive cultural consumers. VR creates a stronger sense of immersion and enriches tourists' cultural experience.

AR overlays digital information onto the physical world, improving real-time interpretation without replacing the actual setting. In museum-guided tourism, visitors' adoption and use of AR are influenced by the technology's perceived usefulness, interaction quality, and ability to support cultural interpretation [31]. AR therefore enhances real-time cultural understanding, improves interpretive visibility, and enriches tourists' experiential perception [32,33].

MR blends physical and digital objects, enabling bidirectional, integrated interaction that deepens cultural participation [12,13]. MR breaks the boundary between virtuality and reality, allowing tourists to interact with digital elements and physical environments in an integrated manner.

The value of these technologies lies not in novelty per se but in their capacity to enhance interpretation, immersion, and experiential richness [17]. Through these mechanisms, virtual technology enriches tourists' cultural experience, which in turn drives satisfaction.

4.3 The Mediating Role of Tourist Cultural Experience

As stated in Proposition 4, tourist cultural experience mediates the relationships between the eight factors and tourist satisfaction. Unlike conventional service tourism, where satisfaction depends largely on convenience and service performance, in digital cultural tourism, satisfaction depends on how meaningfully culture is conveyed and how deeply tourists engage with it [5]. Thus, tourist cultural experience serves as the essential intermediate link.

Tourist cultural experience converts external design and technology inputs into satisfaction outcomes. Design factors strengthen this experience by making culture more understandable, visually coherent, accessible, creative, and symbolically meaningful. Technology factors strengthen it by making interpretation more immersive, interactive, and experientially rich [28]. In both cases, satisfaction is enhanced through the improvement of cultural experience.

This mediating role is critical: better technology does not guarantee higher satisfaction unless it deepens cultural interpretation. Similarly, strong design has limited impact if tourists cannot actively engage with it [23]. Therefore, tourist cultural experience is the essential mediator through which all eight factors affect satisfaction.

4.4 Synergy Between the Two Research Domains

Proposition 5 states that the two domains are mutually reinforcing. Rather than operating as separate influences, they work together synergistically [22]. Cultural creative design offers the cultural content, symbolic logic and experience structure, while virtual technology supplies immersion, interactivity, and interpretive presentation. If one domain is favored over the other, the tourism experience remains incomplete. Their synergistic interaction jointly shapes cultural experience and promotes satisfaction.

When design is strong but technology is weak, interactivity experiential depth may be lacking. When technology is strong but design weak, interactivity and experiential depth may be lacking [26]. Therefore, digital cultural tourism requires a coherent combination of both domains. The eight factors work together to strengthen tourist cultural experience and, through it, tourist satisfaction [17].

5. Discussion

5.1 Theoretical Implications

This article makes three contributions to the digital cultural tourism literature. Compared with existing models, our framework offers three distinct advances. First, while prior studies often treat cultural creative design and virtual technology as separate streams (e.g., studies on design focus on symbolic expression and product innovation; studies on technology focus on immersion and novelty), our framework explicitly integrates both domains within a single analytical structure. Second, unlike models that reduce multi-dimensional factors to higher-order variables (e.g., technology acceptance models that collapse all technology features into a single construct), we retain eight analytically

separate factors, recognizing the multi-faceted nature of digital cultural tourism. Third, whereas previous research rarely positions tourist cultural experience as a central mediator, our framework makes mediation the core explanatory mechanism, clarifying how external inputs are transformed into satisfaction outcomes.

In summary, the proposed framework contributes to four interconnected literature streams: digital cultural tourism (by integrating design and technology), heritage tourism (by emphasizing meaning-making), technology-mediated experience (by articulating a mediation model), and tourist satisfaction research (by specifying multi-factor pathways).

5.2 Practical Implications

The framework offers actionable guidance for different stakeholder groups.

Destination managers: Do not treat technology investment as sufficient for satisfaction. VR, AR, or MR can enhance immersion and interactivity, but their value is fully realized only when linked to substantial cultural content and coherent experience design [29]. Prioritize balanced investment in both cultural content development and technological applications.

Museum and heritage site managers: Beyond symbolic content and visual visibility, ensure that participation is active, interpretation is dynamic, and interaction is facilitated. Even rich cultural resources and creative design will lead to superficial experiences if these elements are missing [26]. Integrate cultural content, visual identity, user experience, and technology as a holistic plan.

Cultural planners and creative designers: Digital transformation efforts should focus less on technological novelty and more on the utility of digital tools for cultural interpretation–supplementing rather than replacing it [33]. Design should go beyond aesthetics to organize cultural narratives and symbols meaningfully, facilitating experiential participation.

Technology developers (VR/AR/MR): Focus on how tourists enter, make sense of, and participate in the tourism experience. Since tourist cultural experience is the mediating variable, technology features should directly support cognitive, emotional, and sensory engagement with cultural meaning.

By directing practical attention to tourists' actual experiences, the mediating effect can be fully leveraged, thereby strengthening the path from design and technology optimization to tourist satisfaction

5.3 Limitations and Future Research Directions

This conceptual framework requires empirical validation. Several limitations should be acknowledged.

First, the framework is theoretical and has not been empirically tested. Future research should operationalize the eight factors and develop reliable measurement scales. Second, the relative importance of each factor may vary across different types of digital cultural tourism (e.g., museums, historic cities, natural heritage sites). Comparative case studies or configurational analyses (e.g., fuzzy-set QCA) could explore this. Third, potential moderators–such as tourists' prior knowledge, cultural distance, or technology readiness–are not included. Subsequent studies could extend the model by incorporating these variables. Fourth, the proposed mediating role of tourist cultural experience should be tested using structural equation modeling or partial least squares path modeling.

Future research may also examine whether certain factors interact non-linearly or whether the synergistic effect (Proposition 5) is conditional on specific contexts. Mixed-method approaches combining surveys, interviews, and design-based research are encouraged.

6. Conclusion

This article integrates two research domains–cultural creative design and virtual technology–while retaining eight specific factors as analytically separate elements. Rather than compressing these domains into higher-order variables,

the framework demonstrates how design-related and technology-related factors jointly shape tourist satisfaction through the mediating mechanism of tourist cultural experience.

The main claim is that tourist satisfaction in digital cultural tourism does not emerge from design features or technological novelty alone, but from a meaningful experiential process in which content-related and technology-related factors jointly shape tourist satisfaction through tourist cultural experience [5]. Tourist cultural experience thus serves as the essential mediator linking external inputs to satisfaction outcomes.

Future research should address the limitations noted above by empirically testing the framework using quantitative methods, comparative case analyses, or context-specific studies across diverse digital cultural tourism destinations.

Conflict of Interest

The authors declare no conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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