

ANALYSIS OF INNOVATIVE DESIGN PATHS FOR CULTURAL TOURISM PRODUCTS BASED ON THOUSAND-ANGLE LANTERN ELEMENTS

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ABSTRACT

Against the backdrop of cultural rejuvenation and global communication, traditional intangible cultural heritage generally faces challenges, including broken inheritance chains, insufficient youth-oriented expression, and weak digital communication capacity. As a national-level intangible cultural heritage, Dongguan Thousand-Horn Lantern embodies the value of Lingnan folk culture, clan symbolism and traditional craftsmanship. Nevertheless, its conventional presentation modes fail to meet the demands of contemporary digital cultural tourism and young people's aesthetic preferences. Accordingly, this study takes the Thousand-Horn Lantern as the core research object and establishes a research framework of “cultural gene deconstruction—visual symbol translation—digital innovative design—communication and promotion.” Adopting multiple research methods such as literature research, field investigation, questionnaire surveys, and expert interviews, this paper systematically extracts the cultural symbols and visual artistic characteristics of the Thousand-Horn Lantern. Combined with digital art technologies including 3D modeling, VR/AR interaction, motion visual design and IP reconstruction, it realizes the modern and digital translation of traditional cultural elements. The research findings demonstrate that this innovative design model effectively improves the clarity of cultural expression of the Thousand-Horn Lantern, recognition among young consumers, and the communication influence of regional cultural brands, while strengthening the interactive experience and market transformation potential of intangible cultural heritage. This study provides theoretical support and practical references for the digital innovation of traditional folk intangible cultural heritage, the integrated development of culture and tourism, as well as international cultural communication.

Keywords: Thousand-Angle Lantern, Intangible Cultural Heritage, Cultural and Tourism Products, Innovative Design, Cultural-Tourism Integration, Living Inheritance

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INTRODUCTION

In the context of integrated development between the digital economy and cultural tourism, the protection and innovative dissemination of intangible cultural heritage have become a key focus in cultural research and design practice. With the advancement of the UNESCO Convention for the Safeguarding of Intangible Cultural Heritage, the approach to its preservation has evolved from "static preservation" toward "living inheritance" and "innovative transformation," emphasizing the use of digital technologies, cultural creativity, and experiential design to promote contemporary dissemination and sustainable development of traditional culture. The growth of digital media art, immersive interactive experiences, and cultural IP management has also opened new avenues for the modernization of intangible cultural heritage.

The Dongguan Thousand-Horn Lantern, as a representative national intangible cultural heritage of the Lingnan region, integrates traditional lantern-making craftsmanship, festive customs, and regional cultural spirit, possessing significant artistic value and cultural symbolism. Its intricate polygonal structure, auspicious patterns, and lantern cord system not only embody the aesthetic principles of Lingnan traditional craftsmanship but also reflect local cultural identity and folk beliefs. However, with evolving times, the development of the Thousand-Horn Lantern faces challenges such as an aging workforce of inheritors, inadequate market relevance for traditional crafts, limited digital dissemination capabilities, and insufficient innovation in cultural and creative products. The traditional static display format can no longer meet young consumers' demands for interactive experiences and cultural engagement.

Based on this, this paper takes the Dongguan Thousand-Horn Lantern as its research subject, integrating theories of intangible cultural heritage protection, cultural semiotics, and digital cultural tourism design methodologies. Through literature review, interviews, and questionnaire analysis, it explores pathways for the digital interpretation of Qianjiao Lantern's cultural symbols and innovation in cultural tourism products, aiming to establish a digital cultural tourism design model that combines cultural, communicative, and industrial value, thereby providing theoretical and practical references for the living inheritance and sustainable development of the Qianjiao Lantern.

Research Objectives

This research focuses on analyzing the cultural symbols, structural design, and visual aesthetic characteristics of the Qianjiao Lantern, exploring the mechanisms for designing and adapting traditional intangible cultural heritage elements into cultural tourism products as well as innovative application approaches. The aim is to promote the integrated development of cultural preservation, product innovation, and market dissemination for Qianjiao Lantern culture within the digital cultural tourism context.

LITERATURE REVIEWS

Related Domestic Research

Based on a review of relevant studies from the China National Knowledge Infrastructure (CNKI), Wanfang Database, and local intangible cultural heritage research materials, recent research on the Dongguan Thousand-Angle Lantern can generally be categorized into six major directions: cultural and historical studies, intangible cultural heritage protection studies, arts and crafts studies, digital communication studies, cultural tourism integration studies, and product innovation design studies. Among these, cultural history and folklore research account for the largest proportion, approximately 30%, mainly focusing on the historical origins of the Thousand-Angle Lantern, clan culture, festival customs, and the cultural value of Lingnan folk traditions, emphasizing its significance as a regional cultural symbol. This is followed by studies on intangible cultural heritage protection and inheritance, accounting for 25%, which

mainly address issues such as the aging of inheritors, the loss of traditional craftsmanship, living inheritance mechanisms, and preservation strategies. Research on craftsmanship and artistic forms accounts for approximately 16.7%, concentrating on paper crafting techniques, structural modeling, decorative patterns, and the aesthetic characteristics of traditional craftsmanship. At the same time, digital communication research accounts for about 10%, involving topics such as VR exhibitions, digital modeling, and new media dissemination; however, most studies remain at the conceptual and theoretical level, with relatively few systematic practical cases. Research on cultural tourism integration represents approximately 11.7%, gradually focusing on the integration of the Thousand-Angle Lantern with local tourism, cultural branding, and creative cultural industries. Product innovation design research accounts for only 6.6%, making it the least explored field. Systematic studies on IP image development, cultural and creative product design, visual symbol transformation, and digital innovation design remain relatively insufficient. Overall, current academic research on the Dongguan Thousand-Angle Lantern still centers primarily on cultural inheritance and intangible cultural heritage protection, while studies related to digital innovation design, immersive communication, and cultural tourism product development still have considerable room for further expansion and exploration.

Related International Research

At the international level, under the frameworks of “creative tourism” and “heritage interpretation,” the interdisciplinary integration of cultural heritage, design innovation, and the tourism industry has become a widely discussed topic. Researchers such as Greg Richards (2020) and experts from UNESCO have emphasized the importance of adopting experiential and participatory approaches to enhance public interaction with heritage. Studies on the adaptive reuse of architectural heritage by Koenraad Plevoets and Robert Van Cleempoel (2019), as well as research on symbolic design transformation in cultural products by Elisa Giaccardi (2018), provide methodological references for narrative design, digital interaction, and sustainable value creation. However, there are still very few studies specifically exploring the design potential of folk intangible cultural heritage such as the Thousand-Angle Lantern within the context of Chinese-Western cultural integration. This indicates the unique value of this research field, which can provide localized insights for global heritage design through the case of the Thousand-Angle Lantern.

Research on the Integration of Intangible Cultural Heritage and Cultural Tourism

In recent years, Intangible Cultural Heritage (ICH) has gradually become an important component of the cultural tourism industry. UNESCO, intangible cultural heritage is not only a carrier of historical and cultural memory, but also an important source of regional cultural identity. Laurajane Smith (2006) argued that the core of cultural tourism development lies in “experiential cultural consumption,” where tourists pay greater attention to participation, interactivity, and the recreation of cultural contexts rather than merely material sightseeing. Chinese scholars generally believe that the development of intangible cultural heritage tourism can promote local economic growth and cultural dissemination, but it may also lead to superficial cultural symbolism and commercial homogenization. Wang Wenzhang (2021) pointed out that current Chinese intangible cultural heritage tourism products suffer from problems such as “insufficient cultural depth” and “weak creative transformation capability.” Chen Qinjian (2022) proposed that traditional intangible cultural heritage should achieve modern transformation through digital media, interactive design, and IP-based operations in order to enhance acceptance among younger consumer groups. Within the field of Lingnan cultural studies, the Dongguan Thousand-Angle Lantern possesses high research value due to its complex structure, festival ritual functions, and symbolic representation of clan culture. However, existing studies mainly focus on its historical origins, craft processes, and folk

cultural value, while research on cultural tourism product design, digital communication, and consumer experience remains relatively insufficient.

Research on Cultural and Creative Product Design and Cultural Symbol Translation

Cultural tourism products not only serve economic functions but also carry responsibilities related to cultural communication and emotional identity. Don Norman (2004) in his theory of emotional design, proposed that products should simultaneously satisfy users' needs on the "visceral level, behavioral level, and reflective level." This indicates that the design of cultural and creative products is not merely the replication of forms, but also the establishment of connections between cultural meaning and user emotions.

In recent years, semiotics has been widely applied in the study of intangible cultural heritage product design. Klaus Krippendorff (2006) argued that product design is essentially a process of "meaning creation." Chinese scholar Li Yanzu proposed that the modern translation of traditional cultural elements should shift from simple "graphic extraction" toward "cultural narrative reconstruction," meaning that modern materials, digital media, and interactive approaches should be used to provide traditional culture with new contexts for dissemination. Regarding research on lantern cultural products, most scholars focus on visual communication in lantern festivals, festival spatial design, and the redesign of traditional decorative patterns. For example, Zhao Xin (2023) proposed that traditional lantern elements could be applied to the development of modern cultural and creative products through modular design, parametric modeling, and digital pattern systems. However, for the Thousand-Angle Lantern — an intangible cultural heritage object characterized by complex cultural semantics such as the "thousand-lamp structure," the "Twenty-Four Filial Piety lantern bands," and "brocade ornamentation" — systematic research on product innovation remains lacking.

Research on Digital Technology and Immersive Cultural Tourism Experiences

With the development of digital media art and immersive technologies, cultural tourism products are gradually shifting from "material consumption" to "experience consumption." B. Joseph Pine II and James H. Gilmore (1999) in the theory of the experience economy, pointed out that the future core of consumption lies in immersion, participation, and memorable value. Currently, technologies such as AR, VR, 3D modeling, digital projection, and AI-generated technology have been widely applied in cultural heritage exhibitions. Cases such as the digital exhibitions of The Palace Museum and the digital caves of Mogao Caves demonstrate that digital technology can enhance the visual communication efficiency of traditional culture and strengthen public interactive experiences. Chinese researcher Liu Yang (2024) pointed out that the key to digital cultural tourism design lies in the integration of "digitalization of cultural content" and "scenario-based user experience." For the Thousand-Angle Lantern, its complex three-dimensional structure, dynamic lighting effects, and festival ritual characteristics make it highly suitable for integration with immersive projection, interactive installations, and digital cultural product development. However, most current digitalization projects for intangible cultural heritage still remain at the level of static display, lacking systematic product operation pathways and user experience evaluation mechanisms. Therefore, how to transform Thousand-Angle Lantern cultural elements into cultural tourism products that simultaneously possess cultural value, commercial value, and digital communication value has become an important direction for current research.

RESEARCH METHODOLOGY

A total of 173 valid samples were collected in this study, including Thousand-Angle Lantern craftsmanship inheritors, product developers, industry experts, market consumers, and theoretical and industrial support groups. The research subjects covered multiple dimensions, including cultural inheritance, design innovation, industrial operation, and consumer markets, thereby ensuring strong representativeness.

Table 1 Statistics of Respondent Types

Respondent Group	Number of Samples (Persons)	Percentage (%)	Research Function
Inheritor of the Thousand-Horn Lantern-making Technique	6	3.47	Provide information about traditional crafts and culture.
Product Developers	50	28.90	Provide suggestions for design innovation and product development
Industry Experts and Practitioners	7	4.05	Provided theoretical and industrial analysis
Market Consumer Group	100	57.80	Provided consumer demand and market feedback
Theoretical and Industrial Support Group	10	5.78	Provided suggestions on industry development and cultural communication
Total	173	100	

The sample structure reflects the distinct roles of two types of evidence: consumer questionnaires are used to determine demand priorities and experience preferences; interviews with cultural inheritors, designers, and industry experts serve to verify cultural authenticity, technical feasibility, and boundaries for visual reinterpretation. Thus, consumer data does not directly dictate the selection of cultural symbols, nor do expert opinions replace market validation; both elements collectively underpin the design model.

Qualitative data were analyzed using thematic analysis and symbolic coding. First, open coding was applied to interview transcripts, yielding five initial categories: structural morphology, pattern semantics, color systems, manufacturing processes, and ritual contexts. These were subsequently consolidated through axial coding into three design constraints: cultural irreplaceability, deformable visual elements, and technically achievable features. Finally, inheritors and design experts reviewed the coding results. Quantitative data were analyzed using descriptive statistics, with calculations of product preference proportions, mean digital experience satisfaction scores, and design influence factor scores. Design decisions were incorporated into the final model only when supported by both qualitative and quantitative evidence; in cases of conflict, cultural authenticity and craftsmanship logic took precedence, followed by market alignment considerations regarding visual hierarchy, interaction methods, and product presentation.

RESEARCH RESULTS

Deconstruction of Cultural Genes and Translation of Digital Parameters

To prevent the extraction of cultural elements from remaining at the level of graphic collage, this study categorizes the cultural genes of the Thousand-Horn Lantern into morphological genes, pattern genes, color genes, craftsmanship genes, and ritual genes, and establishes a technical framework comprising semantic recognition, visual measurement, parameter encoding, reconstruction constraints, and application validation. After orthographic correction and background separation of the physical image, contour nodes, curvature variations, symmetry axes, color values, and component proportions are extracted; retention priorities are then determined based on cultural semantics. The dragon head orientation, the lamp's polygonal structure, floral symmetry relationships, and auspicious textual meanings are designated as

high-critical parameters that must not be altered during simplification; line density, number of local decorations, and color brightness can be adjusted appropriately across different media. Taking the dragon motif as an example, digital processing does not involve direct replication but first divides the dragon's head, torso, claws, tail, and flame pattern into independent semantic units. These units are then described using Bézier nodes for external contours, curve transition points, line thickness variations, and positive/negative shape proportions. The contour extraction phase preserves the primary motion directions; the geometric simplification phase removes low-identification details while controlling node counts; the vector reconstruction phase standardizes line thicknesses, corner radii, and module connection methods; ultimately generating multi-scale vector assets suitable for logos, dynamic graphics, 3D textures, and interactive interfaces. This process ensures that "visual simplification" does not equate to "loss of cultural significance."

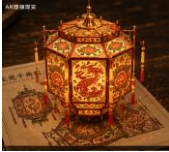
Analysis of the Cultural Symbolic Value and Market Consumption Preferences of the Thousand-Angle Lantern

The research results indicate that the Dongguan Thousand-Angle Lantern possesses outstanding cultural recognizability and visual communication value. Its unique multi-angled structure, lantern-band system, auspicious patterns, and Lingnan festival culture can be integrated into a highly distinctive cultural IP symbol system. Respondents generally showed a high level of recognition toward the cultural symbolic value of the Thousand-Angle Lantern, among which the three core connotations—traditional festival culture, Lingnan regional characteristics, and auspicious meanings—received the highest public awareness.

After the traditional elements of the Thousand-Angle Lantern are modularized and digitally translated, the related design resources can be widely applied to various scenarios such as tourism souvenirs, digital interactive installations, lighting art, AR navigation systems, and immersive exhibition spaces. According to the questionnaire survey and Table 2 data, consumers show a stronger preference for cultural tourism products featuring interactivity, digitalization, and cultural experience attributes. Among them, digital interactive cultural and creative products, AR/VR immersive experiences, and lighting art installations accounted for 78.0%, 72.0%, and 69.0%, respectively. Handmade lantern DIY experiences, digital collectibles, and IP products also attracted considerable attention, whereas traditional souvenirs accounted for only 48.0%.

These findings clearly reflect the declining attractiveness of traditional static souvenir markets, while immersive digital experience products are increasingly favored by the public, especially younger consumer groups. The cultural tourism consumption model of the Thousand-Angle Lantern is gradually transforming from traditional viewing-oriented consumption to deeply participatory experiential consumption. Meanwhile, digital cultural and creative products integrating cultural stories and interactive gameplay achieved higher user satisfaction. Cultural tourism formats combining VR exhibitions and festival activities can effectively enhance tourists' cultural participation and regional identity. In addition, communication strategies based on social media and digital IP visual systems are more conducive to promoting Thousand-Angle Lantern culture among younger audiences.

Table 2 Analysis of Consumer Preferred Product Types

Product Type	Number of Selections	Percentage (%)	Design Results
Digital Interactive Cultural and Creative Products	78	78.0	
AR/VR Immersive Experiences	72	72.0	
Lighting Art Installations	69	69.0	
Traditional Souvenirs	48	48.0	
Handmade Lantern DIY Experiences	64	64.0	
Digital Collectibles / IP Products	58	58.0	

Analysis of the Effects of Digital Design and Influencing Factors of Product Innovation

The impact of digital design on user experience

The application of digital media technologies can significantly enhance users' cultural experience and willingness to engage in cultural dissemination. As shown in the satisfaction data in Table 3 (5-point scale), all forms of digital display received substantially higher evaluations than static graphic and textual displays. VR immersive spaces achieved the highest average satisfaction score of 4.71, emphasizing deep cultural immersion experiences. AR interactive guides, digital light shows, and 3D dynamic displays received average satisfaction scores of 4.63, 4.58, and 4.56, respectively, demonstrating strengths in interactive participation, festival atmosphere creation, and visual impact. In contrast, static graphic and textual displays scored only 3.42, revealing shortcomings in their singular mode of information dissemination. The data fully demonstrate that immersive and interactive digital experiences have become mainstream demands, while single static display models can

Table 3 Analysis of Satisfaction with Digital Design Experiences

Design Method	Average Satisfaction (5-point Scale)	Characteristics of User Feedback
3D Dynamic Display	4.56	Enhances visual impact
AR Interactive Guide	4.63	Improves interactive participation
VR Immersive Space	4.71	Strengthens cultural immersion experience
Digital Light Show	4.58	Enhances festival atmosphere
Static Graphic and Text Display	3.42	Information dissemination is relatively monotonous

Core Influencing Factors of Product Innovation Design

Based on interview findings and questionnaire statistics, this study identified various factors influencing the innovation of Thousand-Angle Lantern cultural tourism products, as shown in Table 4

Under the 5-point evaluation system, “distinctiveness of cultural characteristics” scored 4.82 and “interactive product experience” scored 4.75. Both indicators showed extremely high influence and were identified as the core factors determining consumers’ purchasing intentions. “Digital visual effects” and “practical product functionality” scored 4.69 and 4.51, respectively, indicating a high level of influence. “Brand packaging design” and “market price acceptance” scored 4.37 and 4.12, respectively, showing relatively weaker influence.

These results confirm that contemporary consumers are no longer concerned solely with product appearance when purchasing intangible cultural heritage tourism products; instead, they place greater emphasis on cultural connotations, emotional value, and interactive experiences embodied in the products.

Table 4 Statistics of Influencing Factors in Product Innovation Design

Influencing Factor	Average Score (5-point Scale)	Degree of Influence
Distinctiveness of Cultural Characteristics	4.82	Extremely High
Interactive Product Experience	4.75	Extremely High
Digital Visual Effects	4.69	High
Practical Product Functionality	4.51	High
Brand Packaging Design	4.37	Relatively High
Market Price Acceptance	4.12	Moderate

Construction of the Innovation Path Model and Comprehensive Discussion

Based on the preceding survey data, user experience analysis, and evaluation of influencing factors, this study constructs a four-dimensional innovation path model consisting of “cultural symbols - digital translation - experience design - industrial communication.” This model can effectively strengthen the modern communication efficiency of Thousand-Angle Lantern culture and promote the transformation and upgrading of traditional intangible cultural heritage resources into the digital cultural tourism industry. Throughout the study, cultural symbol interviews and coding analysis methods were employed. Interview outlines were designed around the Thousand-Angle Lantern’s structural patterns, traditional craftsmanship, and folk cultural connotations. Hierarchical coding and classification analysis were conducted on the interview texts to achieve standardized extraction and professional interpretation of intangible cultural heritage cultural symbols. Based on the comprehensive research findings, this paper identifies three major innovative development directions for Thousand-Angle Lantern cultural tourism products. First, it is necessary to deeply explore and strengthen the application of core cultural symbols in order to establish differentiated advantages and avoid the homogenization

problem commonly found in intangible cultural heritage products. Second, various digital media technologies should be extensively integrated to create immersive interactive scenarios and expand channels for cultural interaction and dissemination. Third, a collaborative development model combining “culture + tourism + digital creativity” should be established to simultaneously realize both the cultural value and industrial economic value of intangible cultural heritage. Overall, the study confirms that digital design can not only comprehensively optimize user experience, but also enhance younger generations’ cultural identity and recognition of traditional intangible cultural heritage. thereby providing strong support for the long-term living inheritance and sustainable development of the Dongguan Thousand-Angle Lantern.

Table 5 Innovation Design Path Model for Thousand-Angle Lantern Cultural Tourism Products

Design Category	Specific Design Content	Design Method Support	Application Scenarios and Practical Value
	Cultural posters, new media visuals, festival promotion systems	Cultural element extraction, visual symbol analysis	Enhances social media communication and youthful cultural dissemination
	Online exhibitions, immersive spaces, promotional videos, VR exhibition scenes	Field investigation, digital technology application	Realizes permanent digital display and immersive cultural experiences
	Themed packaging, tourism souvenirs, creative derivative products	Cultural symbol analysis, modern aesthetic adaptation	Promotes the transformation of cultural resources into creative industry assets
	IP visuals, logos, pattern systems, VIS identity systems	Symbol reconstruction, systematic design	Strengthens brand identity and cultural recognizability
	VR virtual exhibitions, AR interaction, virtual lantern-lighting experiences	Digital technology application, user experience research	Enhances user participation and interactive cultural experiences

DISCUSSION AND CONCLUSION

This study argues that the Thousand-Angle Lantern is not only a traditional folk craft, but also an important cultural resource with regional cultural identity, visual artistic value, and significant potential for digital dissemination. In the context of cultural-tourism integration in

the new era, the protection of intangible cultural heritage should not remain at the level of static preservation; instead, innovative design approaches should be adopted to realize cultural reproduction and social re-communication.

The research demonstrates that digital media technology, immersive experience design, and cultural IP operation can effectively promote the transformation of the Thousand-Angle Lantern from a “traditional craft exhibition” into a “modern cultural consumption experience.” At the same time, the design of cultural tourism products must balance cultural authenticity with market-oriented demands in order to avoid problems such as excessive symbolization, over-entertainment, and homogenization.

Future research may further integrate Artificial Intelligence Generated Content (AIGC), metaverse exhibition spaces, and cross-media communication strategies to establish a more comprehensive digital ecosystem for intangible cultural heritage. In addition, stronger collaborative cooperation among local governments, design institutions, and intangible cultural heritage inheritors should be promoted in order to achieve the sustainable development and international dissemination of Thousand-Angle Lantern culture.

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