

Innovative Development of Digital Cultural Tourism: Theoretical Framework, Technological Empowerment and Sustainable Realization Paths

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Abstract

Driven by the full penetration of the digital economy and the high-quality development of the cultural and tourism industry, digital cultural tourism has evolved from technological application to a comprehensive transformation stage of industrial restructuring, value recreation and sustainable development. Taking the whole-chain innovation of digital cultural tourism as the research object, this paper adopts systematic review and logical deduction to sort out the global research context and theoretical basis of digital cultural tourism. This study constructs a five-in-one conceptual framework of "technological empowerment — business innovation — model restructuring — value realization — sustainable guarantee", deeply analyzes the empowerment mechanism and application scenarios of core technologies such as metaverse, artificial intelligence, blockchain, digital storytelling and smart platforms, and extracts four practical models: digitalized business model, cultural heritage revitalization, rural cultural tourism upgrading and inclusive service supply. Finally, it puts forward implementable and replicable sustainable realization paths from five dimensions: technological innovation, industrial integration, model optimization, cultural inheritance and institutional guarantee. This paper aims to provide a systematic conceptual reference for the theoretical improvement, industrial transformation and policy formulation of digital cultural tourism, and clarifies the differences between this multi-dimensional whole-chain framework and previous fragmented single-perspective digital tourism analytical frameworks.

Keywords: Digital Cultural Tourism; Technological Empowerment; Business Model Innovation; Cultural Heritage; Sustainable Development

Introduction

The global cultural and tourism industry is undergoing profound structural changes amid the digital wave. Digital technology is no longer an auxiliary tool, but a core force reshaping cultural tourism resource protection, product creation, consumption experience, operation management and industrial collaboration. From digital archiving of cultural heritage and construction of virtual tourism scenarios to smart scenic spot operation and development of digital cultural and creative products, digital technology has continuously expanded the boundaries of the cultural and tourism industry, promoting the transformation of traditional cultural tourism towards experiential, personalized, intelligent and ecological development (Wu et al., 2024). In the post-pandemic era and against the background of global economic recovery, digital cultural tourism has become an important engine to activate the consumer market, boost economic growth, inherit cultural heritage and promote regional coordinated development (Li et al., 2022; Zhao et al., 2023).

Nevertheless, practical practice also exposes prominent bottlenecks: fragmented digital-project construction, technology-oriented investment lacking long-term operational logic, digital inequality risk, excessive cultural commercialization risks, imperfect data governance mechanisms, and insufficient community participation in decision-making and benefit distribution. These practical dilemmas restrict the high-quality development of digital cultural tourism.

In recent years, academia has carried out multi-dimensional and multi-perspective research on digital cultural tourism, forming a rich achievement system. Bekele and Raj (2025) systematically sorted out the research context of digitalization and digital transformation in the tourism industry through bibliometric analysis, pointing out that technological application, business model, sustainable development and user behavior are the core topics in the future. Gutierrez et al. (2025) summarized the laws of technological recombination and innovative combination in tourism digital transformation with a systematic review method. Jiang and Phoong (2023), Roziqin et al. (2023) and Wider et al. (2023) revealed the development law that digital cultural tourism has shifted from technology-oriented to value-oriented and from single application to industrial integration from the perspectives of ten-year research evolution, research trends and knowledge mapping respectively. Meanwhile, Kumar et al. (2024) and Lian and Xie (2024) focused on digital cultural heritage and digital transformation of cultural tourism, identifying research hotspots, practical challenges and future directions, laying a foundation for subsequent research. Zheng et al. (2023) proposed an integrated research framework based on combing the progress of digital cultural tourism, further promoting the systematization of this field.

Although existing research has covered technology, industry, users, sustainability and other dimensions, there are still three obvious deficiencies: first, insufficient integration of theoretical frameworks, most studies focus on a single technology or scenario, failing to form a systematic framework covering the whole chain, multiple subjects and multiple values; second, the discussion is too conceptual and modeled, with insufficient in-depth analysis of technological empowerment mechanism, model operation logic and path implementation

conditions; third, the lack of a complete system that fully integrates literature achievements to form a closed-loop argument. Compared with existing partial-perspective frameworks, few studies have constructed a holistic analytical framework covering technology, business, operation, value and multi-subject governance simultaneously.

Against such practical and theoretical background, this paper puts forward three explicit research questions:

RQ1: What theoretical dimensions can explain the whole-chain innovation process of digital cultural tourism?

RQ2: How can diversified digital technologies jointly generate cultural, economic, social and ecological compound value?

RQ3: What kinds of institutional and operational conditions support the long-term sustainable operation of digital cultural tourism?

Based on this, taking the whole-chain innovation of digital cultural tourism as the research object, this paper uses systematic review and logical deduction to sort out the research context and theoretical basis of digital cultural tourism, and constructs a five-in-one framework of "technological empowerment — business innovation — model restructuring — value realization — sustainable guarantee", providing a reference for theoretical construction, industrial transformation and policy formulation of digital cultural tourism. This paper adopts integrative systematic review rather than bibliometric analysis; such methodological design helps synthesize scattered theoretical viewpoints and practical cases in this interdisciplinary domain, so as to build a holistic conceptual framework.

Research Context and Theoretical Basis of Digital Cultural Tourism Innovation

1. Research Context and Knowledge Evolution of Digital Cultural Tourism

The research evolution of digital cultural tourism is highly synchronized with the iteration of digital technology, industrial policy orientation and upgrading of consumer demand, showing a clear path of "technology introduction — application exploration — industrial integration — sustainable development". Early research focused on the basic application of digital technology in cultural tourism, such as digital recording, online display and information query, focusing on technical feasibility and basic efficiency improvement, with limited discussion on industrial logic and value creation (Poulopoulos & Wallace, 2022). With the maturity of big data, artificial intelligence, virtual reality, metaverse and other technologies, the research focus has gradually shifted to deeper topics such as technological empowerment mechanism, user experience optimization and business model innovation.

Existing bibliometric research clearly presents this trend. Jiang and Phoong (2023) reviewed the impact of digitalization on tourism development from 2012 to 2022, and found that research hotspots have gradually shifted from early informatization and online marketing to intelligent experience, data-driven, industrial integration and sustainable development. Wider et al. (2023) further verified that digital cultural tourism research has formed five clusters: technology application, user behavior, business model, heritage protection and sustainable development through co-citation and co-word analysis. The bibliometric results of

Roziqin et al. (2023) also show that digital tourism research is moving from technological instrumentalism to industrial system theory, focusing on whole-chain optimization and multi-value realization. The review studies of Bekele and Raj (2025) and Gutierriz et al. (2025) jointly point out that the future digital transformation of cultural tourism will pay more attention to the integration of technological recombination, community participation, market-oriented mechanism and sustainable goals, which also provides a direct basis for the framework design of this study.

In terms of regional and thematic differences, some studies focus more on technological application, user behavior, business model and sustainable governance, including the continuous usage intention of metaverse cultural tourism users (Jo, 2023), digital storytelling and inclusive design (Kasemsarn et al., 2023), community empowerment and digitalization of rural tourism (Lapuz, 2023), etc. Chinese research is closely integrated with national strategies, focusing on digital economy-driven cultural and tourism integration, rural revitalization and cultural heritage revitalization (Tang et al., 2024; Li et al., 2022). The researches complement and verify each other, jointly forming the theoretical and practical foundation for the innovative development of digital cultural tourism, and providing rich viewpoint support for the integrated framework of this paper.

2. Core Theoretical Basis for the Innovative Development of Digital Cultural Tourism

As an interdisciplinary research field, digital cultural tourism integrates theories from economics, management, sociology, engineering, art and other disciplines. Based on the research topic and literature coverage, this paper extracts five core theories as the theoretical foundation of the full text. Table 1 maps these theories, core concepts, corresponding framework components and explanatory mechanisms.

Table 1 Mapping between theoretical foundations and conceptual framework components

Theoretical foundation	Core concept	Framework component	Mechanism explained	Representative literature
Industrial integration theory	Digital technology breaks industrial boundaries to realize resource-value synergy	Technological empowerment, business innovation	Explains how digital tools drive cross-industry integration of culture and tourism	(Li et al., 2022; Zhao et al., 2023)
Business model innovation theory	Restructuring value creation, delivery and acquisition logic	Business innovation, model restructuring	Reveals the transformation of profit, operation and cooperation modes	(Ammirato et al., 2022; Liu et al., 2024)

Theoretical foundation	Core concept	Framework component	Mechanism explained	Representative literature
Sustainable development theory	Coordination among culture-heritage, economy, society and ecology	Value realization	Defines multi-dimensional value goals for digital cultural tourism	(Stoica et al., 2022; Polukhina et al., 2025)
User acceptance and continuous usage theory	User-centered experience and perceived utility	Business innovation, value realization	Interprets market acceptance of digital cultural-tourism products	(Jo, 2023; Tuomi et al., 2023)
Community empowerment theory	Multi-stakeholder participation and benefit sharing	Model restructuring, sustainable guarantee	Highlights community roles, fairness and social sustainability	(Lapuz, 2023; Maquera et al., 2022)

These theories are complementary rather than mutually exclusive: industrial integration and business-model innovation mainly explain the industrial-economic logic; user acceptance theory focuses on micro-user dimension; community empowerment and sustainable development theory provide social-ecological perspectives. They jointly support different analytical layers of the whole-chain framework.

Industrial integration theory. The digital economy is characterized by high permeability and high synergy, which can break the traditional boundaries between cultural industry and tourism industry, promote all-round integration of resources, technology, market, business format and value, and form a new industrial form of digital cultural tourism (Li et al., 2022). Digital technology enables the transformation, replication and dissemination of cultural resources, and the precision, intelligence and extension of tourism services, finally realizing the collaborative upgrading of "cultural industrialization, tourism experientialization and industrial digitalization". The research of Zhao et al. (2023) confirms that digitalization can effectively promote the sustainable integration of culture and tourism and economic recovery, supporting the applicability of industrial integration theory in the field of digital cultural tourism from an empirical perspective.

Business model innovation theory. Digitalization fundamentally reconstructs the logic of value creation, delivery and realization in the cultural and tourism industry, changing the traditional profit model dominated by tickets and offline consumption, and giving birth to diversified business models such as platform-based, experience-based, content-based and ecological models (Ammirato et al., 2022). The innovation of digital cultural tourism business model is not only reflected in the diversification of revenue sources, but also in the comprehensive reconstruction of customer segmentation, channel pathways, core resources and cooperation networks. Liu et al. (2024) proved through long-term case studies that digital

drive can promote cultural tourism enterprises to form a sustainable innovation model and upgrading path, further enriching the application of business model innovation theory in cultural tourism scenarios.

Sustainable development theory. Digital cultural tourism is characterized by low resource consumption, high sharing efficiency and recyclable utilization, which can balance cultural heritage protection, ecological environment optimization, community benefit sharing and balanced economic development (Stoica et al., 2022). Digital technology reduces the damage of excessive crowd concentration to heritage and ecology, improves resource utilization efficiency, and promotes the inclusive development of cultural tourism services. Polukhina et al. (2025) empirically found based on transition economies that digital solutions can significantly improve the level of sustainable development of cultural tourism; Zeqiri et al. (2025) confirmed that digital platforms can effectively promote the industry to achieve Sustainable Development Goals (SDGs), providing a realistic basis for sustainability theory.

User acceptance and continuous usage theory. The final implementation of digital cultural tourism products and services depends on users' acceptance, usage intention and continuous usage behavior (Jo, 2023). Whether it is metaverse cultural tourism, smart scenic spots, digital cultural creativity or online heritage display, it must conform to users' cognition, experience needs and usage habits. Tuomi et al. (2023) studied the elderly group and showed that the design of digital cultural tourism services must consider the differences in technology acceptance of different groups to achieve real inclusiveness. This theory emphasizes user-centricity, which is the key basis for digital cultural tourism to move from "technologically usable" to "market-friendly".

Community empowerment theory. In rural tourism, heritage tourism and other scenarios, local communities are resource guardians, service providers and benefit sharers. Digital transformation must empower communities with participation, operation and income rights to achieve long-term sustainability (Lapuz, 2023). The community-based smart platform for rural tourism proposed by Maquera et al. (2022) and the rural tourism digital communication studied by Yanti et al. (2023) both take community participation as the core premise. Community empowerment theory emphasizes multi-stakeholder collaboration, avoiding interest imbalance and cultural alienation caused by digitalization, and is an important social dimension theory for the sustainable development of digital cultural tourism.

Construction of Theoretical Framework for Digital Cultural Tourism Innovation

The innovative development of digital cultural tourism is not the improvement of a single technology or link, but a systematic transformation covering technology, industry, model, value and guarantee. Based on the above research context, theoretical basis and literature synthesis, this paper constructs a five-in-one integrated conceptual framework of "technological empowerment — business innovation — model restructuring — value realization — sustainable guarantee". This five-dimensional structure is induced through iterative synthesis of existing literature, case evidence and multi-theory deduction, rather than pure subjective classification. Although presented in sequential order, the framework admits reciprocal feedback loops: sustainable guarantee conditions can in turn constrain or adjust

technological selection and business-model design, rather than being a simple one-way linear chain.

First, technological empowerment is the underlying support. All innovations of digital cultural tourism are based on technological maturity and scenario implementation, including metaverse, artificial intelligence, big data, blockchain, digital storytelling, smart platforms, etc. (Dayoub et al., 2024; Liang, 2022; Ratna et al., 2024; Kasemsarn et al., 2023). Technology not only improves efficiency, but also creates new scenarios, experiences and interactive methods, making cultural heritage tangible, tourism experiences immersive, service supply precise and operation management intelligent. Pouloupoulos and Wallace (2022) emphasized that data and digital technology have become core infrastructure for the protection and utilization of cultural heritage, determining the innovation ceiling of digital cultural tourism.

Second, business innovation is the intermediate carrier. Supported by technology, digital cultural tourism has spawned a large number of new business formats, including digital cultural heritage, virtual tourism, immersive scenic spots, digital cultural creativity, smart navigation, online performances, cloud tourism, etc. (Fauzi et al., 2022; Gonçalves et al., 2022; Zhou & Chen, 2022). New business formats break time and space constraints, expand consumption scenarios, enrich product supply, and shift the cultural tourism industry from "resource dependence" to "content creation". For example, virtualization of cultural assets enables global dissemination of immovable heritage, digital cultural creativity brings cultural symbols into daily life, and immersive experience greatly improves user stay time and consumption willingness. Business innovation has become a key bridge connecting technology and market. Distinct from business innovation focusing on new product-format creation, model restructuring stresses the adjustment of operation modes, profit structures and multi-subject governance mechanisms, which avoids conceptual overlap between the two dimensions.

Third, model restructuring is the operational core. Technological and business innovation inevitably promotes the comprehensive restructuring of operation, business and governance models (Ammirato et al., 2022; Zeqiri et al., 2025; Lapuz, 2023). In terms of business model, it shifts from single income to diversified ecological benefits; in operation mode, from offline decentralization to online-offline integrated platform operation; in governance mode, from government-led to multi-collaboration of government, enterprises, communities and users. The core of model restructuring is to realize market-oriented and sustainable operation of digital cultural tourism, avoiding the dilemma of "emphasizing technology over operation" and "emphasizing construction over maintenance", ensuring that innovation can be transformed into economic and social benefits. Key stakeholders and their respective roles are clarified as follows: governments undertake regulation, infrastructure construction and cultural-heritage protection; enterprises provide technology investment and commercial operation; local communities own cultural resources and participate in benefit sharing; tourists focus on experience acquisition and co-creation; technology platforms control data resources and coordinate ecosystem; cultural institutions guarantee heritage authenticity and interpretation.

Fourth, value realization is the ultimate goal. Digital cultural tourism ultimately aims to achieve the unity of cultural, economic, social and ecological values (Zhao et al., 2023; Polukhina et al., 2025; Costantino et al., 2022). Cultural value is reflected in heritage protection, inheritance and dissemination; economic value in industrial upgrading, consumption stimulation and employment increase; social value in inclusive public services, balanced regional development and enhanced cultural identity; ecological value in resource conservation, environmental friendliness and low-carbon development. The collaborative improvement of the four values is the core symbol that distinguishes digital cultural tourism from traditional cultural tourism, and the fundamental embodiment of its high-quality development.

Fifth, sustainable governance (revised from "sustainable guarantee") is the stable support. The term "guarantee" is replaced here, because this system cannot provide absolute guarantee for development outcomes; it supplies institutional and contextual governance conditions to mitigate risks. To ensure the long-term effective operation of the framework, a multi-dimensional governance system covering policy, technology, users, community and ecology must be established (Kasemsarn et al., 2023; Tuomi et al., 2023; Zeqiri et al., 2025).

Policy governance provides institutional support and standardized guidance; technology governance promotes continuous iteration and safe operation; user governance emphasizes inclusive design and aging-friendly transformation; community governance strengthens participation and income rights; ecological governance adheres to protection priority and rational utilization. This governance system responds to multiple potential risks including data privacy threats, digital exclusion risk, algorithm bias, over-commercialization of cultural heritage, loss of cultural authenticity, platform dependence, intellectual-property disputes, high operation-maintenance costs and unequal community benefit distribution, balancing innovation and regulation, efficiency and fairness, development and protection.

In summary, this paper constructs the theoretical framework for the innovative development of digital cultural tourism as shown in Figure 1.

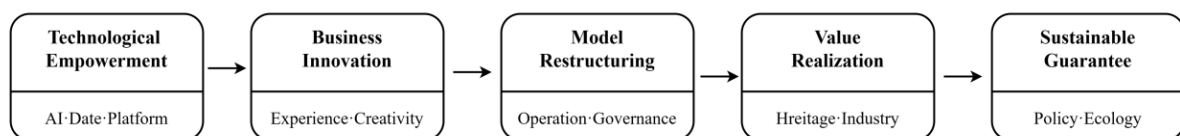


Figure 1 The theoretical framework for the innovative development of digital cultural tourism

This conceptual framework integrates existing literature viewpoints on technology, business model, rural tourism, heritage protection, user behavior, sustainable development into a unified analytical system, achieving self-consistent theoretical logic and clear practical orientation, laying a complete foundation for the subsequent analysis of technological empowerment, extraction of practical models and proposal of paths.

Empowerment Mechanism and Application Scenarios of Digital Technology in Cultural Tourism Industry

Digital technology is the primary driving force for digital cultural tourism innovation. Different technologies form differentiated empowerment paths in cultural tourism scenarios, jointly promoting industrial upgrading. Combined with literature, this paper discusses the empowerment mechanism, application scenarios, created value and major risks of core technologies, as summarized in Table 2.

Table 2 Technology-empowerment synthesis table

Technology	Empowerment mechanism	Application scenario	Created value	Main risks & governance requirements
Metaverse & virtual space	Construct immersive cross-time-space virtual scenes	Virtual heritage tourism, cloud exhibition	Expand tourism accessibility, cross-regional cultural communication	High-cost maintenance; risk of over-virtualization. Require reasonable investment evaluation and authenticity review
Artificial intelligence	Intelligent content generation & personalized recommendation	AI cultural-creative production, personalized tour service	Improve creation efficiency and user experience	Algorithm bias, copyright risk. Require algorithm auditing and intellectual-property protection
Blockchain & fintech	Build traceable trust mechanism	Heritage copyright confirmation, ticketing transaction	Reduce intermediary cost, protect cultural property rights	High technical threshold. Require standardized technical interface and supervision
Digital storytelling + inclusive design	Emotional cultural communication & accessible service	Heritage-theme social-media communication, senior-friendly tourism service	Improve cultural dissemination and social inclusiveness	Over-simplification of cultural connotation. Require participation of cultural-heritage experts
Digital smart platform	Integrate multi-subject resources and match supply-demand	Rural-tourism community platform, smart scenic-spot management	Realize resource sharing and multi-party collaboration	Platform monopoly and data risk. Require data security regulation and benefit-distribution mechanism

1. Metaverse and Virtual Space: Reconstructing the Spatiotemporal Boundaries of Cultural Tourism Experience

With immersion, interactivity and cross-temporality as core features, metaverse brings a paradigm revolution to cultural tourism experience. Traditional tourism is limited by geography, time and physical conditions, while metaverse can build highly simulated virtual scenarios, enabling users to "travel around the world without leaving home". Dayoub et al. (2024) proposed the concept of "Digital Silk Road", integrating metaverse technology into the "Belt and Road" cultural tourism framework, building a cross-regional cultural exchange platform through virtual space, enabling global sharing of cultural heritage along the route. Metaverse is not only a display tool, but also a new interactive, participatory and consumable space, where users can complete a complete set of behaviors such as sightseeing, interaction, shopping and socializing in virtual scenarios.

From the perspective of user behavior, the value of metaverse cultural tourism ultimately depends on users' continuous usage intention. Jo (2023)'s research on metaverse tourism users shows that perceived ease of use, perceived entertainment, experience value and satisfaction significantly positively affect continuous usage intention, which means that metaverse cultural tourism development must focus on experience design, interactive fluency and content attractiveness, rather than simply pursuing technological coolness. The core value of metaverse empowerment lies in expanding the time and space of cultural tourism consumption, improving travel accessibility for special groups (the elderly, the disabled), alleviating crowd pressure in popular scenic spots, and promoting cross-regional cultural dissemination, opening up incremental space for the cultural tourism industry.

2. Artificial Intelligence and Digital Cultural Creativity: Enhancing Content Creation and Aesthetic Value

Artificial intelligence mainly undertakes functions such as content generation, precise recommendation, aesthetic evaluation and intelligent management in digital cultural tourism, especially playing an irreplaceable role in the innovation of digital cultural and creative products. Traditional cultural and creative products have problems such as long design cycle, serious homogenization and insufficient personalization. Artificial intelligence can quickly analyze cultural elements, user preferences and market trends, generate diverse and highly creative cultural and creative design schemes, and greatly improve R&D efficiency. Liang (2022) constructed an AI-driven aesthetic value evaluation system for digital cultural and creative products, realizing quantitative assessment of the aesthetic value of cultural and creative products through algorithm models, solving the problems of inconsistency and inaccuracy of traditional subjective evaluation, and providing scientific tools for the optimization and upgrading of cultural and creative products.

Meanwhile, the combination of artificial intelligence and big data enables precise supply of cultural tourism services. Pouloupoulos and Wallace (2022) pointed out that data technology shifts cultural heritage from passive protection to active utilization. Through intelligent analysis of tourist behavior, preferences and needs, scenic spots can provide personalized tour routes, customized interpretation services and precise marketing pushes, improving tourist experience and operation efficiency. The essence of AI empowerment is to

use technology to improve content quality, optimize service efficiency and reduce creation costs, promoting digital cultural creativity from "mass production" to "precise creation and high-quality supply", and enhancing the core competitiveness of the cultural tourism industry.

3. Blockchain and Fintech: Building a Trust Mechanism and Efficient Operation System

Blockchain and fintech bring multiple values to the cultural tourism industry, such as transaction security, property right protection, payment innovation and knowledge management, effectively solving pain points such as lack of trust, copyright disputes and cumbersome payment in traditional cultural tourism. After systematically reviewing the application of blockchain and fintech in tourism and hotel industry, Ratna et al. (2024) pointed out that blockchain has the characteristics of decentralization, immutability and traceability, which can build a highly credible environment in ticketing transactions, homestay booking, copyright protection, supply chain finance and other scenarios, reducing intermediary costs and default risks; fintech improves payment convenience, financing availability and capital operation efficiency, supporting the digital transformation of small and medium-sized cultural tourism enterprises.

At the level of sustainable development, digital finance and technological solutions can significantly improve the resilience of cultural tourism development. Polukhina et al. (2025) empirically found based on transition economies that digital financial services can alleviate financing constraints of cultural tourism enterprises, improve risk resistance, and promote the industry to transform towards sustainability. The deep significance of blockchain and fintech empowerment lies in establishing a trust foundation and efficient system for market-oriented operation of digital cultural tourism, making digital transactions safer, digital copyrights better protected, and digital operations more efficient, supporting the long-term healthy development of the cultural tourism industry.

4. Digital Storytelling and Inclusive Design: Strengthening Cultural Communication and Service Inclusiveness

Digital storytelling disseminates cultural content in a storytelling, emotional and social way, greatly improving the attractiveness and dissemination of cultural heritage, especially for young groups. Kasemsarn and Nickpour (2025) found that integrating digital storytelling with social media can effectively stimulate youth participation in cultural heritage tourism, making traditional culture reach audiences in a younger and more vivid way. Digital storytelling is no longer a simple information introduction, but evokes cultural identity through plots, roles, interaction and emotion, turning tourists from "onlookers" into "participants".

On this basis, inclusive design makes digital cultural tourism services cover more groups. Kasemsarn et al. (2023) proposed an integrated framework of inclusive design and digital storytelling, emphasizing that cultural tourism services should take into account the elderly, the disabled, groups with low digital literacy, etc., and improve service accessibility through simplified interfaces, multi-modal interaction and aging-friendly transformation. The joint empowerment of digital storytelling and inclusive design makes digital cultural tourism both "content-rich" and "warm-hearted", realizing efficient cultural communication and universal service for all, reflecting social value and humanistic care.

5. Digital Platforms and Smart Systems: Optimizing Resource Integration and Community Collaboration

Smart digital platforms are the core carrier for the large-scale and systematic development of digital cultural tourism, which can integrate resources, connect supply and demand, collaborate subjects and improve management efficiency. In rural tourism scenarios, Maquera et al. (2022) proposed a community-based smart platform model for rural tourism, integrating rural resources, connecting urban customers and empowering local communities through platforms to solve problems such as information asymmetry, non-standard services and weak marketing capabilities in rural tourism; Costantino et al. (2022) confirmed with Italian cases that digital trail systems can effectively improve the visibility and tourism value of rural cultural heritage, driving regional sustainable development.

From an industrial perspective, digital platforms are important tools to promote the achievement of sustainable development goals. Zeqiri et al. (2025) showed that in the context of Industry 4.0, digital cultural tourism platforms can integrate upstream and downstream of the industrial chain, optimize resource allocation, reduce energy consumption and improve transparency, helping the cultural tourism industry implement the UN Sustainable Development Goals. The core of digital platform empowerment is to break information islands, connect multiple subjects, achieve efficient collaboration, transform scattered cultural tourism resources into systematic competitiveness, and enable villages, communities and small and medium-sized enterprises to share the dividends of digitalization.

Typical Practical Models for the Innovative Development of Digital Cultural Tourism

Supported by technological empowerment and theoretical framework, global digital cultural tourism has formed a number of replicable and promotable practical models. This paper selects four representative models synthesized from existing cross-national literature; these models are not mutually exclusive, and can overlap in actual destinations. Each model applies to specific resource endowments and institutional conditions, with corresponding expected outcomes and inherent limitations, as shown in Table 3.

Table 3 Comparative analysis of four practical models

Practical model	Applicable destination type	Necessary resources & institutional conditions	Expected outcomes	Main risks & limitations
Digital business-model innovation model	Comprehensive cultural-tourism destinations with market-oriented subjects	Technology enterprise cooperation, diversified market subjects	Diversified revenue sources, market vitality	Excessive commercialization risk, high operation cost
Digital revitalization model of cultural heritage	Heritage-rich sites with tangible/intangible cultural resources	Heritage-protection institutions, digital-scanning capacity	Heritage protection & cross-border communication	Risk of distorting cultural authenticity, high maintenance cost
Digital upgrading model of rural cultural tourism	Rural areas with featured folk-cultural resources	Rural community participation, basic digital infrastructure	Increase villagers' income, activate rural culture	Digital divide, benefit outflow to external capital
User-oriented inclusive development model	All types of cultural-tourism destinations	Inclusive-design concept, multi-group demand investigation	Social equity, expanded user coverage	Higher product-design cost, conflict between inclusiveness and commercial profit

1. Digital Business Model Innovation Model

Digital business model is the core for the market-oriented survival and development of digital cultural tourism. The digital business model for cultural tourism proposed by Ammirato et al. (2022) is highly representative, including seven modules: value proposition, customer segmentation, channel pathways, revenue sources, core capabilities, cooperation network and cost structure, forming a complete business closed loop. In terms of value proposition, digital cultural tourism emphasizes experience upgrading, cultural depth, convenience and efficiency and personalization; customer segmentation covers young groups, family tourists, the elderly, cultural enthusiasts, etc.; channel pathways are dominated by online platforms, social media and immersive scenarios; revenue sources include a diversified combination of tickets, cultural creativity, membership, advertising, customized services, etc.

The transformation practice of large cultural tourism groups further verifies the effectiveness of this model. Taking OCT as the object, Liu et al. (2024) carried out a long-term case study and found that digital-driven cultural tourism industry innovation needs to go through three stages: technology introduction, process restructuring and ecological integration,

finally forming a comprehensive innovation model of "digital platform + content creation + scenario experience + community operation". The key success factors of this model include: taking user demand as the starting point, data as the core production factor, technology as support, and ecological cooperation as the path, which can continuously improve enterprise competitiveness and market adaptability.

2. Digital Revitalization Model of Cultural Heritage

Cultural heritage is the core resource of cultural tourism. Digitalization transforms it from "static protection" to "dynamic revitalization", achieving a win-win situation between protection and utilization. Taking Malaysia as an example, Fauzi et al. (2022) proposed a virtualization path of cultural assets, transforming immovable and vulnerable heritage into permanently preserved and globally disseminated digital resources through 3D scanning, digital modeling and virtual display, which not only reduces physical protection pressure but also expands heritage influence; Gonçalves et al. (2022) focused on intangible cultural heritage and proposed a sustainable development path combining digital recording, immersive performance and interactive experience, enabling intangible heritage skills to break through time and space constraints and gain new vitality.

In addition, Lian & Xie (2024) pointed out through bibliometric analysis that digital cultural heritage research is shifting from technical archiving to value mining, communication innovation and sustainable utilization, and will pay more attention to the balance between digital copyright, user experience and commercialization in the future. The core logic of the heritage digital revitalization model is: retaining the authenticity of heritage with digital technology, enhancing heritage attractiveness with innovative experience, realizing heritage value regeneration with market-oriented methods, and finally forming a virtuous cycle of "protection — inheritance — utilization — feedback protection".

3. Digital Upgrading Model of Rural Cultural Tourism

Digital technology injects new momentum into rural tourism and becomes an important force to promote rural revitalization. Tang et al. (2024) proposed a complete model and path for digital cultural tourism to empower rural revitalization, emphasizing the improvement of rural tourism quality and efficiency through digital infrastructure construction, resource digitalization, online marketing, intelligent operation and community participation. The digitalization of rural cultural tourism is not only the sinking of technology, but also the renewal of concepts, improvement of capabilities and restructuring of interests.

Community empowerment is the key to the sustainability of rural digital cultural tourism. Taking the Philippines as an example, Lapuz (2023) confirmed that local community empowerment can improve the effectiveness and fairness of digital transformation, avoiding benefit outflow caused by excessive capital dominance; Yanti et al. (2023) showed that digital innovation can effectively improve the communication efficiency of rural tourism, enhance rural visibility and attractiveness, and drive villagers' income increase; the Italian rural case of Costantino et al. (2022) also proved that digital systems can enhance the value of rural heritage and promote rural sustainable development. The core of the rural digital cultural tourism model is: connecting urban and rural areas with digital technology, guaranteeing local benefits with

community participation, forming differentiated competitiveness with characteristic resources, and realizing the coordinated development of rural economy, culture and ecology.

4. User-Oriented and Inclusive Development Model

The ultimate service object of digital cultural tourism is people, and user orientation and inclusiveness are inherent requirements for its sustainable development. Tuomi et al. (2023) studied the elderly group and found that elderly users' acceptance of digital cultural tourism services is significantly affected by perceived ease of use, perceived usefulness, social influence and facilitating conditions. Therefore, digital cultural tourism design must simplify operations, optimize interfaces, provide auxiliary services, and promote aging-friendly transformation. Inclusiveness not only covers the elderly, but also includes the disabled, groups with low digital literacy, overseas tourists, etc., reflecting service fairness.

The inclusive design framework of Kasemsarn et al. (2023) further emphasizes that the combination of digital storytelling and friendly interfaces can greatly improve the accessibility of cultural tourism, allowing more people to share cultural dividends. The core value of the user-oriented and inclusive model is to make digital cultural tourism move from "technologically advanced" to "service-friendly", from "niche experience" to "public inclusiveness", expand market coverage, improve social satisfaction, and achieve the unity of economic and social benefits.

Sustainable Realization Paths of Digital Cultural Tourism

Based on the theoretical framework, technological empowerment and practical models, combined with all literature viewpoints, this paper proposes five specific, implementable and replicable sustainable realization paths, each with clear directions and implementation priorities.

1. Technological Innovation Path: Consolidate Underlying Support and Promote In-Depth Scenario Implementation

Continuously promoting the R&D and scenario adaptation of core technologies is the foundation for digital cultural tourism innovation. On the one hand, accelerate the in-depth application of metaverse, artificial intelligence, blockchain, big data, virtual reality and other technologies in cultural tourism scenarios, and build typical scenarios such as immersive experience, intelligent services, trusted transactions and precise marketing (Dayoub et al., 2024; Liang, 2022; Ratna et al., 2024); on the other hand, improve digital technical standards, data security norms and copyright protection systems to prevent risks such as technology abuse, data leakage and property right disputes (Pouloupoulos & Wallace, 2022). Meanwhile, encourage cooperation between technology enterprises and cultural tourism institutions to promote the transformation of technological achievements, avoid disconnection between technology and demand, and form a virtuous cycle of "technology R&D — scenario testing — iterative optimization — large-scale promotion".

2. Industrial Integration Path: Deepen the Integration of Digital Economy and the Whole Chain of Cultural Tourism

Taking the digital economy as a link, promote the deep integration of cultural resources, tourism services, creative design and modern communication, and build a whole-chain

integration system. First, promote the digitalization of cultural resources, establish regional digital cultural tourism resource libraries to realize resource integration and sharing (Li et al., 2022; Zhao et al., 2023); second, promote the intelligentization of tourism services, build smart scenic spots, smart hotels and smart transportation to improve operation efficiency and experience quality (Wu et al., 2024); third, promote the diversification of business scenarios, cultivate new business formats such as virtual tourism, digital cultural creativity, immersive performances and online research (Liu et al., 2024). Through industrial integration, improve the added value and competitiveness of the cultural tourism industry, and promote high-quality industrial development.

3. Model Innovation Path: Build a Market-Oriented, Platform-Based and Ecological Operation System

Activate market vitality through model innovation to realize sustainable operation of digital cultural tourism. First, innovate business models, learn from the framework of Ammirato et al. (2022) to build a commercial system with diversified profits, efficient operation and controllable risks; second, promote platform-based operation, integrate resources, connect supply and demand, and empower small and medium-sized subjects and communities relying on digital platforms (Zeqiri et al., 2025; Maquera et al., 2022); third, strengthen community participation and collaboration of market entities, protect local interests and promote fair development (Lapuz, 2023). The key to model innovation is to adhere to market orientation, respect market laws, stimulate the enthusiasm of enterprises, communities, individuals and other multiple subjects, and form a benign mechanism of self-hematopoiesis and continuous upgrading.

4. Cultural Inheritance Path: Promote Heritage Protection and Cultural Communication with Digital Technology

Adhere to cultural standard and realize the organic unity of digital technology and cultural inheritance. First, strengthen the digital protection of tangible and intangible cultural heritage, establish permanent digital archives to prevent heritage damage and loss (Fauzi et al., 2022; Gonçalves et al., 2022); second, innovate cultural expression forms, enhance cultural attractiveness with digital storytelling, immersive experience and social media communication (Kasemsarn et al., 2023; Kasemsarn & Nickpour, 2025); third, promote the creative transformation and innovative development of excellent traditional culture, and build digital cultural tourism IP with local characteristics and international communication power (Lian & Xie, 2024). Through digital empowerment, make cultural heritage "come alive" and "go global", achieving a win-win situation between cultural value and market value.

5. Sustainable Governance Path: Improve the Collaborative Governance of Policy, Community, Users and Ecology

Build an all-round governance system to ensure the long-term and stable development of digital cultural tourism. At the policy level, strengthen planning guidance, financial support, talent training and market supervision to create a good development environment; at the community level, strengthen community empowerment, capacity building and benefit sharing to promote common development (Lapuz, 2023; Maquera et al., 2022); at the user level, promote inclusive design and aging-friendly transformation to improve service inclusiveness

(Tuomi et al., 2023; Kasemsarn et al., 2023); at the ecological level, adhere to protection priority and rational utilization, and promote low-carbon and green cultural tourism (Stoica et al., 2022; Polukhina et al., 2025). The five dimensions work together to balance development and security, innovation and regulation, efficiency and fairness, supporting the sustainable development of digital cultural tourism.

Conclusions and Research Prospects

Conclusions

First, the innovative development of digital cultural tourism is a systematic project integrating technological empowerment, business innovation, model restructuring, value realization and sustainable governance. This paper puts forward a conceptual analytical framework rather than an empirically verified model; it provides a multi-dimensional whole-chain perspective for sorting out digital-cultural-tourism innovation logic.

Second, technologies such as metaverse, artificial intelligence, blockchain, digital storytelling and digital platforms deeply empower the cultural tourism industry from five dimensions: experience, content, trust, communication and collaboration, promoting the industry to shift from traditional resource-driven to digital innovation-driven, forming a new development logic.

Third, digital cultural tourism has formed four typical practical models: digital business model, digital revitalization of heritage, upgrading of rural cultural tourism, and user-oriented inclusive development. Different models are applicable to different regions and resource scenarios, jointly forming a diversified practical system.

Fourth, the sustainable development of digital cultural tourism must adhere to the coordinated promotion of five paths: technological innovation, industrial integration, model optimization, cultural inheritance and institutional governance, taking into account market efficiency, cultural standard, social fairness and ecological friendliness, so as to achieve high-quality development.

Research Limitations and Prospects

Limitations of this study should be acknowledged explicitly. First, this paper is built on secondary literature synthesis without original empirical data or field investigation. Second, this conceptual framework has not been quantitatively tested or validated by expert interviews or case coding. Third, the literature sources are mainly English-language journal articles, which may bring potential language-related selection bias. Fourth, rapid iteration of digital technologies may change partial boundary conditions of this framework; regional heterogeneity of cultural-tourism resources is not fully quantified.

Future research can be further deepened based on the framework of this paper: first, strengthen the research on digital cultural tourism governance system, and explore the collaborative governance mechanism of government, market, community and users; second, carry out cross-regional and cross-cultural comparative research to extract more universal laws; third, pay attention to the new opportunities and risks brought by new technologies such as generative artificial intelligence and large models; fourth, construct an evaluation index system

for the sustainable development of digital cultural tourism to provide tools for empirical assessment.

References

- Ammirato, S., Felicetti, A. M., Linzalone, R., & Carlucci, D. (2022). Digital business models in cultural tourism. *International Journal of Entrepreneurial Behavior & Research*, 28(8), 1940-1961. <https://doi.org/10.1108/IJEBr-01-2021-0070>
- Bekele, H., & Raj, S. (2025). Digitalization and digital transformation in the tourism industry: a bibliometric review and research agenda. *Tourism Review*, 80(4), 894-913. <https://doi.org/10.1108/TR-07-2023-0509>
- Chengcai, T. A. N. G., Lingyi, S., Limei, L. I. U., & Jianghai, M. E. I. (2024). The model and path for digital cultural tourism to promote rural revitalization. *Journal of Resources and Ecology*, 15(3), 528-540. <https://doi.org/10.5814/j.issn.1674-764x.2024.03.002>
- Costantino, C., Mantini, N., Benedetti, A. C., Bartolomei, C., & Predari, G. (2022). Digital and territorial trails system for developing sustainable tourism and enhancing cultural heritage in rural areas: The case of San Giovanni Lipioni, Italy. *Sustainability*, 14(21), 13982. <https://doi.org/10.3390/su142113982>
- Dayoub, B., Yang, P., Omran, S., Zhang, Q., & Dayoub, A. (2024). Digital silk roads: leveraging the metaverse for cultural tourism within the belt and road initiative framework. *Electronics*, 13(12), 2306. <https://doi.org/10.3390/electronics13122306>
- Fauzi, H., Sharif, H. M., & Razak, R. A. (2022). Virtualization of digitalized cultural assets to promote sustainable heritage tourism in Malaysia. *International Journal of Environment, Architecture, and Societies*, 2(02), 85-99. <https://doi.org/10.26418/ijeas.2022.2.02.85-99>
- Gonçalves, A. R., Dorsch, L. L. P., & Figueiredo, M. (2022). Digital tourism: an alternative view on cultural intangible heritage and sustainability in Tavira, Portugal. *Sustainability*, 14(5), 2912. <https://doi.org/10.3390/su14052912>
- Gutiérrez, I., Ferreira, J. J., & Fernandes, P. O. (2025). Digital transformation and the new combinations in tourism: A systematic literature review. *Tourism and Hospitality Research*, 25(2), 194-213. <https://doi.org/10.1177/14673584231198414>
- Jiang, C., & Phoong, S. W. (2023). A ten-year review analysis of the impact of digitization on tourism development (2012–2022). *Humanities and Social Sciences Communications*, 10(1), 1-16. <https://doi.org/10.1057/s41599-023-02150-7>
- Jo, H. (2023). Tourism in the digital frontier: A study on user continuance intention in the metaverse. *Information Technology & Tourism*, 25(3), 307-330. <https://doi.org/10.1007/s40558-023-00257-w>
- Kasemsarn, K., Harrison, D., & Nickpour, F. (2023). Applying inclusive design and digital storytelling to facilitate cultural tourism: A review and initial framework. *Heritage*, 6(2), 1411-1428. <https://doi.org/10.3390/heritage6020077>

- Kasemsarn, K., & Nickpour, F. (2025). Digital storytelling in cultural and heritage tourism: A review of social media integration and youth engagement frameworks. *Heritage*, 8(6), 200. <https://doi.org/10.3390/heritage8060200>
- Kumar, S., Kumar, V., Kumari Bhatt, I., Kumar, S., & Attri, K. (2024). Digital transformation in tourism sector: trends and future perspectives from a bibliometric-content analysis. *Journal of Hospitality and Tourism Insights*, 7(3), 1553-1576. <https://doi.org/10.1108/JHTI-10-2022-0472>
- Lapuz, M. C. M. (2023). The role of local community empowerment in the digital transformation of rural tourism development in the Philippines. *Technology in Society*, 74, 102308. <https://doi.org/10.1016/j.techsoc.2023.102308>
- Li, X., Liang, X., Yu, T., Ruan, S., & Fan, R. (2022). Research on the integration of cultural tourism industry driven by digital economy in the context of COVID-19—based on the data of 31 Chinese provinces. *Frontiers in Public Health*, 10, 780476. <https://doi.org/10.3389/fpubh.2022.780476>
- Lian, Y., & Xie, J. (2024). The evolution of digital cultural heritage research: Identifying key trends, hotspots, and challenges through bibliometric analysis. *Sustainability*, 16(16), 7125. <https://doi.org/10.3390/su16167125>
- Liang, D. (2022). Aesthetic value evaluation for digital cultural and creative products with artificial intelligence. *Wireless Communications and Mobile Computing*, (1), 8318620. <https://doi.org/10.1155/2022/8318620>
- Liu, Q., Gao, J., & Li, S. (2024). The innovation model and upgrade path of digitalization driven tourism industry: Longitudinal case study of OCT. *Technological Forecasting and Social Change*, 200, 123127. <https://doi.org/10.1016/j.techfore.2023.123127>
- Maquera, G., da Costa, B. B., Mendoza, Ó., Salinas, R. A., & Haddad, A. N. (2022). Intelligent digital platform for community-based rural tourism—a novel concept development in Peru. *Sustainability*, 14(13), 7907. <https://doi.org/10.3390/su14137907>
- Polukhina, A., Sheresheva, M., Napolskikh, D., & Lezhnin, V. (2025). Digital solutions in tourism as a way to boost sustainable development: Evidence from a transition economy. *Sustainability*, 17(3), 877. <https://doi.org/10.3390/su17030877>
- Ratna, S., Saide, S., Putri, A. M., Indrajit, R. E., & Muwardi, D. (2024). Digital transformation in tourism and hospitality industry: a literature review of blockchain, financial technology, and knowledge management. *EuroMed Journal of Business*, 19(1), 84-112. <https://doi.org/10.1108/EMJB-04-2023-0118>
- Roziqin, A., Kurniawan, A. S., Hijri, Y. S., & Kismartini, K. (2023). Research trends of digital tourism: a bibliometric analysis. *Tourism Critiques: Practice and Theory*, 4 (1-2), 28-47. <https://doi.org/10.1108/TRC-11-2022-0028>
- Stoica, G. D., Andreiana, V. A., Duica, M. C., Stefan, M. C., Susanu, I. O., Coman, M. D., & Iancu, D. (2022). Perspectives for the development of sustainable cultural tourism. *Sustainability*, 14(9), 5678. <https://doi.org/10.3390/su14095678>

- Tuomi, A., Moreira Kares, E., & Zainal Abidin, H. (2023). Digital cultural tourism: Older adults' acceptance and use of digital cultural tourism services. *Scandinavian Journal of Hospitality and Tourism*, 23(2-3), 226-247. <https://doi.org/10.1080/15022250.2023.2256698>
- Poulopoulos, V., & Wallace, M. (2022). Digital technologies and the role of data in cultural heritage: The past, the present, and the future. *Big Data and Cognitive Computing*, 6(3), 73. <https://doi.org/10.3390/bdcc6030073>
- Wider, W., Gao, Y., Chan, C. K., Lin, J., Li, J., Tanucan, J. C. M., & Fauzi, M. A. (2023). Unveiling trends in digital tourism research: A bibliometric analysis of co-citation and co-word analysis. *Environmental and Sustainability Indicators*, 20, 100308. <https://doi.org/10.1016/j.indic.2023.100308>
- Wu, W., Xu, C., Zhao, M., Li, X., & Law, R. (2024). Digital tourism and smart development: State-of-the-art review. *Sustainability*, 16(23), 10382. <https://doi.org/10.3390/su162310382>
- Yanti, D., Heryadi, D. Y., Cakranegara, P. A., & Kadyrov, M. (2023). Developing rural communication through digital innovation for village tourism. *Jurnal Studi Komunikasi*, 7(3), 696-712. <https://doi.org/10.25139/jsk.v7i3.7384>
- Zeqiri, A., Ben Youssef, A., & Maherzi Zahar, T. (2025). The role of digital tourism platforms in advancing sustainable development goals in the industry 4.0 era. *Sustainability*, 17(8), 3482. <https://doi.org/10.3390/su17083482>
- Zhao, X., Xie, C., Huang, L., Wang, Y., & Han, T. (2023). How digitalization promotes the sustainable integration of culture and tourism for economic recovery. *Economic Analysis and Policy*, 77, 988-1000. <https://doi.org/10.1016/j.eap.2023.01.005>
- Zheng, D., Huang, C., & Oraltay, B. (2023). Digital cultural tourism: progress and a proposed framework for future research. *Asia Pacific Journal of Tourism Research*, 28(3), 234-253. <https://doi.org/10.1080/10941665.2023.2217958>
- Zhou, Y., & Chen, S. (2022). Design innovation of ethnic cultural wisdom tourism products based on digital information technology. *Wireless Communications and Mobile Computing*, (1), 1833649. <https://doi.org/10.1155/2022/1833649>