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THE COLLABORATIVE LOGIC OF DIGITAL TRANSFORMATION OF CHINA'S TOURISM INFRASTRUCTURE

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Abstract. The recovery of China's tourism demand and the expansion of digital infrastructure have shifted the supply of tourism infrastructure from physical facilities to a composite system supported by networks, data, platforms and governance rules. This article uses a mixed secondary data research design, combined with official statistical trend analysis, policy text analysis and public case material verification, to examine the supply evolution, policy tools and regional differences of China's tourism infrastructure digitalization from 2019 to 2024. The study found that transformation is characterized by rapid expansion of technology base, insufficient data coordination, deepening service platformization, and supplementary governance rules. This article proposes a conceptual framework of technology layer-data layer-service layer-governance layer, explaining that this transformation is a system reorganization jointly shaped by policy supply, spatial differences and operational capabilities. **Keywords:** digitalization of tourism infrastructure; smart tourism; digital infrastructure; policy text analysis; regional differences.

Annotatsiya. Xitoyning sayyohlik talabining tiklanishi va raqamli infratuzilmaning kengayishi turizm infratuzilmasini yetkazib berishni jismoniy ob'ektlardan tarmoqlar, ma'lumotlar, platformalar va boshqaruv qoidalari bilan qo'llab-quvvatlanadigan kompozit tizimga o'tkazdi. Ushbu maqola 2019 yildan 2024 yilgacha Xitoyning turizm infratuzilmasini raqamlashtirishning ta'minot evolyutsiyasi, siyosat vositalari va mintaqaviy farqlarini o'rganish uchun rasmiy statistik tendentsiya tahlili, siyosat matni tahlili va ommaviy ish materiallarini tekshirish bilan birgalikda aralash ikkinchi darajali ma'lumotlarni tadqiqot dizaynidan foydalanadi. qo'shimcha boshqaruv qoidalari. Ushbu maqola texnologiya darajasi-ma'lumotlar qatlami-xizmat darajasi-boshqaruv qatlamining kontseptual asosini taklif qiladi va bu transformatsiya siyosat ta'minoti, fazoviy farqlar va operatsion imkoniyatlar bilan birgalikda shakllanadigan tizimni qayta tashkil etish ekanligini tushuntiradi.

Kalit so'zlar: turizm infratuzilmasini raqamlashtirish; aqlli turizm; raqamli infratuzilma; siyosat matnini tahlil qilish; mintaqaviy farqlar.

Аннотация. Восстановление туристического спроса в Китае и расширение цифровой инфраструктуры привели к тому, что предложение туристической инфраструктуры перешло от физических объектов к сложной системе, поддерживаемой сетями, данными, платформами и правилами управления. В этой статье используется смешанный дизайн исследования вторичных данных в сочетании с официальным статистическим анализом тенденций, анализом текста политики и проверкой материалов публичного дела, чтобы изучить эволюцию предложения, инструменты политики и региональные различия в цифровизации туристической инфраструктуры Китая в период с 2019 по 2024 год. Исследование показало, что трансформация характеризуется быстрым расширением технологической базы, недостаточной координацией данных, углублением платформизации услуг и дополнительными правилами управления. В этой статье предлагается концептуальная основа «технологический уровень-уровень данных-уровень услуг-уровень управления», объясняя, что эта трансформация представляет собой системную реорганизацию, совместно сформированную политическими предложениями, пространственными различиями и оперативными возможностями.

Ключевые слова: туристическая инфраструктура; устойчивый туризм; инклюзивный туризм; Китай; высокоскоростная железная дорога; умный туризм; возрождение сельских районов; целевое сокращение бедности.





INTRODUCTION

China's tourism industry has entered a stage of restorative growth after the impact of the epidemic, and the objects of tourism infrastructure have also changed. In 2024, the number of Chinese tourists will reach 5.615 billion, China's total tourism expenditure (China's tourism revenue) will reach 5.75 trillion yuan, and the scale of demand has approached and partially exceeded the pre-epidemic level (Ministry of Culture and Tourism, 2025). During the same period, digital infrastructure became the underlying condition for the operation of tourist destinations. By the end of 2024, the total number of 5G base stations in the country reached 4.251 million, the number of Internet broadband access ports reached 1.22 billion, and the number of standard data center racks reached 830,000 (Ministry of Industry and Information Technology, 2025); a report released by the China Internet Network Information Center (CNNIC) shows that the number of Internet users in China reached 1.108 billion, the Internet penetration rate was 78.6%, and the number of online travel booking users reached 548 million (CNNIC, 2025). These data show that tourism infrastructure not only involves roads, visitor centers, toilets, parking lots, signage systems and scenic area equipment, but also includes communication networks, reservation ticketing, payment and settlement, data platforms, cloud resources and real-time information systems for tourists.

Changes at the policy level have further heightened awareness of the problem. The "14th Five-Year Plan" tourism development plan incorporates smart tourism, digital cultural tourism and regional coordination into the construction of a modern tourism system, and puts public services, market supervision, consumption scenarios and infrastructure transformation within the same policy framework (State Council, 2021a). Since 2020, policies such as "Internet + Tourism", 5G + Smart Tourism and Smart Tourism Innovation and Development have been successively introduced, indicating that the digitalization of tourism infrastructure has shifted from single-point project construction to a combination of policy tools (Ministry of Culture and Tourism et al., 2020; Ministry of Industry and Information Technology, Ministry of Culture and Tourism, 2023; General Office of the Ministry of Culture and Tourism et al., 2024). This shift provides a realistic entrance for research: If smart tourism is still understood as front-end applications such as scenic tour guides, online marketing, or mobile payments, it will be difficult to explain the role of data interfaces, platform rules, county operation and maintenance, and cross-department governance in infrastructure transformation.

Based on the above background, this paper proposes three research questions. RQ1: What are the supply-side evolution characteristics of the digitalization of China's tourism infrastructure from 2019 to 2024? RQ2: What combination of tools does the relevant policy text use to promote the construction of the technology layer, data layer, service layer and governance layer? RQ3: What regional and hierarchical differences does digital transformation show between





the east, middle and west, core cities and county cultural tourism, large scenic spots and small and medium-sized scenic spots?

LITERATURE REVIEW

Concept definition and digital dimension of tourism infrastructure.

Tourism infrastructure usually refers to a set of material and institutional conditions that support tourists' arrival, stay, tour, consumption and safety. Tourism infrastructure in the traditional sense includes transportation connections, scenic trails, visitor centers, parking facilities, signage systems, public toilets, emergency rescue facilities, ticket windows and destination public service facilities. After digital transformation enters this field, the boundaries of infrastructure are expanded: communication networks, IoT sensing devices, electronic ticketing, reservation systems, mobile payments, cloud platforms, data middle platforms, identity authentication, traffic monitoring and emergency command systems have all become part of the destination's operational capabilities. This article uses the concept of "digital transformation of tourism infrastructure" to refer to the systemic changes in tourism infrastructure in technology embedding, data connectivity, service reorganization, and governance rule updates.

This concept requires distinguishing two dimensions. The first is the digital transformation of hard infrastructure, which means superimposing or embedding digital technology on existing physical facilities. For example, scenic spot gates are connected to ID card recognition, parking lots are connected to sensorless payment, visitor centers are equipped with passenger flow monitoring screens, tourist trails and ropeway systems are connected to safety sensing equipment, and tourist toilets are integrated with map retrieval and status feedback. This type of renovation relies on existing space and facility conditions, and the goal is usually to improve management efficiency, service convenience, and security response speed. The second is digitally native infrastructure, that is, infrastructure that does not rely on a single physical facility but exists directly in the form of data, platforms and interfaces, such as a unified reservation platform, cultural tourism data resource directory, online travel trading platform, electronic contract system, cross-departmental supervision platform, destination applets and open APIs. The value of this type of infrastructure lies not in the "visible devices" but in its ability to connect tourists, businesses, governments and destination resources.

Digital infrastructure theory helps understand this distinction. Tilson et al. (2010) pointed out that digital infrastructure is open, scalable and relational, and its evolution is not entirely controlled by a single organization, but is formed through the use and recombination of multiple agents. Applied to the tourism field, scenic gates, 5G networks, reservation platforms, supervision interfaces and user evaluation systems are not isolated technical projects, but together form the basic layer of destination services and governance. If digital transformation only stops at the equipment procurement level, it may be difficult to create cross-





system collaboration; if digital native infrastructure lacks public rules, data standards, and operation and maintenance, it may also form new platform barriers. This article includes both of them as research objects in order to put "what to build" and "how to run" on the same plane of analysis.

Research context of smart tourism and destination digitization.

Smart tourism research provides a direct theoretical source for understanding the digitalization of tourism infrastructure. Gretzel et al. (2015) summarized smart tourism as a tourism form based on smart destinations, smart business ecology and smart experience. Its core is not a single application, but the organizational process of data collection, exchange, processing and value conversion. Li et al. (2017) sorted out the concept of smart tourism from the perspective of tourism information services, emphasizing the interaction between tourists, enterprises and destination managers in information acquisition, service response and experience shaping. Both types of research jointly suggest that tourism digitalization cannot only be understood as the replacement of offline channels by online channels, but is closer to a reorganization of service systems mediated by data and technology.

There is a closer relationship between China research and policy practice. Zhang Lingyun et al. (2012) earlier started from the basic concepts and theoretical system of smart tourism, proposed an analytical framework supported by communication, perception, computing and intelligent services, and included tourists, enterprises, governments, communities and other subjects into the value supply process. Wang et al.'s (2013) analysis of China's smart tourism destination initiatives also shows that smart tourism in the Chinese context is not entirely spontaneously formed by the market, and the public sector plays an organizational role in destination planning, data integration, and public service provision. From this point of view, on the one hand, China's smart tourism research absorbs discussions on technology, experience and platform in international research, and on the other hand, it has stronger policy orientation and local governance.

However, smart tourism research still has limitations at the object level. Many studies take tourist experience, service innovation or destination marketing as the main objects of analysis, and infrastructure is often treated as a background condition. This helps explain tourists' behavior in using mobile services, but it is not easy to explain why there are gaps in smart scenic spots, reservation systems, data governance and operational capabilities in different regions. If viewed from an infrastructure perspective, the research object shifts from "how tourists use digital services" to "which technologies, data, platforms and rules make services possible." This shift does not negate smart tourism research, but traces its service and experience issues back to supply structure, institutional arrangements and spatial conditions.

Policy drivers and institutional characteristics in China's context.

The digitalization of China's tourism infrastructure has strong policy-driven characteristics. The 2020 "Opinions on Deepening "Internet + Tourism" to





Promote High-Quality Development of the Tourism Industry" proposed to improve tourism information infrastructure, expand Internet tourism services, promote scenic spot reservations and smart management, and put public services, market entity cultivation and governance capabilities in the same document for deployment (Ministry of Culture and Tourism et al., 2020). The 2021 "14th Five-Year Plan" tourism development plan further links smart tourism, public services, tourism consumption and regional coordination, indicating that digitalization is not just the work of the technical department, but part of the construction of the modern tourism system (State Council, 2021a). These policies provide action directions for local governments and scenic spots, and also make the digitalization of tourism infrastructure exhibit obvious institutional supply characteristics.

The focus of policy instruments has been refined in recent years. The 5G+ smart tourism policy focuses on network coverage of tourist sites, typical application scenarios and industrial collaboration, reflecting the direct embedding of technical layer construction in the tourist space (Ministry of Industry and Information Technology, Ministry of Culture and Tourism, 2023). The 2024 Smart Tourism Innovation and Development Action Plan proposes tasks such as improving smart tourism infrastructure, improving smart tourism public services, and "going to the cloud and using data to empower intelligence" in scenic spots. The policy statement has shifted from "promotion and application" to the combined governance of "infrastructure-service efficiency-data collaboration" (General Office of the Ministry of Culture and Tourism et al., 2024).

This policy drive does not mean that regions will achieve homogeneous results. Digital infrastructure construction is jointly constrained by local finance, industrial foundation, tourist scale, operational talents and platform partnerships. It is usually easier for large destinations to dilute system construction costs through passenger flow scale, and it is easier to obtain cooperation from communication operators, online travel platforms and technology companies; counties and small and medium-sized scenic spots may face problems such as insufficient investment, weak maintenance capabilities, inconsistent data standards and low-frequency application use. The digitalization of tourism infrastructure in the Chinese context therefore has dual attributes: national and industry policies provide direction and resource mobilization, and local execution capabilities and spatial hierarchies determine differences in transformation effects.

Based on the above literature and policy context, this article constructs a four-layer conceptual framework of "technology layer-data layer-service layer-governance layer". This framework is a conceptual framework used in this article to organize evidence and explain phenomena, not an empirical model used for statistical testing. The technical layer refers to the basic base such as networks, terminals, sensing devices, computing power and cloud resources, and answers the question of "can it be connected and processed?" The data layer refers to data





collection, standards, sharing, interfaces, resource directories and security management, and answers the question "Can a usable data flow be formed?" The service layer refers to application scenarios such as tourist reservations, tour guides, payment, complaints, recommendations, transportation connections, and business operation support, and answers the question of "can it be converted into user and business value?" The governance layer refers to policy rules, regulatory platforms, public service responsibilities, market order, privacy protection, accessibility and emergency management, and answers the question of "who will coordinate, constrain and provide security".

There is no linear substitution relationship between the four layers. The expansion of the technology layer can improve the accessibility of destination digitalization, but if the data layer lacks unified standards, the service layer may remain in multiple disconnected applications; if the service layer relies too much on external platforms, the governance layer will need to deal with data availability, platform rule transparency, and the bargaining power of small and medium-sized entities; if the governance layer only focuses on approval and project construction but neglects operational evaluation, the investment in the technology layer may also be used inefficiently. Based on this, this article understands the digitalization of tourism infrastructure as a cross-layer collaborative process, and examines how statistical indicators, policy tools, and regional differences correspond to this framework in subsequent research results.

RESEARCH METHODOLOGY

This article adopts a mixed secondary data research design and does not use questionnaires, interviews, experiments or primary behavioral data crawled by platforms. The core of the design is to put official statistical trends, policy texts and public case materials into the same analytical framework to mutually verify the changes in the supply, institutional and spatial levels of tourism infrastructure digitalization. The data retrieval time is August 16, 2026. The statistical and policy materials will give priority to the public original texts of national statistics, industry authorities and authoritative industry reports; the public case materials will come from notices, annual reports, press releases and service pages publicly released by destination management agencies, local governments and cultural tourism departments. This article does not force conversion of data of different calibers, nor does it interpolate missing values. All indicators that lack continuous public data of the same caliber are marked with "—".

The official statistics section is used to describe the overall trend from 2019 to 2024. Key indicators include the number of Chinese travellers, China's total tourism expenditure, the number of 5G base stations, Internet penetration rate and the scale of online travel booking users.

In addition to the analysis of statistical trends and policy texts, this article is supplemented by public materials at the three levels of scenic spots, cities and counties as sources of confirmation. Relevant materials mainly include





management agency notices, annual reports, service pages and public information from local cultural and tourism departments, which are used to observe differences in the presentation of reservations, ticketing, tour guides, passenger flow monitoring and other functional modules at different levels.

RESULTS AND DISCUSSION

Official statistics show that the digitalization of China's tourism infrastructure from 2019 to 2024 is not advancing linearly, but has experienced a parallel process of demand fluctuations and technological expansion. China's tourism market reached 6.006 billion people and 5.73 trillion yuan in total expenditure in 2019. After the impact in 2020, it dropped to 2.879 billion people and 2.23 trillion yuan. It rebounded to 3.246 billion people and 2.92 trillion yuan in 2021. 20 It will be under pressure again in 2022 to 2.530 billion person-times and 2.04 trillion yuan, rebound to 4.891 billion person-times and 4.91 trillion yuan in 2023, and further recover to 5.615 billion person-times and 5.75 trillion yuan in 2024 (Ministry of Culture and Tourism, 2020, 2021, 2022, 2023, 2024, 2025). Correspondingly, the digital base continues to expand: the Internet penetration rate will increase from 64.5% in 2019 to 78.6% in 2024, the number of 5G base stations will increase from 718,000 in 2020 to 4.251 million in 2024, and the number of online travel booking users will reach 548 million in 2024 (CNNIC, 2020, 2021, 2022, 2023, 2024, 2025; Ministry of Industry and Information Technology, 2021, 2022, 2023, 2024, 2025). Together, these data show that travel demand is recovering amid fluctuations, while network and computing power bases maintain continuous investment.

Table 1

Evolution of key indicators of digitalization of China's tourism infrastructure (2019-2024)

Year	5G Base Stations (10,000 units)	Internet Penetration Rate (%)	Domestic Tourist Trips (100 million)	Total Tourism Expenditure (Trillion CNY)
2019	13	64.5	60.06	5.73
2020	71.8	70.4	28.79	2.23
2021	142.5	73.0	32.46	2.92
2022	231.2	75.6	25.30	2.04
2023	337.7	77.5	48.91	4.91
2024	425.1	78.6	56.15	5.75

Data sources: the Ministry of Culture and Tourism's "Statistical Bulletin on Culture and Tourism Development" over the years, the Ministry of Industry and Information Technology's "Statistical Bulletin on the Communications Industry", and CNNIC's "Statistical Report on China's Internet Development" over the years. The Ministry of Culture and Tourism's bulletins over the years have made adjustments to the name and statistical caliber of China's total tourism expenditure. This article directly quotes the original report values without caliber conversion.

Analysis of policy text shows that policies related to the digitalization of tourism infrastructure have gradually shifted from "single point application promotion" to "equal emphasis on infrastructure, data governance, platform supervision and equipment updating". The 2020 policy still focuses on Internet service access, scenic spot reservations, and smart management, which is a typical





combination of supply- and environment-based tools; the 2021 "14th Five-Year Plan" tourism development plan incorporates smart tourism, public services, and regional coordination into the main line of industrial development (State Council, 2021a); in the same year, the "14th Five-Year Plan" digital economy development plan incorporates data elements, platform collaboration, and governance capabilities into the broader institutional environment (State Council, 2021b); the 2022 digital government construction document further strengthens cross-departmental data sharing and government collaboration (State Council, 2022); the 2024 smart tourism innovation development action plan and equipment update measures in the cultural and tourism fields will advance digitalization to the level of infrastructure transformation, facility and equipment update, and public service efficiency improvement (General Office of the Ministry of Culture and Tourism, etc., 2024; National Development and Reform Commission, et al., 2024). In terms of policy tools, supply-based tools still dominate, but the proportion of environmental-based tools is increasing. Demand-based tools are mainly reflected in reservations, consumption scenarios, and the activation of platform services.

Table 2
Text analysis matrix of policies related to digitalization of tourism infrastructure

Policy Name (Document No.)	Year of Issuance	Issuing Authority	Summary of Core Measures	Corresponding Framework Level in This Paper	Policy Instrument Type
<i>Opinions on Deepening "Internet + Tourism" to Promote the High-Quality Development of the Tourism Industry</i> (Wen Lü Zi Yuan Fa [2020] No. 81)	2020	Ministry of Culture and Tourism, et al.	Improving tourism information infrastructure; promoting scenic-area reservation systems, smart management, and internet-based tourism services	Technology and service layers (primary); data and governance layers (secondary)	Supply-oriented; environment-oriented
<i>The 14th Five-Year Plan for Tourism Development</i> (Guo Fa [2021] No. 32)	2021	State Council	Integrating smart tourism, public services, tourism consumption, and regional coordination into the main thrust of tourism development	Service and governance layers	Environment-oriented
<i>The 14th Five-Year Plan for the Development of the Digital Economy</i> (Guo Fa [2021] No. 29)	2021	State Council	Emphasizing digital infrastructure, the circulation of data as a factor of production, and the well-regulated development of the platform economy	Technology, data, and governance layers	Supply-oriented; environment-oriented
<i>Guiding Opinions on Strengthening the Construction of a Digital Government</i> (Guo Fa [2022] No. 14)	2022	State Council	Promoting cross-departmental data sharing, inter-agency coordination of government affairs, and the development of unified regulatory capacity	Data and governance layers	Environment-oriented
<i>Action Plan for the Innovative Development of Smart Tourism</i>	2024	General Office of the Ministry of Culture and Tourism, et al.	Proposing the upgrading of smart tourism infrastructure and public services, alongside "cloud adoption, data utilization, and intelligence empowerment"	Technology, data, and service layers	Supply-oriented
<i>Implementation Plan on Promoting Equipment Renewal in the Cultural and Tourism Sector</i>	2024	National Development and Reform Commission, et al.	Promoting the renewal of cultural and tourism facilities and equipment, energy-saving renovation, and smart upgrading	Technology and service layers	Supply-oriented

Only policy texts that can be verified from the official websites of the central government and ministries and are directly related to the digitalization of tourism infrastructure are included in the table.





Based on the public policy texts and public service information of local cultural and tourism departments included in this article, regional and hierarchical differences can be qualitatively summarized. Some core cities in the east have earlier formed a service chain of "network coverage - reservation platform - payment and settlement - supervision linkage". Cultural tourism services are often presented through unified entrances, mini-programs or city-level platforms. Tourists are faced with integrated services across scenic spots and departments. Digitalization in the central and western regions more often starts from key scenic spots and core corridors. Online reservations, passenger flow monitoring and ticketing systems are advancing rapidly, but cross-scenic area data exchange and municipal-level platform collaboration are relatively limited. The digitization of county cultural tourism relies more on superior financial investment, platform outsourcing and single-point project construction. Public service platforms are often implemented before in-depth data governance. Large-scale scenic spots and cultural heritage-type scenic spots are more likely to deploy electronic ticketing, time-sharing reservations, guidance systems and emergency linkages at the same time; small and medium-sized scenic spots are more limited to basic ticket sales, QR code navigation and mobile payment and other single functions. The above differences are qualitative generalizations based on public materials and lack quantitative verification with a unified national standard.

The four-layer framework has a corresponding relationship with the above results. On the technical level, the continuous expansion of 5G and network bases provides basic conditions for destination networking; on the data layer, reservations, monitoring and cross-department sharing determine whether information can flow between systems; on the service layer, electronic ticketing, mobile payment, tour guides and online customer service constitute the most direct experience interface for tourists; on the governance layer, policy tools and regulatory platforms determine whether digitalization is just project construction, or whether it can be transformed into stable public service capabilities. The results show that the digitalization of tourism infrastructure has formed a clear hierarchical differentiation in China, but the degree of synchronization at different levels is not the same. Technology expansion is faster than data integration, and service platformization is faster than the refinement of governance rules. This difference appears repeatedly in the above statistics and policy materials.

Theoretical Interpretation of Main Findings.

The results of this article support the basic judgment of smart tourism research on the linkage of "technology-data-experience", but also supplement existing research. Gretzel et al. (2015) and Li et al. (2017) emphasized that smart tourism consists of data processing, service response and experience generation. The statistics and policy materials of this article show that this process in China does not start from the tourist experience side alone, but is jointly promoted by 5G network, reservation ticketing, online platforms, public services and





regulatory rules. In other words, the navigation, payment, reservation and complaint portals seen on the tourist side are only the service layer manifestations of the digitalization of tourism infrastructure. Behind them are multi-layered supports of communication networks, data interfaces, platform rules and public governance.

This article also corrects the narrow understanding that equates smart tourism with "informatization of scenic spots". Zhang Lingyun et al. (2012) once discussed the theoretical system of smart tourism from the perspective of communication, perception, computing and intelligent services. Wang et al. (2013) pointed out that the construction of smart tourism destinations in China reflects the dominant logic of public sector organizations and services. The policy text analysis of this article further illustrates that this public sector organizational role has extended from early smart scenic spots and online service promotion to digital infrastructure, data governance, equipment updates and platform supervision. National planning and ministry policies form a combined supply between technology base, service applications and governance rules, making the digitalization of tourism infrastructure in China's context highly policy embedded.

The results of this article show that the digitalization of China's tourism infrastructure is shifting from "facilities plus technology" to "infrastructure is the relationship network". Tourist toilets, parking lots, ticket gates, passenger flow monitoring screens and scenic area applets cannot automatically generate service capabilities. Only after being connected to unified data flows, service entrances and supervision mechanisms can they become operable, dispatchable and assessable infrastructure. This also corresponds to the control paradox pointed out by Tilson et al. (2010): On the one hand, digital infrastructure relies on planning and rules, and on the other hand, it will continuously generate new connection relationships and governance problems during multi-agent use. If each system is only built at the project level without interfaces and rules, digitalization will easily remain in display applications.

Research results show that the primary contradiction faced by the digitalization of tourism infrastructure is to focus on investment and neglect operation. In many places, smart construction is understood as equipment procurement, platform launch and demonstration project application. Visible results can be achieved in the short term, but long-term operation and maintenance, system iteration, data cleaning, personnel training and performance evaluation are often underestimated. Digital infrastructure is different from traditional one-time projects. The launch of the system is only the beginning of the operation cycle. Without a stable budget and a professional operation and maintenance team, scenic spot passenger flow monitoring, reservation systems, emergency platforms, and public service entrances may experience low frequency use, aging functions, or data slumber.

Data silos are the second type of contradiction. The expansion of the technology layer does not automatically bring about data layer collaboration. Tourism data is scattered among scenic spots, transportation, public security,





market supervision, communication operators, online travel platforms and local cultural and tourism departments. Data standards, sharing boundaries and security responsibilities are not completely consistent. Disclosure policies have repeatedly emphasized cross-department sharing and cloud use of data to empower intelligence. However, judging from local practice, data sharing is more likely to form temporary linkages during major holidays, key scenic spots, and emergency scenarios. There is still room for improvement in normalized, institutionalized, and reusable data governance capabilities. This also explains why 5G, electronic ticketing and mobile payment are popularized quickly, while regional tourist flow analysis, precise public services and cross-platform supervision are promoted relatively slowly.

Platform dependence and bargaining power constitute the third type of contradiction. Online travel platforms, map platforms and super applications provide traffic entrances, transaction capabilities and user data for destinations, but small and medium-sized scenic spots, county cultural tourism enterprises and local public departments have limited bargaining power in terms of platform rules, data return and marketing expenses. Buhalis (2020)'s judgment about tourism technology moving from ICT, e-tourism, and smart tourism to environmentally intelligent tourism suggests that platforms and algorithms will become more and more deeply involved in the tourism consumption chain. For destinations, platform cooperation can lower the threshold for service construction and may also weaken local control over user relationships and data assets. How to retain the governance capabilities of public data, public services and market order while leveraging platform capabilities is an issue that must be addressed in the digitalization of tourism infrastructure.

Gaps in county digital capabilities are equally prominent as in inclusive accessibility. County cultural tourism has rich scenarios such as rural tourism, ecological leisure and cultural experiences, but the construction of digital systems often relies on outsourcing, and internal personnel have insufficient understanding of data analysis, platform operations and system maintenance. Elderly tourists, disabled tourists and groups unfamiliar with mobile terminal operations may also encounter new barriers to entry in reservation systems, cashless payments, electronic tickets and mini-program services. The public nature of tourism infrastructure requires that digitalization cannot only serve high-frequency mobile Internet users. Offline windows, human assistance, barrier-free interaction, multi-language information and low-threshold identity authentication should still be regarded as components of the digital service system, rather than being regarded as transitional arrangements.

The theoretical contribution of this article is to put tourism infrastructure research, smart tourism research and digital infrastructure research into the same analytical framework. Existing smart tourism research emphasizes technology application and tourist experience, digital infrastructure research emphasizes platform, data and generativity, and tourism infrastructure research has long focused on transportation, scenic spots and public service supply. The





technology layer-data layer-service layer-governance layer framework proposed in this article enables the three types of research to be connected on the issue of "how infrastructure is digitally reorganized." This framework does not regard technology as an exogenous tool, nor does it regard tourist experience as the only outcome, but emphasizes the synergy and dislocation between multi-layer structures.

This article also incorporates policy drivers in the Chinese context into theoretical discussions. International smart tourism research focuses more on destination competition, corporate innovation and tourist experience. The Chinese case shows that policy texts, planning tools, demonstration projects and regulatory rules are deeply involved in the process of infrastructure digitalization. Therefore, the digitalization of China's tourism infrastructure is not a purely market-oriented technology diffusion, nor is it a simple project construction under administrative orders, but a composite governance process formed between national policies, local execution, platform enterprises and destination operating entities. This finding complements the discussion of institutional environments and spatial hierarchies in the smart tourism literature.

Practice and Policy Implications.

In practice, the digitalization of tourism infrastructure should shift from project construction logic to full life cycle operation logic. Local governments and scenic spots should simultaneously set operation and maintenance funds, data update responsibilities, system iteration cycles, and performance evaluation indicators during the project establishment stage, and include tourist usage, system stability, data availability, and emergency response effects into acceptance, rather than just checking the number of devices and platform online status.

Data governance should prioritize standards, interfaces, and reflow issues. Provincial or city-level cultural and tourism departments can establish minimum necessary data directories to clarify field standards, sharing conditions and security boundaries for scenic spot reservations, ticketing, passenger flow, complaints, security and consumption data. For projects that cooperate with platform companies, public service data return, interface open scope and data usage audit mechanism should be stipulated in the contract to avoid public governance completely relying on closed reports of external platforms.

Regional policies need to distinguish between levels and scenarios. Head scenic spots can focus on building passenger flow forecasting, emergency linkage and cross-system dispatching capabilities; county cultural tourism should give priority to building low-cost, maintainable and trainable basic service systems to reduce the maintenance burden caused by one-time customized platforms. For the central and western regions and small and medium-sized scenic spots, policy support should not only subsidize hardware procurement, but also support operation and maintenance hosting, personnel training, data governance consultation and cross-scenic spot sharing platforms.





Inclusive services should be included as an infrastructure standard rather than as an add-on feature. Reservation, payment, navigation and complaint systems need to retain manual alternative routes, and public service interfaces should consider the needs of the elderly, disabled groups and foreign tourists. Digital service assistance points can be set up at the entrance of scenic spots, visitor centers and transportation nodes to combine online convenience with offline information. Only when digital services do not exclude groups with low digital capabilities can the digitalization of tourism infrastructure conform to the attributes of public services.

CONCLUSIONS

The conclusion of this article is that the digitalization of tourism infrastructure is not about moving offline facilities online, nor is it about superimposing a number of smart devices in scenic spots, but a process of joint reorganization of the technology layer, data layer, service layer and governance layer. The Chinese case shows that policy supply can accelerate the integration of digital infrastructure and tourism scenarios, but whether stable service capabilities can be formed still depends on data collaboration, operation and maintenance, platform relationships and inclusive public services. The four-layer framework proposed in this article can provide a conceptual tool for subsequent research to compare the digital maturity of different destinations, and can also provide a diagnostic dimension for local governments and scenic spots to formulate digital construction plans.

The above framework also has reference value for countries where the tourism growth period and the digital infrastructure construction period overlap each other. Taking Uzbekistan as an example, it has made rapid progress in visa facilitation, cross-border transportation channel construction and Silk Road cultural heritage tourism development in recent years. The growth of tourism demand highly coincides with the advancement of mobile network coverage, electronic payment popularization, and government digitalization. This combination of supply conditions is comparable to China's situation from 2019 to 2024. As far as the framework of this article is concerned, the experiences available for reference focus on three points. First, the technical layer construction and data layer standards should be deployed simultaneously to avoid network coverage and terminal investment first, while data interfaces and resource directories lag behind, resulting in system segmentation that is difficult to dismantle later. Second, the cooperation between the service layer and external platforms should clarify public data return, interface opening scope and usage audit mechanism at an early stage, so that the destination retains basic control over user relationships and data assets. Third, the governance layer needs to include operation and maintenance funds, personnel capabilities and performance evaluation into the project establishment process; in areas with limited local finance and professional manpower, low-cost, maintainable, and trainable basic service systems are often more sustainable than one-time





customized platforms. At the same time, it should be noted that China's transformation path relies on a large domestic passenger flow scale, strong central policy mobilization capabilities, and a relatively complete platform industry foundation. These conditions are not universal. Therefore, the transferable part of the framework of this article is the diagnostic perspective of four-layer collaboration and the identification method of dislocation between layers, rather than the specific construction timing, investment intensity, or platform organizational form; the corresponding institutional design still needs to be demonstrated separately based on the financial capabilities, tourism structure, and governance traditions of each country.

REFERENCES

1. Buhalis, D. (2020). Technology in tourism—from information communication technologies to eTourism and smart tourism towards ambient intelligence tourism: A perspective article. *Tourism Review*, 75(1), 267–272. <https://doi.org/10.1108/TR-06-2019-0258>
2. China Internet Network Information Center. (2020). Statistical report on China's Internet development. <https://www.cnnic.net.cn/>
3. China Internet Network Information Center. (2021). Statistical report on China's Internet development. <https://www.cnnic.net.cn/>
4. China Internet Network Information Center. (2022). Statistical report on China's Internet development. <https://www.cnnic.net.cn/>
5. China Internet Network Information Center. (2023). Statistical report on China's Internet development. <https://www.cnnic.net.cn/>
6. China Internet Network Information Center. (2024). Statistical report on China's Internet development. <https://www.cnnic.net.cn/>
7. China Internet Network Information Center. (2025). Statistical report on China's Internet development. <https://www.cnnic.net.cn/>
8. Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: Foundations and developments. *Electronic Markets*, 25(3), 179–188. <https://doi.org/10.1007/s12525-015-0196-8>
9. Li, Y., Hu, C., Huang, C., & Duan, L. (2017). The concept of smart tourism in the context of tourism information services. *Tourism Management*, 58, 293–300. <https://doi.org/10.1016/j.tourman.2016.03.014>
10. Ministry of Culture and Tourism. (2020). Statistical communique on culture and tourism development. <https://www.mct.gov.cn/>
11. Ministry of Culture and Tourism. (2021). Statistical communique on culture and tourism development. <https://www.mct.gov.cn/>
12. Ministry of Culture and Tourism. (2022). Statistical communique on culture and tourism development. <https://www.mct.gov.cn/>
13. Ministry of Culture and Tourism. (2023). Statistical communique on culture and tourism development. <https://www.mct.gov.cn/>
14. Ministry of Culture and Tourism. (2024). Statistical communique on culture and tourism development. <https://www.mct.gov.cn/>





15. Ministry of Culture and Tourism. (2025). Statistical communique on culture and tourism development. <https://www.mct.gov.cn/>
16. Ministry of Culture and Tourism, & Ministry of Industry and Information Technology. (2023). Notice on strengthening collaborative innovation of 5G + smart tourism (Document No. MIIT-Link Communication [2023] 42). <https://www.miit.gov.cn/>
17. Ministry of Culture and Tourism, & General Office of the Ministry of Culture and Tourism. (2020). Opinions on deepening "Internet + tourism" to promote high-quality tourism development (Document No. WLV Resources Development [2020] 81). <https://www.mct.gov.cn/>
18. Ministry of Culture and Tourism, et al. (2024). Action plan for innovation and development of smart tourism. <https://www.mct.gov.cn/>
19. Ministry of Industry and Information Technology. (2021). Statistical communique on the communications industry. <https://www.miit.gov.cn/>
20. Ministry of Industry and Information Technology. (2022). Statistical communique on the communications industry. <https://www.miit.gov.cn/>
21. Ministry of Industry and Information Technology. (2023). Statistical communique on the communications industry. <https://www.miit.gov.cn/>
22. Ministry of Industry and Information Technology. (2024). Statistical communique on the communications industry. <https://www.miit.gov.cn/>
23. Ministry of Industry and Information Technology. (2025). Statistical communique on the communications industry. <https://www.miit.gov.cn/>
24. National Development and Reform Commission, et al. (2024). Implementation plan for promoting equipment renewal in the culture and tourism sector. <https://www.ndrc.gov.cn/>
25. State Council. (2021a). The 14th Five-Year Plan for tourism development (Document No. GF [2021] 32). https://www.gov.cn/zhengce/content/2022-01/20/content_5669468.htm
26. State Council. (2021b). The 14th Five-Year Plan for digital economy development (Document No. GF [2021] 29). https://www.gov.cn/zhengce/content/2022-01/12/content_5667817.htm
27. State Council. (2022). Guiding opinions on strengthening digital government construction (Document No. GF [2022] 14). https://www.gov.cn/zhengce/content/2022-06/23/content_5697299.htm
28. Tilson, D., Lyytinen, K., & Sorensen, C. (2010). Research commentary—Digital infrastructures: The missing IS research agenda. *Information Systems Research*, 21(4), 748–759. <https://doi.org/10.1287/isre.1100.0318>
29. Wang, D., Li, X. R., & Li, Y. (2013). China's "smart tourism destination" initiative: A taste of the service-dominant logic. *Journal of Destination Marketing & Management*, 2(2), 59–61. <https://doi.org/10.1016/j.jdmm.2013.05.004>
30. Zhang, L., Li, N., & Liu, M. (2012). Basic concepts and theoretical system of smart tourism. *Tourism Tribune*, 27(5), 66–73. <https://doi.org/10.3969/j.issn.1002-5006.2012.05.014>



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