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Exploring the Path of Digital Development for Premium Red Tourism Routes: A Case Study of Xinjiang

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Abstract: In the contemporary context where the national cultural digital-ization strategy is being fully advanced, the digital transformation of red tourism has become an important path for inheriting revolutionary spirits, boosting the integration of culture and tourism, and empowering regional economies. As a core area of the Silk Road Economic Belt, Xinjiang boasts profound red-cultural resources, yet its digital-development level remains relatively backward. It is urgent to explore a digital-development pathway for premium red-tourism routes that features both regional characteristics and technical appropriateness. In view of this, this paper conducts an in-depth analysis of paths for the digital development of premium red-tourism routes, aiming to provide references for promoting the digital development of Xinjiang's tourism industry.

Keywords: Red tourism; Premium routes; Digital development

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1. Introduction

As a thematic-tourism form with revolutionary-historical heritage and spiritual-cultural resources as its core attractions, red tourism undertakes multiple functions including patriotic-education, inheritance of revolutionary traditions and construction of cultural identity [1]. *Opinions on Implementing the Project for the Protection and Utilization of Revolutionary Cultural Relics (2018-2022)* clearly put forward the need to "expand approaches for utilizing revolutionary cultural relics and boost the revitalization of old revolutionary base areas". In May 2022, the General Office of the CPC Central Committee and the General Office of the State Council issued *Opinions on Promoting the Implementation of the National Cultural Digitalization Strategy* (hereinafter referred to as the *Opinions*), which set the strategic goal that "by 2035, a national cultural big-data system with physical distribution, logical correlation, rapid linking, efficient searching, comprehensive sharing and focused integration shall be built". This top-level design points out directions for the digital protection, development and communication of red-cultural resources, and also provides policy

support and institutional guarantees for the digital transformation of red tourism [2].

The red-tourism market is thriving in the new era. In 2023, national red-tourism arrivals exceeded 1.4 billion person-times, and the cultural value and social benefits of red culture-and-tourism are increasingly prominent. As the core area of the Silk Road Economic Belt, Xinjiang preserves abundant red-cultural relics. It has three national-level premium red-tourism routes: "Revolutionary Memories · Footprints in Xinjiang", "Patriotism and Border-Defending · Youth Without Regrets", and "Land Reclamation and Border Guarding · Red Corps". Nevertheless, affected by multiple factors, the digital development of premium red-tourism routes in Xinjiang progresses slowly and lags behind inland regions. Against such a backdrop, exploring effective digital-development paths based on the development status of Xinjiang's premium red-tourism routes bears great practical significance for promoting the development of the tourism industry in Xinjiang.

2. Current status and practical problems in the digital construction of Xinjiang's premium red-tourism routes

2.1. Overview of red resources and premium routes

Xinjiang's red resources bear distinct borderland features and can be categorized into revolutionary-site type, land-reclamation-and-border-guarding type, national-defense-and-border-defending type, and ethnic-unity type. Revolutionary-site relics represented by the Memorial Hall of the Eighth-Route-Army Office in Xinjiang and Urumqi Martyrs Cemetery witness the struggles of Communists in Xinjiang during the War of Resistance against Japanese Aggression. The spirit of the Production and Construction Corps is fully embodied by the Corps Reclamation Museum and the 359th Brigade Land-Reclamation Memorial Hall. Xiaobaiyang Sentry Post and Karamay No. 1 Well fall into national-defense-and-border-guarding cultural relics, recording the history of border defense and industrial construction. Physical materials left by people of all ethnic groups represented by Kurban Tulum for jointly building borderlands belong to ethnic-unity-type cultural relics, which are of great value for community-consciousness education [3].

The three premium routes constitute the main context of Xinjiang red tourism. Centered on Urumqi, "Revolutionary Memories · Footprints in Xinjiang" boasts concentrated revolutionary sites, yet museums vary widely in digital-construction levels and there exists no unified digital-service route. Stretching thousands of kilometers across northern Xinjiang, "Patriotism and Border-Defending · Youth Without Regrets" features scattered sites; digital technologies are urgently needed to remove experience restrictions brought by geographical distances. Connecting Production-and-Construction-Corps museums across northern and southern Xinjiang, "Land Reclamation and Border Guarding · Red Corps" covers a large spatial span and calls for digital means to realize cross-regional resource linkage. Each scenic spot operates independently, and overall digital cooperation for premium routes advances at a slow pace.

2.2. Gradient pattern of digital construction

Digital presentation of red-tourism venues in Xinjiang falls into three tiers. The first tier covers immersive-experience-oriented venues represented by Xinjiang Uygur Autonomous Region Museum and the Corps Reclamation Museum. They carry out 3D scanning of cultural relics, 720-degree VR panoramas, AI-powered commentary, and other construction work, establishing a complete chain of resource collection, database building, and interactive exhibition. They enjoy high online access volume and have entered the stage of digital-intelligent integration development. The second tier consists of interaction-upgraded venues.

Venues such as the Memorial Hall of the Eighth-Route-Army Office in Xinjiang and the General Detachment of the West-Route-Army Memorial Hall launch VR cloud exhibition halls, electronic sand tables and other facilities with basic interactive-exhibition capabilities. However, inter-museum data remains disconnected and resource-sharing mechanisms are absent. The third tier refers to lightweight-supplemented venues, mostly distributed in border counties and prefecture-level grassroots areas. Lighthouse Educated-Youth Museum and Xinjiang Xinhui Red-Memory Museum are only equipped with scan-code audio guides, lacking 3D cultural-relic databases and independent online exhibition halls, with very weak digital foundations. There exists a prominent digital gap between leading venues and grassroots sites [4].

2.3. Structural difficulties encountered in digital transformation

First, the absence of top-level planning gives rise to prominent data silos [5]. Although digital development of Xinjiang red tourism has been incorporated into multiple broader culture-and-tourism development plans and is being actively promoted, no special dedicated plan for red-tourism digitalization has been issued. Each venue carries out construction separately with inconsistent data formats and technical standards, and closed system interfaces. Databases for sites along one single premium route are isolated from one another. No unified digital-service entrance is available for the three premium routes, making it hard for tourists to obtain integrated digital guides for the whole route. Compared with the regional-collaborative-development mode of the Yangtze-River Delta and Beijing-Tianjin-Hebei regions, cross-prefecture, cross-Corps and cross-culture-an d-tourism-cultural-relic-department coordination mechanisms in Xinjiang remain imperfect, which may easily cause duplicated construction and raise difficulties in resource integration.

Second, technology and culture are misplaced, leading to formalistic construction [6]. Some venues one-sidedly pursue the deployment of VR, AR and other technical equipment, equating technical hardware with digital-transformation outcomes while ignoring in-depth excavation of red-cultural connotations. Certain digital products simply migrate offline exhibition boards onto online platforms, adopting only chronicle-style superficial narration without in-depth interpretation of revolutionary figures and historical contexts. Technological spectacles overshadow spiritual core. As a result, audiences gain rich sensory experiences yet can hardly generate emotional resonance.

Third, communication efficiency is weak and user-feedback iteration mechanisms are missing [7]. Many VR cloud exhibition halls suffer low access traffic after launch, and online digital resources are underutilized. Online content continues the one-way indoctrination mode, with insufficient creative content adapted for new-media communication and young-generation groups. The vast majority of digital platforms lack user-feedback channels. Once launched, platforms are statically maintained without continuous content optimization driven by user demands. Meanwhile, most digital products only provide Chinese-language versions, lacking ethnic-minority-language adaptation, which fails to fit communication realities in multi-ethnic regions.

Fourth, regional particularities amplify the digital divide [8]. Xinjiang boasts vast territory. Some red sites are located in border areas with limited network-infrastructure conditions and high equipment-operation-an d-maintenance costs. Some national-defense-related red resources are subject to confidentiality regulations, imposing institutional restrictions on digital collection and public display. Grassroots venues generally face shortages of funds and digital-specialized talent. Mature models from leading venues can hardly be directly replicated for remote sites, further widening gaps in digital-development levels.

3. Practical pathways for digital development of Xinjiang's premium red-tourism routes

3.1. Improve top-level design and build cross-departmental coordination mechanisms

Digitalization of premium red-tourism routes constitutes a systematic project, and fragmented construction cannot unlock the overall value of routes [9]. Led by the Department of Culture and Tourism of Xinjiang Uygur Autonomous Region, a special working group shall be formed together with the Publicity Department, Cultural Relics Bureau, Party-History and-Literature Research Institute and relevant Production-and-Construction-Corps units. A special plan for digitalization of premium red-tourism routes shall be compiled to define construction objectives, technical standards and implementation procedures for the three routes, coordinate cross-regional and cross-system resource integration and avoid duplicated construction. Carry out a digital census of red resources across Xinjiang, compile a digital catalogue of red resources, assign unified resource identification codes, standardize technical specifications such as metadata and file formats, implement classified grading of data, distinguish publicly-available resources from confidential-restricted resources, and strike a balance between open utilization and security-confidentiality. Connect Xinjiang red digital resources to the national cultural big-data system and the national-cultural private network, so that local red resources achieve semantic correlation with national cultural databases.

3.2. Implement dual-track platform construction to break data-silo problems

In accordance with the task requirements for building cultural-data-service platforms set by the national cultural-digitalization strategy, construct a dual-track platform of "public-oriented services + industry-oriented sharing" [10]. First, build a popular-oriented Xinjiang Red-Cloud Exhibition Hall. Integrate digital resources of all sites along the three premium routes into one unified online-service entrance, and integrate functions including 720° panoramic exhibition halls, 3D interactive cultural-relic displays, red-story databases, intelligent-route guides and online-interaction communities. Add Uyghur and Kazakh multilingual interfaces to realize integrated services of cloud touring, route planning and visit reservation. Adopt the idea of "physical distribution yet logical correlation", and realize interconnection of resources from various venues via unified interfaces so as to reduce overall renovation costs. Second, build an industry-oriented shared platform for red-resource databases. Open access for venues, administrative institutions and scientific-research units with differentiated permission levels. Provide lightweight SaaS services for under-resourced grassroots venues, which can automatically generate online-display pages upon uploading basic data. This lowers digital-construction thresholds for grassroots sites and narrows regional digital divides.

3.3. Adhere to content priority and promote rational technology embedding into cultural narration

Digital technologies shall serve the communication of red spirits instead of prioritizing technology over content. Centering on the three themes of revolutionary memories, land-reclamation-and-border-guarding and patriotism-and-border-defending, leverage knowledge-graph and text-mining technologies to integrate historical materials and oral-history archives and build a spatiotemporal database for red history. Associate cultural relics, historical sites, and figures with historical stories of people of all ethnic groups jointly developing borderlands, and support the construction of a sense of community for the Chinese nation. Implement a gradient-transformation strategy: leading venues shall polish content for digital twins and immersive experiences; mid-tier venues shall complete supplementary construction of online interactive

resources; remote grassroots venues shall prioritize cultural-relic archiving and online graphic-text display instead of blindly purchasing high-end hardware equipment. Develop diversified products such as short videos, digital cultural-and-creative works and online research-study courses that fit information-receiving habits of teenagers, and enhance the appeal of red-cultural communication.

3.4. Build a user-oriented feedback closed-loop system to improve communication effectiveness

Collect user demands and feedback under the philosophy that "cultural digitalization serves the people and fruits of cultural digitalization are shared by the people". Adopt online behavior tracking, questionnaires and offline field visits to collect differentiated demands from groups of varied ages, ethnicities and occupations. Distinguish three usage scenarios: research-study education, mass sightseeing and academic research to build user portraits. Construct an online-offline linked feedback network: collect opinions via cloud exhibition halls and new-media channels online; set feedback collection points inside venues offline. Classify and dispose suggestions from users, and continuously optimize platform narration and guiding services based on user data, so as to change the static problem of "emphasizing construction while neglecting operation" for digital platforms and realize dynamic updating of products.

3.5. Improve security governance and consolidate talent and institutional guarantees

Implement confidentiality management for border- and national-defense-related red resources, adopt graded-control measures according to data-classification levels, and strictly distinguish three access modes: public access, authorized access, and physically isolated confidentiality. Improve network-infrastructure construction in border areas to guarantee normal operation of digital equipment at remote sites. Establish a content-review mechanism to regulate AI-generated red-themed digital content, and guard against risks such as biased historical narration and misinterpretation of cultural symbols. Carry out digital-competency training for grassroots venues at prefecture-level and Production-and-Construction-Corps sites. Make up grassroots talent shortages through technical assistance and ensure long-term operation of digital projects.

4. Conclusion

The digitalization of Xinjiang's premium red-tourism routes constitutes a systematic project for carrying forward borderland red genes and advancing cultural-enrich-Xinjiang initiatives. Unique red-cultural resources together with vast and complex geographical conditions form the realistic foundation for digital development of Xinjiang red culture-and-tourism. Although preliminary achievements have been made, problems including uneven gradient-development levels, data silos, imbalance between technology and content, and regional digital divides still exist, restraining maximum realization of value for premium routes. Guided by the national cultural-digitalization strategy, prioritizing cultural connotation and rationally embedding technologies, this paper constructs a Xinjiang-adapted digital-development path from five dimensions: top-level collaborative planning, dual-track platform construction, innovative content supply, user-feedback closed-loop mechanism, and security-governance guarantees. It promotes red resources to evolve from static preservation toward living inheritance and boosts the development of Xinjiang's tourism industry.

Disclosure statement

The author declares no conflict of interest.

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