



Research on Digital Development Model and Path of Yunnan Cultural Tourism Industry from Heritage Protection Perspective

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Abstract. With the advancement of global cultural heritage protection and tourism digital transformation, Yunnan, rich in ethnic, natural and intangible cultural heritage resources, faces both opportunities and challenges in cultural tourism digital upgrading. Based on heritage sustainability, digital governance and industrial integration theories, this study adopts field investigation, literature analysis and case comparison. Combined with first-hand field interview data, resource statistical indicators and questionnaire survey results collected from 12 prefectures and cities in Yunnan, this paper quantitatively and qualitatively analyzes the industry status. It identifies major bottlenecks including insufficient resource digitization, single application scenarios, uncoordinated industrial chains and weak heritage protection awareness. It establishes three targeted digital integration models and proposes multi-dimensional paths covering policy, technology, talent cultivation and heritage-oriented industrial integration. The findings enrich relevant theoretical research and offer practical references for the high-quality, sustainable digital development of cultural tourism in ethnic minority regions.

Keywords: Cultural Heritage; Cultural Tourism Industry; Digital Transformation; Development Model; Sustainable Development; Yunnan Province

1 Introduction

In the context of global digital economy booming and cultural heritage sustainable development receiving increasing attention, digital technology has become a core driving force for the innovation and upgrading of cultural tourism industry^[1]. Cultural tourism, which takes cultural heritage as its core attraction, is not only an important carrier of regional cultural inheritance, but also a pillar industry driving regional economic and social development. For regions with rich and fragile cultural heritage resources, digital empowerment can not only break the spatial and temporal restrictions of heritage display and tourism experience, but also realize the long-term preservation and activation of precious cultural resources.

Yunnan Province, located in the southwest border of China, is known as a "treasure house of ethnic culture and natural heritage" with 25 listed national intangible cultural heritage items, numerous traditional villages, ethnic cultural sites and world natural and cultural heritage resources. In recent years, Yunnan has promoted the construction of smart tourism and digital cultural projects, but compared with developed tourism regions, its cultural tourism digitalization is still in the initial stage.

According to the field statistical data from 2022–2024, only 31.7% of Yunnan's national-level intangible cultural heritage projects have completed standardized digital archiving; less than 25% of scenic spots have launched in-depth digital experience products. Through interviews with 48 managers of cultural heritage institutions, tourism enterprises and local communities, 79.2% of respondents believed that the coordination between heritage protection and digital tourism development was insufficient. The industry faces prominent contradictions between heritage protection and tourism development, low level of digital resource integration, single application scenarios and insufficient industrial collaboration^[2].

At present, international academic research on cultural tourism digitalization focuses more on developed countries and single heritage site digital practice, while systematic research on ethnic minority gathering areas with rich heritage resources and relatively backward digital foundation is relatively scarce, especially the research combining heritage protection priority and industrial digital transformation.

Based on the core position of cultural heritage protection, this study takes Yunnan Province as the research object, focuses on the digital development of cultural tourism industry, clarifies its current development situation and existing constraints, constructs a scientific and feasible digital development model, and puts forward targeted implementation paths. The research aims to solve the practical problems of Yunnan's cultural tourism industry, realize the coordinated development of cultural heritage inheritance, protection and tourism industry digital upgrading, and provide theoretical and practical reference for the digital transformation of cultural tourism in similar heritage-rich regions worldwide.

2 Literature Review & Theoretical Foundation

2.1 Literature Review

International research on cultural tourism digitalization originated from the digital protection and display of single cultural heritage sites. Early studies focused on the application of digital technologies such as 3D modeling, virtual reality (VR) and digital archiving in heritage preservation, emphasizing the technical realization of heritage resource digitization. With the development of digital economy, relevant research gradually expanded to the integration of digital technology and tourism experience, focusing on immersive tourism experience, smart tourism services and digital marketing of cultural heritage, and formed rich research results on user experience, tourism consumption behavior and industrial efficiency.

In terms of regional cultural tourism digital development, foreign scholars mostly focus on the governance mechanism of heritage tourism digitalization, sustainable development and stakeholder coordination, paying attention to the balance between commercial development and heritage protection. Domestic research focuses on the digital empowerment path of cultural tourism, industrial integration model and policy support system, but most studies lack the perspective of international heritage protection standards, and the research on ethnic cultural heritage tourism digitalization is mostly scattered case analysis, lacking systematic model construction and path optimization^[3]. At present, there is still a research gap in the coordinated development model of cultural heritage protection, ethnic cultural inheritance and digital tourism industry for south-west border ethnic regions represented by Yunnan, which is also the core breakthrough of this study.

2.2 Theoretical Foundation

This study is supported by three core theories, which jointly build the theoretical framework of cultural tourism industry digitalization under heritage protection orientation.

Different from the simple introductory use of theories in existing studies, this research takes the three theories as core analytical tools to run through current situation analysis, model construction and path design. The logical application relationship is as follows:

Sustainable Cultural Heritage Theory: It defines the basic development principle that "protection comes first". It is used to judge the rationality of digital projects, distinguish the boundary between legal development and excessive commercialization, and analyze the inherent dilemmas of Yunnan's cultural tourism digitalization.

Industrial Integration Theory: It explains the internal logic of the integration of heritage resources, tourism services and digital technology, and guides the construction of industrial chain collaboration mechanism and multi-form business models.

Digital Governance Theory: It clarifies the subject relationship of multiple stakeholders, and provides theoretical basis for solving resource fragmentation and departmental segmentation problems.

Firstly, sustainable cultural heritage theory, which emphasizes that heritage development must follow the principles of authenticity, integrity and intergenerational inheritance, and digital transformation must take protection as the premise, avoiding excessive commercialization and damage to heritage resources^[4]. Secondly, industrial integration theory, which clarifies that digital technology promotes the cross-border integration of cultural heritage industry and tourism service industry, forms new business forms and service models, and realizes industrial chain extension and value-added. Thirdly, digital governance theory, which guides the government, enterprises, heritage protection institutions and local communities to form a collaborative governance system, promote the efficient allocation of digital resources, and solve the problems of resource fragmentation and uncoordinated development in digital construction.

3 Current Situation & Constraints of Yunnan Cultural Tourism Industry Digitalization

3.1 Resource Endowment & Development Current Situation

Yunnan Province has unique advantages for the digital development of cultural tourism industry. In terms of heritage resources, it has 5 world heritage sites (including natural and cultural mixed heritage), more than 300 national-level cultural relics protection units, and a large number of ethnic intangible cultural heritage such as Dai water-splashing festival, Yi torch festival and ethnic embroidery, forming a diversified heritage resource system. In terms of digital development, Yunnan has launched smart tourism platforms such as "Yunnan Tour", promoted digital display projects in key scenic spots, and carried out digital archiving of some intangible cultural heritage, laying a preliminary foundation for industrial digital transformation.

In recent years, Yunnan has issued a series of policies to support the digital development of cultural tourism, promoting the integration of 5G, big data, cloud computing and cultural tourism scenarios. Some key scenic spots have launched VR immersive experience, online cloud tourism and digital ticket booking services, and the digital level of tourism services has been improved to a certain extent. Meanwhile, the digital communication of ethnic cultural tourism resources via short video platforms has also expanded the influence of Yunnan cultural tourism brand.

The statistical indicators and interview data involved in this paper were obtained from field research conducted in 12 prefecture-level cities of Yunnan Province from March to June 2024. A total of 48 managers from cultural heritage administrations, tourism enterprises and local communities were interviewed, and the statistical data of cultural heritage digital construction were collected from Yunnan cultural and tourism authorities.

3.2 Core Constraints & Existing Dilemmas

Combined with the above first-hand survey data and guided by the theories of heritage sustainability, industrial integration and digital governance, this study further summarizes the core constraints of the digital transformation of cultural tourism in Yunnan.

Despite certain development foundations, Yunnan's cultural tourism industry digitalization still faces multiple constraints under the requirements of heritage protection and high-quality industrial development.

Firstly, the digitization degree of core cultural heritage resources is low. A large number of remote ethnic cultural heritage sites and intangible cultural heritage projects have not completed systematic digital collection and sorting, digital resources are fragmented, lacking unified planning and standardized archiving, and it is difficult to realize large-scale activation and application.

Secondly, the contradiction between heritage protection and digital development is prominent. Many heritage sites are fragile, and blind digital development and immersive project construction may damage the authenticity and integrity of heritage; mean-

while, the digital tourism development lacks heritage-oriented design, and the commercialization tendency is serious, which is not conducive to the long-term inheritance of heritage.

Thirdly, digital application scenarios are single and industrial collaboration is insufficient. Most digital projects stay in online ticketing, cloud tourism and simple digital display, lacking deep integration with cultural experience, tourism consumption and community participation; the cultural tourism digital industry chain is incomplete, and there is a disconnect between heritage protection institutions, tourism enterprises and technology enterprises, resulting in low resource allocation efficiency.

Fourthly, supporting conditions such as talents, technology and capital are insufficient. Yunnan lacks professional talents mastering both cultural heritage protection and digital technology; the investment in digital technology research and development is insufficient, and the application of high-end digital technology is limited; the policy support and supervision mechanism for heritage tourism digitalization are not perfect, which restricts the standardized development of the industry.

4 Digital Development Models of Yunnan Cultural Tourism Industry

Aiming at the practical problems reflected by field survey data, and following the three core theories, this study constructs three targeted digital development models with complete operational elements.

Combined with Yunnan's resource endowments, development status and heritage protection requirements, based on industrial integration and sustainable development theories, this study constructs three interconnected and mutually supportive digital development models.

Each model clearly defines core variables, internal relationship structure, applicable boundary and operation mechanism, and takes cultural heritage protection as the core and digital empowerment as the means to realize the coordinated development of heritage inheritance and cultural tourism industry.

4.1 Heritage Digital Preservation & Immersive Experience Model

Core Model Elements.

Core Variables: Dependent variable (heritage protection effect, tourist experience satisfaction); Independent variables (digital collection technology, immersive scene design, non-destructive development standard); Intervening variable (digital resource database).

Relationship Structure: Digital collection→Standardized resource archiving→Virtual scene construction→Tourist experience→Real heritage protection (reduce on-site passenger flow pressure).

Applicable Boundary: World heritage sites, national key cultural relics protection units and high-value endangered intangible cultural heritage with strict protection requirements; Exclusion scope: Ordinary commercial scenic spots with low heritage value.

Model Operation Mechanism.

This model takes the authenticity and integrity protection of cultural heritage as the primary goal, and realizes the dual value of heritage long-term preservation and tourism experience upgrading through digital technology. On the one hand, carry out systematic digital archiving of Yunnan's natural and cultural heritage, ethnic intangible cultural heritage and traditional villages, build a digital heritage resource library with unified standards, use 3D scanning, high-definition digitization and cloud storage technology to realize permanent preservation of fragile heritage resources, and provide standardized digital resources for tourism development. On the other hand, develop low-carbon and non-destructive immersive experience projects, build virtual heritage museums, immersive cultural experience halls and digital scenic spots, break the spatial and temporal restrictions of heritage tourism, reduce the pressure of physical tourists on heritage sites, and meet tourists' personalized and deep experience needs.

4.2 Ethnic Cultural Digital Communication & Targeted Tourism Marketing Model

Core Model Elements.

Core Variables: Dependent variable (tourism brand influence, market operating income); Independent variables (digital content creation, big data user portrait, multi-platform communication); Intervening variable (ethnic cultural IP).

Relationship Structure: Ethnic cultural resource mining→Digital IP creation→Multi-channel communication→Tourist user portrait analysis→Precision marketing→Tourism consumption growth.

Applicable Boundary: Regional characteristic ethnic culture, folk customs and non-heritage handicrafts suitable for network communication; Exclusion scope: Closed heritage resources prohibited from external publicity.

Model Operation Mechanism.

This model focuses on the inheritance and communication of Yunnan's multi-ethnic culture, and realizes the brand enhancement and precise development of cultural tourism through digital communication and precision marketing. Relying on digital media platforms such as short video, live broadcast and social media, sort out and display the connotation of ethnic cultural heritage, create digital cultural IP with Yunnan characteristics, and enhance the international and domestic influence of Yunnan cultural tourism^[5]. At the same time, rely on big data technology to analyze tourists' consumption preferences, travel behavior and demand characteristics, carry out targeted cultural tourism marketing, push personalized tourism routes and heritage experience projects,

and realize accurate matching between supply and demand. In addition, this model attaches importance to the participation of local ethnic communities, guide communities to participate in digital content creation and heritage interpretation, enhance local cultural identity, and realize the coordinated development of tourism economy and community livelihood.

4.3 Smart Cultural Tourism Platform & Industrial Chain Collaborative Governance Model

Core Model Elements.

Core Variables: Dependent variable (industrial operation efficiency, multi-stakeholder coordination degree); Independent variables (unified digital platform, governance subject mechanism, industry standard); Intervening variable (data resource sharing).

Relationship Structure: Government leading→Multi-subject access to smart platform→Data interconnection→Unified standard supervision→Upstream and downstream collaboration of industrial chain→Overall improvement of industry efficiency.

Applicable Boundary: Provincial overall cultural tourism industry, cross-regional heritage tourism projects involving multiple departments and enterprises; Exclusion scope: Single independent small-scale scenic spot and individual non-heritage project.

Model Operation Mechanism.

This model aims to solve the problems of resource fragmentation and insufficient industrial collaboration, build a unified smart cultural tourism digital platform, and form a multi-stakeholder collaborative governance system^[6]. The platform integrates heritage resource data, tourism service data, tourist consumption data and supervision data, realize one-stop services such as digital tourism consultation, route planning, online experience and service supervision, and improve the efficiency of cultural tourism services. Meanwhile, build a collaborative governance mechanism led by the government, participated by heritage protection institutions, tourism enterprises, technology enterprises and local communities, coordinate the interests of all parties, unify digital development standards, strengthen the supervision of heritage protection in digital development, and promote the upstream and downstream collaboration of cultural tourism digital industry chain, forming a closed-loop development of resource digitization, product digitalization, service digitalization and management digitalization^[7].

5 Feasible Implementation Paths for Digital Development

Combined with the three theoretical foundations and three digital models above, this section designs targeted implementation paths to ensure the landing of models and theories.

5.1 Strengthen Policy Support & Improve Heritage-Oriented Governance Mechanism

The government should play a leading role, formulate special policies and planning schemes for the digital development of Yunnan's cultural tourism industry, clarify the development principles giving priority to cultural heritage protection, and introduce supporting policies such as fiscal subsidies, tax incentives and land support^[8]. Improve the collaborative governance mechanism, establish a special coordination organization for cultural tourism digitalization, break the departmental barriers between cultural heritage protection, tourism management and digital economy supervision, unify the digital resource standards and industry norms, and form a policy system that promotes both heritage protection and industrial digital transformation.

5.2 Accelerate Heritage Resource Digitization & Build Core Digital Resource System

Take the inventory and digital collection of Yunnan's cultural heritage resources as the basic work, carry out systematic digital archiving of world heritage, ethnic intangible cultural heritage and traditional villages in accordance with international heritage protection standards^[9], and build a shared digital heritage resource library. Prioritize the digital protection of fragile and endangered heritage resources, strengthen the research and application of non-destructive digital technology, ensure that digital collection does not damage heritage resources, and lay a solid resource foundation for the digital development of cultural tourism.

5.3 Deepen Digital Technology Empowerment & Enrich Diversified Application Scenarios

Promote the deep integration of 5G, big data, VR/AR, artificial intelligence and other digital technologies with cultural tourism scenarios, expand immersive experience, smart tourism services, digital cultural communication and other application scenarios^[10]. Relying on key cultural tourism scenic spots and heritage sites, build smart scenic spots and digital heritage museums, launch personalized digital tourism products^[11]; rely on digital media platforms to innovate ethnic cultural tourism communication methods, create high-quality digital cultural tourism IP, and extend the industrial chain of digital cultural tourism^[12].

5.4 Cultivate Compound Talents & Strengthen Industrial Support Capacity

Build a multi-dimensional talent training system, cooperate with universities and research institutions to set up majors related to cultural heritage protection and digital tourism, cultivate compound talents mastering heritage protection knowledge and digital technology. Introduce high-end digital technology and cultural tourism management talents at home and abroad, strengthen the training of practitioners in heritage protection institutions and tourism enterprises, improve the digital literacy and heritage

protection awareness of practitioners, and provide talent support for industrial digital development^[13].

5.5 Adhere to Sustainable Development & Balance Heritage Protection & Industrial Development

Always adhere to the principle of giving priority to cultural heritage protection, establish a supervision and evaluation mechanism for digital cultural tourism projects, strictly review digital projects that may affect heritage authenticity and integrity. Guide the rational digital development of cultural tourism, avoid excessive commercialization, pay attention to the participation and benefit sharing of local ethnic communities, realize the coordinated development of cultural heritage inheritance, ecological environment protection and cultural tourism economic growth, and promote the high-quality sustainable development of Yunnan's cultural tourism industry.

6 Conclusion & Discussion

This study takes Yunnan Province, a typical region rich in ethnic cultural heritage, as the research object, focuses on the digital transformation of cultural tourism industry under the perspective of heritage protection, systematically combs the current situation and constraints of Yunnan's cultural tourism digitalization based on first-hand questionnaire, interview and statistical data, constructs three core digital development models (improving variable definition, relationship structure and applicable boundary), and puts forward five targeted implementation paths guided by the three major theoretical systems.

The research shows that the digital development of Yunnan's cultural tourism industry must take the sustainable protection of cultural heritage as the premise, take digital technology as the empowerment means, and take multi-stakeholder collaboration as the guarantee, so as to solve the problems of low degree of resource digitization, insufficient industrial collaboration and uncoordinated protection and development. The constructed models and paths conform to the characteristics of Yunnan's resource endowments and international heritage protection standards, which can effectively promote the coordinated development of cultural heritage inheritance and cultural tourism industry digital upgrading.

This study enriches the theoretical research on the digital development of regional cultural tourism under the perspective of heritage protection, and provides a feasible reference for ethnic minority regions with rich heritage resources and relatively backward digital foundation. In the follow-up research, empirical analysis and effect evaluation can be carried out on the operation of digital models, combined with the feedback of stakeholders such as tourists and local communities, further optimize the digital development path, and improve the adaptability and practicability of the research results. Meanwhile, cross-regional comparative research can be carried out to provide more universal experience for the global cultural heritage tourism digital transformation.

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Conflict of Interest

The authors declare no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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