

Opportunities, Challenges and Optimization Paths for Digital Development of Ethnic Sports Tourism in Yunnan

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Abstract: Using literature review, field investigation, and logical analysis methods, this study systematically analyzes the opportunities and challenges faced by the digital development of ethnic sports tourism in Yunnan and proposes optimization pathways. The opportunities include: development opportunities driven by policy support, innovation opportunities enabled by technological advancement, and expansion opportunities stemming from geographical advantages. The challenges involve: insufficient accumulation of core elements, urgent need to upgrade digital product supply, and lack of breakthroughs in operational model innovation. The proposed optimization pathways are: optimizing the allocation of element resources to consolidate the development foundation; advancing the deep integration of technology to enhance the supply quality of ethnic sports tourism products; and establishing digital service platforms to innovate business models for ethnic sports tourism.

Keywords: Yunnan; Ethnic sports; Sports tourism; Digitization

1. Introduction

Under the national "14th Five-Year Plan" for digital economy development and the construction of Yunnan Province's Digital Economy Innovation Pilot Zone, digital transformation has emerged as a crucial engine driving high-quality economic development in Yunnan. As one of China's most ethnoculturally diverse provinces hosting 25 ethnic minorities, Yunnan preserves distinctive traditional sports such as Dai bamboo-ball games, Yi wrestling, and Bai horse racing. Beyond showcasing athletic prowess, these ethnic sports act as crucial vehicles for preserving cultural heritage and fostering ethnic unity. The integration of ethnic sports with tourism not only aligns with market economy development but also facilitates innovative inheritance of Yunnan's exceptional ethnic cultural heritage 1.

Ethnic sports tourism, characterized by its amalgamation of regional features and ethnic cultural elements, has evolved into a comprehensive experience encompassing fitness, entertainment, and participatory activities, establishing itself as a pivotal direction in modern tourism development 2. Rooted in ethnic sports resources, this tourism model promotes physical and mental well-being through sports competitions, recreational activities, and health rehabilitation programs 3. As an essential component of sports tourism, its deep integration with modern digital technologies significantly propels industrial transformation and upgrading towards high-quality development 4.

Current research on ethnic sports tourism predominantly focuses on traditional domains such as resource exploitation, cultural inheritance, and industrial development, while studies on its digital transformation remain inadequate. Particularly in the context of rapid technological advancements including 5G, big data, and artificial intelligence, there exists substantial research potential regarding how digital innovation can reshape development models and enhance industrial competitiveness. Digital transformation enables innovative cultural presentation through VR/AR technologies to elevate tourist experiences, facilitates market demand analysis via big data to optimize product offerings, and improves operational efficiency through intelligent platform construction to achieve industrial upgrading.

Therefore, advancing the digital development of ethnic sports tourism represents both an inevitable response to contemporary trends and a strategic solution to developmental bottlenecks, constituting a crucial agenda for Yunnan's future progress.

2. Development Opportunities for Digital Transformation in Yunnan's Ethnic Sports Tourism.

Based on relevant research findings 5678 and field investigations into Yunnan's ethnic sports tourism

industry, this study identifies four key opportunities for its digital transformation: policy support, technological advancement, market demand, and geographical advantages.

2.1. Development Opportunities from Policy Support

Firstly, both national and provincial authorities have introduced a series of policy measures supporting ethnic sports tourism development, establishing favorable institutional conditions for industrial digital transformation. The 14th Five-Year Plan for Cultural and Tourism Development explicitly advocates deepening the integration of traditional ethnic sports with cultural tourism while supporting ethnic minority regions in developing characteristic cultural tourism industries⁹. In 2024, Yunnan pioneered nationwide by issuing the Guidelines on Promoting Ethnic Exchanges and Solidarity through Sports to Build a Shared Spiritual Homeland for the Chinese Nation, encouraging localities to organize diverse traditional sports activities and innovate "Sports+" development models to cultivate distinctive sports-cultural products¹⁰. Provincial regulations such as the Implementation Plan for National Fitness and Regulations on the Construction of Ethnic Unity Progress Demonstration Zones explicitly require revitalizing traditional ethnic sports and promoting their integration with modern information technologies. In future developmental planning, digital transformation of ethnic sports tourism will inevitably become a crucial consideration in advancing Yunnan's tourism-cultural-sports industry through technological means.

Secondly, during the construction of the National Digital Economy Innovation and Development Pilot Zone, Yunnan has proposed building a world-class "Healthy Living Destination" by developing new cultural tourism formats and models through digital innovation. This strategic positioning provides critical policy support for the digital advancement of Yunnan's ethnic sports tourism. Simultaneously, as a frontier ethnic region, Yunnan's unique ethnic sports cultural resources are poised for enhanced development through digital empowerment under national initiatives like the Belt and Road Initiative and the South Asia-Southeast Asia Radiation Center strategy.

2.2. Innovation Opportunities Brought by Technological Progress

The rapid development of digital technology has brought revolutionary innovation opportunities to Yunnan's ethnic sports tourism industry.

First, technologies such as 5G, big data, and artificial intelligence are developing rapidly. Yunnan has built over 100,000 5G base stations, achieving full 5G network coverage in main urban areas of prefectures and cities and key scenic spots, providing support for high-bandwidth applications such as ethnic sports event broadcasts and immersive experiences. High-tech enterprises are participating, such as Huawei, which builds infrastructure like computing centers and 5G/5G-A networks based on independent innovative root technologies like Kunpeng and Ascend¹¹. Meanwhile, the completion of Yunnan's provincial big data center enables precise analysis of tourist behaviors and consumption preferences, providing data support for personalized customization and precision marketing of ethnic sports tourism projects. The application of artificial intelligence technology in intelligent tour guides and intelligent translation effectively solves the challenge of multilingual services in ethnic minority areas.

Second, digital experience technologies are increasingly prevalent in the tourism sector. In Xishuangbanna Dai Autonomous Prefecture, VR technology has recreated traditional Dai rattan ball competition scenes, allowing tourists to experience unique Dai sports culture through VR devices. In Dali Bai Autonomous Prefecture, AR technology is used to display caravan culture; tourists can see virtual caravan merchants and historical scene recreations by scanning specific markers with their phones. The application of these technologies not only enriches experience methods but also opens new pathways for the protection and inheritance of ethnic sports culture.

Third, intelligent terminal devices are becoming more widespread with improved functionality. Yunnan's internet user population has reached 32.891 million, with the internet penetration rate exceeding 70% for the first time, reaching 70.4%; the province has been selected as one of the first pilot provinces for national digital transformation standardization. **Error! Reference source not found.** Through mobile applications, tourists can easily obtain information about ethnic sports events, book experience projects, and share travel experiences. The development of wearable devices also provides convenience for the collection and analysis of sports data.

2.3. Expansion Opportunities Brought by Geographic Advantages

First, rich ethnic sports cultural resources. In terms of ethnic sports cultural resources, Yunnan is home to 25 indigenous ethnic minorities, each preserving distinctive traditional sports events. For example, rattan ball and throw-bag of the Dai people, horse racing and wrestling of the Yi people, ethnic archery of the Hani people, and mountain competitions of the Bai people - these activities are not only displays of athletic competition but also carriers of ethnic culture. Meanwhile, as of 2023, Yunnan Province has announced 686 provincial-level representative items of intangible cultural heritage, with ethnic sports-related projects mainly concentrated in the category of "traditional sports, recreation, and acrobatics"¹³. These rich ethnic sports cultural resources provide a solid content foundation for digital development.

Second, Yunnan's unique natural geographical environment and climatic conditions provide natural advantages for the development of ethnic sports tourism. In terms of topography, the diverse landscape from the Hengduan Mountains to plateau lakes has nurtured rich ethnic sports activities: bamboo rafting and stream trekking in the Nujiang Grand Canyon, Tibetan horsemanship and hiking in Shangri-La, and traditional dragon boat racing on plateau lakes such as Fuxian Lake and Erhai Lake. In terms of climate, Yunnan combines the characteristics of monsoon climate, low-latitude climate, and plateau climate, mainly manifested as small seasonal temperature differences, large daily temperature differences, and distinct dry and wet seasons¹⁴. With no severe cold in winter and no extreme heat in summer, especially Kunming's "spring-like" climate year-round, it ensures that ethnic sports tourism activities can be conducted throughout the year. These unique natural endowments have laid a solid foundation for Yunnan to develop diversified, all-season ethnic sports tourism projects.

3. Challenges in the Digital Development of Yunnan's Ethnic Sports Tourism

3.1. Insufficient Accumulation of Core Elements

Yunnan's ethnic sports tourism industry faces severe challenges in its digital transformation due to insufficient accumulation of core elements. Whether in terms of technological innovation capabilities, digital infrastructure construction, or digital talent reserves, there are significant gaps compared to the needs of digital development. These shortcomings in core elements constrain both the speed and quality of the digital transformation of the ethnic sports tourism industry.

First, weak technological innovation and application capabilities. In recent years, although various regions in Yunnan have actively introduced tourism enterprises to participate in ethnic sports tourism development, these enterprises generally have a low degree of digitalization. Taking ethnic sports tourism enterprises in Shilin County and Lijiang City as examples, most enterprises remain at the basic informatization stage of building corporate websites and mini-programs, and have not yet been able to utilize big data, artificial intelligence, and other technologies to achieve full-chain digitalization in product research and development, production, and operations.

Second, unbalanced digital infrastructure construction. Yunnan Province has complex terrain, with mountains and plateaus covering a total area of 370,000 square kilometers, accounting for 94% of the

province's total area¹⁵. This geographical characteristic poses enormous challenges to digital infrastructure construction. In remote mountainous areas, communication network coverage is severely insufficient due to terrain barriers and dispersed populations. Although cities like the provincial capital Kunming have achieved full 5G network coverage, in remote prefectures and counties such as Nujiang and Diqing, there are even situations where 4G signals are not fully covered. These regional differences in network infrastructure directly affect the balance and accessibility of digital services for ethnic sports tourism.

Third, scarcity of interdisciplinary talents. The digital development of Yunnan's ethnic sports tourism requires interdisciplinary talents who both understand ethnic sports culture and are proficient in digital technology. However, the talent cultivation systems in relevant institutions are not yet perfect, enterprise training mechanisms are incomplete, and collaborative education models among government, universities, and enterprises have not been formed. At the same time, most inheritors of ethnic sports culture are older, with limited acceptance and ability to use digital technology. They excel at traditional methods of teaching sports skills but face obvious barriers when it comes to using digital technology for cultural dissemination and teaching. Additionally, constrained by economic development levels and regional conditions, Yunnan faces significant difficulties in attracting and retaining high-level digital talents, resulting in a severe shortage in the talent reserves supporting the digital development of ethnic sports tourism.

3.2. Digital Product Supply Urgently Needs Upgrading

In the digital era, there is a significant gap between the supply quality of Yunnan's ethnic sports tourism products and the growing demands of tourists. Existing digital products struggle to meet the market demand for high-quality, personalized ethnic sports tourism products in terms of technology application level, service experience, and cultural presentation methods.

First, the product supply level urgently needs improvement. Currently, Yunnan's ethnic sports tourism products mainly focus on festival experience activities such as the Dai Water-Splashing Festival and Yi Torch Festival, observation of traditional sports events of the Lisu and Wa ethnic groups, and traditional ethnic minority sports and fitness activities. However, these products have not formed effective connections with the digital economy, featuring low levels of digital technology application and unreasonable configuration of product elements. For example, ethnic sports tourism scenic areas in Xishuangbanna and Dehong still face problems such as low degrees of digital experience and insufficient integration of the industrial chain in the development of smart tourism, making it difficult to meet tourists' demands for digital and immersive experiences.

Second, with the development of digital technology, living experience methods based on holographic, immersive, and multi-dimensional approaches have become important pathways and entirely new directions for tourism resources themselves and industrial development¹⁶. Constrained by technological levels, the digital presentation methods of Yunnan's traditional ethnic sports events are monotonous, making it difficult to achieve innovative display and dissemination of ethnic sports culture through technologies such as VR and AR, which limits the quality improvement and efficiency enhancement of product supply.

3.3. Operational Model Innovation Has Yet to Breakthrough

First, enterprises lack digital operational capabilities. Small and medium-sized enterprises supporting Yunnan's ethnic sports tourism industry are slow to undergo digital transformation, making it difficult for them to respond quickly to changing market demands. Although some enterprises have begun to attempt platform-based operations, most still remain at the stage of providing basic tourism services, with notably insufficient digital capabilities in tourist demand analysis and precision marketing. For example, ethnic sports tourism enterprises in Diqing and Nujiang lack data analysis capabilities, making it impossible to accurately

grasp the market acceptance of different ethnic sports projects, resulting in a disconnect between product development and market demand.

Second, cross-industry integration development is insufficient. The digital integration of Yunnan's ethnic sports tourism with cultural creation, health and wellness, education, and other industries is inadequate, making it difficult to form new models of "sports+" multi-business integrated development. Progress has been particularly slow in the development of ethnic sports IP and derivative innovation supported by digital technology, constraining the expansion of new spaces for industrial development.

4. Optimization Pathways for Digital Development of Yunnan Ethnic Sports Tourism

4.1. Optimizing Resource Allocation to Strengthen the Development Foundation

First, enhance technological innovation capabilities. One approach is to increase funding for scientific research and development, encouraging ethnic sports tourism enterprises to actively implement digital technology innovations. For example, establish a special fund for the digital development of Yunnan ethnic sports tourism, providing subsidies for enterprise investments in VR/AR technology applications and digital preservation of ethnic sports culture. Another approach is to establish technology innovation platforms, such as creating ethnic sports tourism digital innovation laboratories based on Yunnan's university resources and high-tech enterprises to provide technical support and innovation guidance for relevant companies.

Second, strengthen digital infrastructure construction. Digital infrastructure provides the necessary foundation for the digital economy to drive the development of the ethnic sports tourism industry. In terms of hardware construction, accelerate the development of new infrastructure such as 5G networks and Internet of Things in Yunnan's ethnic minority regions. Prioritize support for remote ethnic regions like Nujiang, Diqing, and Xishuangbanna to improve network coverage and break down digital barriers. For software construction, build digital service systems such as a Yunnan ethnic sports cultural resource database, tourist behavior analysis system, and intelligent decision support system. For instance, establish a digital archive of traditional ethnic sports projects to achieve digital preservation and inheritance of valuable sports cultural resources.

Third, improve the talent development system. One method is to innovate talent cultivation models, supporting Yunnan's higher education institutions to offer programs related to ethnic sports tourism digitalization, cultivating interdisciplinary talents who understand both ethnic sports culture and digital technology. Another method is to conduct digital skills training for ethnic sports inheritors. These training programs should be designed according to the characteristics of inheritors, including basic digital skills, new media applications, and digital teaching methods; adopt "hands-on" teaching approaches to lower learning barriers; establish long-term training mechanisms to ensure continuity; and designate exemplary leaders to serve as role models. Additionally, implement talent attraction plans, using preferential policies such as housing subsidies and research funding to attract high-end digital technology talents to Yunnan.

4.2. Advancing Deep Technological Integration to Enhance the Quality of Ethnic Sports Tourism Products

First, develop immersive ethnic sports experience products. During the development of modern tourism, tourists' demand for "experiences" has reached unprecedented levels¹⁷ Leveraging VR/AR and other digital technologies, develop digitalized experiential scenarios in ethnic cultural tourism core areas such as Xishuangbanna, Dali, and Lijiang. For example, establish virtual dragon boat racing experience halls where tourists can simulate participation in dragon boat races through VR equipment; develop Yi wrestling interactive experience systems allowing tourists to learn Yi wrestling techniques and etiquette in a digital environment. These digital means enhance tourists' immersive experience of ethnic minority sports culture.

Second, construct intelligent ethnic sports event systems. For various traditional ethnic sports events in Yunnan, develop intelligent event management systems to achieve end-to-end digital management of event information release, registration, venue booking, and results compilation. Simultaneously employ 5G+4K ultra-high-definition live streaming, AI real-time commentary, and other technologies to enhance the viewability and communicative power of ethnic sports events. Focus on creating renowned ethnic sports IP events such as Shilin Yi Wrestling and the Dali March Fair Horse Racing Festival.

Third, create digital ethnic sports teaching products. Develop digital courses and training systems for traditional sports projects of various ethnic minorities. For example, develop apps for breaking down movements in ethnic martial arts such as Dai Boxing and Shilin Yi Wrestling, equipped with AI recognition and correction functions; produce VR teaching courses for traditional ethnic sports projects, facilitating zero-threshold learning experiences for tourists. Digital technology thus aids in the inheritance and promotion of ethnic sports culture.

4.3. Building Digital Service Platforms to Innovate Ethnic Sports Tourism Business Models

First, create an ethnic sports tourism digital operations platform. Build a digital operations platform covering all 16 prefectures and cities in Yunnan to assist small and medium-sized ethnic sports tourism enterprises in digital transformation. This involves: 1) Integrating individually operated traditional ethnic sports projects, such as small contractors for Dai Water Splashing Festival dragon boat races, Yi wrestling clubs, and Bai martial arts training institutions, enabling resource sharing and business collaboration through the platform; 2) Providing standardized solutions for ethnic sports event operations, traditional sports project training, and ethnic sports tourism route design, reducing the cost of digital transformation.

Second, develop an ethnic sports tourism big data center. Integrate various data resources in Yunnan's ethnic sports tourism field to construct an integrated data service platform. This involves: 1) Establishing an ethnic sports resource database to collect basic data on traditional sports projects and events from all 26 ethnic minorities; 2) Developing a tourism consumption big data system to analyze tourist profiles, consumption preferences, travel characteristics, and other data.

Third, construct an ethnic sports tourism smart service platform. Based on the "One Mobile Phone to Tour Yunnan" initiative, develop an ethnic sports tourism smart service system. This includes: 1) Providing "one-stop" tourism services for online processing of ethnic sports event ticketing, venue booking, guide reservations, and more; 2) Creating an intelligent guide system to showcase ethnic sports cultural connotations through AR technology; 3) Developing an intelligent management system for smart operations of scenic areas, venues, and events; 4) Building an emergency command platform to enhance safety capabilities for ethnic sports tourism.

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