Research on the Path of Digital Technology Enabling High-Quality Integrated Development of Rural Tourism

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Abstract: In recent years, the digital cultural and tourism development in rural areas has been booming and has become one of the key forces driving rural revitalization. However, behind its prosperous development, problems such as serious homogenization of tourism products, significant constraints of the "digital divide", insufficient depth of integration of culture and tourism, and a shortage of professional talents have gradually emerged. Based on this, this paper deeply combs the mechanism of digital technology enabling the integration of rural culture and tourism, analyzes the existing problems in the development of rural digital cultural and tourism, and puts forward the following suggestions: First, use digital technology to empower the innovation of tourism products and create differentiated and personalized tourism products; second, strengthen rural digital construction and promote the growth of rural tourism; third, break through the institutional and mechanism barriers to the integration of culture and tourism and promote the in-depth integration of cultural and tourism resources; fourth, cultivate digital tourism professionals through multiple channels to provide talent guarantee for the sustainable development of rural digital cultural and tourism. This study aims to promote the deep integration of rural digital culture and tourism, enhance new high-quality productivity, and provide a solid theoretical support and practical path for realizing rural revitalization and common prosperity.

Keywords: Digital technology; Cultural and tourist integration; Rural revitalization; Rural digital cultural tourism

Introduction

The profound combination of rural culture and tourism is a crucial approach to boost the high-quality development and all-around revitalization of rural tourism (Tang et al., 2023). In 2024, the No.1 Central Document suggested "carrying out the in-depth integration project of rural cultural tourism and advancing the construction of rural tourism cluster areas(villages)", which made clear the direction for the high-quality growth of rural cultural tourism. Digital technology, being the key to industrial upgrading and high-quality development (Ma et al., 2023), plays a vital part in facilitating the rapid innovation and development of the rural cultural tourism industry and the in-depth integration of rural cultural tourism (Ponsignon & Derbaix, 2020).

At present, foreign researches on digital technology and cultural tourism mainly focus on five aspects, namely cultural tourism, reconstruction of historical sites, information of tourist routes, smart phones and cultural tourism, and virtual cultural tourism (VR, AR, MR) (Zheng et al., 2023). The majority of them are concentrated on the design and protection aspects of cultural tourism. Systematically exploring how digital technologies can facilitate the integration of culture and tourism is an area with little-covered literature. While some scholars make efforts to explain the role that digital technology plays in the integration of the cultural and tourism industries, their discussion only stays at the level of industrial integration and fails to move forward to broader research on cultural-tourism integration (Zhao et al., 2023). Nevertheless, in China, there are a relatively large number of relevant researches on digital technology and cultural tourism. Some scholars have carried out discussions on the theoretical connotation, value, and path of the integration of digital technology and cultural tourism (Huang et al., 2024; Guo, 2023; Lu & Yu, 2022). Although the previous research has provided a strong basis for the profound integration of digital technology and cultural tourism, several issues remain. For example, what does the in-depth integration of digital cultural tourism entail? How can the obstacles and problems during the integration of digital cultural tourism be resolved? And how can the cultural tourism industry, which is oriented by new high-quality productive forces, make use of digital technology to maximally unleash the vitality of cultural tourism consumption? No systematic or thorough research has been conducted on these aspects. Hence, this study makes a deep analysis of the action mechanism, practical difficulties, and implementation paths of digital technology enabling the integration of rural culture and tourism, and offers ideas for promoting the high-quality development of rural tourism.

The action mechanism of digital technology enabling the integration of rural culture and tourism
Digital development of new quality productive forces
As digital technologies continue to iterate and upgrade, market demand and consumption patterns have undergone earth-shaking changes. In this context, the cultural tourism industry is facing the dual challenges of the urgent need to optimize the structure and re-integrate the industrial chain. New quality productive forces emphasizes innovation as the lead, taking new technology, new economy and new business forms as its main connotation (Zhou & Xu, 2023), which undoubtedly points out the direction for the deep integration of cultural tourism. The profound integration of culture and tourism is not merely the combination of various elements, sectors, and industries, which represents only the integration of conceptual interaction and superficial-level exchanges. Instead, it necessitates a fundamental adjustment of the production relations within the cultural tourism industry and the refinement of the combination of production factors. This is done to attain the effective goal of new high-quality productive forces and subsequently establish an appealing and competitive cultural tourism ecosystem (Huang et al., 2024). Digital technology has been beyond the scope of the traditional economic development model, as a new production factor with transformative power, deeply involved in and strongly promote the transformation and upgrading process of industry. As the core engine driving the development of new quality productive forces, digital technology can efficiently optimize the allocation of production factors in the tourism industry and reshape or broaden the development boundaries of the tourism industry (Wang et al., 2024). In this dynamic development process, digital technology comprehensively empowers the tourism industry, bringing about technological innovation and transformation, industrial restructuring and upgrading, product diversification, a remarkable enhancement of the tourist experience, and a broad expansion of the market space. It serves as an unceasing wellspring of impetus, propelling the cultural and tourism industry towards high-quality, sustainable advancement.

Interaction between digital travel supply and demand
In the ever-evolving landscape of the tourism industry, digital technology has emerged as a crucial impetus for regulating the supply-demand dynamics within the tourism market. As an important part of the tourism industry, rural tourism is facing many challenges in the process of vigorous development, such as the lack of forward-looking rural resource planning, product design fails to keep up with the trend of The Times, outdated marketing models, insufficient attraction of tourism products, and generally low satisfaction of tourists. Most of these problems are caused by poor digital information and unbalanced acquisition and application of digital technology (Zhu & Liu, 2023). The empowerment of digital technology has undoubtedly brought new vigor and vitality to the development of rural tourism. It can not only inject new elements into rural tourism products, achieve product innovation and upgrading, but also optimize and adjust various elements on the supply side, so as to effectively stimulate the tourism demand of tourists. Digital technology plays an irreplaceable role in regulating the supply and demand relationship in the tourism market, which is mainly reflected in the following two key aspects:
On the one hand, the supply side factors are optimized. Digital technology can help rural cultural tourism enterprises quickly adjust product supply (Wang & Yang, 2024). Relying on advanced digital design tools, meta-universe, virtual simulation technology, etc., enterprises can optimize the design of tourism products at low cost and high efficiency. By focusing on the expansion of the cultural dimension of tourism products, digital tools are used to deeply explore rural characteristic cultural resources and organically integrate them into tourism products, so that the original traditional tourism products will glow with new vitality, so as to meet the increasing needs of tourists for high-quality and personalized cultural tourism (Wang & Yang, 2024)). On the other hand, promote digital empowerment on the demand side. Through the digital platform to collect tourists' comments feedback, social sharing and other data, use digital algorithms to analyze the changing trend of tourists' demand, design personalized rural digital tourism products and tourism marketing programs for different types of tourists. In addition, through the Internet social media publicity, network broadcast and other forms can extend the market radiation scope of rural tourism products, effectively enhance their brand awareness, and then achieve the expansion of the tourist market, and effectively stimulate tourism consumption demand, promote the economic growth of rural areas, and help achieve rural revitalization and common prosperity.

Digital technology develops new forms of cultural tourism development
The innovative application of digital technology can inject great momentum into the development of rural cultural tourism. First, digital technology innovation helps explore new paths and heritage inheritance of rural tourism cultural heritage protection (Wang & Yang, 2024)). As a non-material spatial category oriented by human value consciousness, cultural space occupies an indispensable and key position in the framework of rural regional system and is one of the core components in the process of rural regional development (Yang et al., 2022). The development and reform of tourism products should not only focus on the optimization of internal service capabilities, but also outward expansion and scientific integration of multiple external resources (Huang & Wen, 2021; Ying & Zhou, 2007). Traditional rural cultural heritage includes not only material cultural heritage such as ancient village buildings, farming utensils and village cultural relics, but also intangible cultural heritage such as folk festivals, traditional handicrafts and folk stories, which plays an important role in the process of cultural and tourism integration. In order to better protect and inherit

these precious rural cultural heritage, modern digital technology plays a key role. The use of 3D scanning, high-definition photography and aerial photography, as well as digital audio and video recording and other technologies can play an important role in the protection and inheritance of the village's material cultural heritage and intangible cultural heritage. At the same time, through virtual reality (VR) and augmented reality (AR) technology, rural culture can be better presented to tourists, integrated into tourism products, enhance tourist experience, and show the unique meaning of rural cultural tourism.

Second, digital technology innovation promotes rural tourism marketing model innovation. Due to the existence of "digital divide" in rural tourism, the digital marketing model of many rural tourism products needs to be further optimized and upgraded. The marketing model of tourism products is related to its brand building and attraction enhancement, tourist drainage and market expansion, tourist experience optimization and satisfaction improvement, which plays a crucial role in the development of rural tourism. Rural tourism products can be promoted through digital marketing platforms, social media and network broadcast platforms to attract professional talents interested in rural environment employment and enrich the rural employment market. In addition, rural tourism products can also analyze tourists' needs and preferences through digital technology, and use big data precision marketing to promote products to target customer groups more efficiently. Digital technology provides qualitative change channels for the integrated development of rural culture and tourism, and the integration of culture and tourism also creates innovative impetus for the development of digital technology, promotes the continuous innovation and development of digital technology, and achieves a virtuous cycle of two-way promotion.

The realistic dilemma of digital technology enabling cultural and travel integration
Serious homogenization of digital cultural tourism products
At present, the rural cultural tourism industry is booming, but many rural cultural tourism products fall into a dilemma, with extremely serious homogenization and lack of attraction to tourists, especially in the key link of creating tourism products based on their own characteristics, there are serious defects (Yang & Yang, 2024).

In the field of rural digital cultural tourism product design, there is a general lack of novel creativity, and the landscape features are monotonous and similar. When using tourism resources to create characteristic landscapes, some villages blindly follow the trend, blindly cater to the preferences of the public, and are keen to create the so-called "network celebrity" landscape, but in this process, they lose the initiative and creativity of special development combined with their own actual situation, which restricts the development of rural tourism. The reason for these problems is that in the process of rural tourism development, developers ignore the unique advantages of the village itself, such as history, culture, folk customs and natural resources. The growth of rural tourism is intrinsically linked to its local culture and natural resources. Leveraging digital technology to further integrate rural history, culture, folk traditions, and natural resources with tourism holds significant importance. It can notably enhance tourists' travel experiences and boost their motivation for repeat visits.

More prominent "digital divide" problem in rural areas
Rural digital tourism is currently in a phase of ongoing development. The imbalance in rural development and the existence of a "digital divide" during the process of urban-rural digital development are prominent issues. These factors play a crucial role in influencing tourists' tourism experiences, as they can impede the seamless integration of digital elements in rural tourism scenarios and disrupt the overall satisfaction and immersion that tourists expect to achieve during their rural travel.

The theoretical origin of "digital divide" has gone through from "knowledge gap" theory to "information gap" theory, and finally formed and developed the concept of "digital divide". Currently, the inadequate digital information manifested in the development of rural digital tourism represents a significant manifestation of the "digital divide." Given the rapid progress of digital technology and its extremely fast upgrading pace, it is easy to form an "information gap" in rural groups with a low degree of digitalization, which may result in the emergence of a "new information gap" before the "old information gap" is filled, and the two are interlaced, exacerbating the unequal situation of information access among groups (He & Chen, 2024). Xu & Ma (2020) divides the specific connotation of "digital divide" into three layers of meanings, which are also deeply reflected in the development of rural digital tourism, revealing many existing digital information differences. First of all, the first "digital divide" lies in the obstacles to access to information and communication technology (ICT) in the process of rural tourism development, resulting in difficulties in updating tourism digital technology. Secondly, the second digital divide is mainly reflected in the limited use of ICT in rural digital tourism, and the differences in learning and cognition of ICT may lead to the technical advantages cannot be fully utilized. In addition, many villages are not equipped with perfect digital tourism equipment, and the lack of digital infrastructure is one of the important reasons for the limited use of digital information technology. Finally, the third digital divide focuses on the differences in the use of the Internet. The brand awareness of rural digital cultural tourism is relatively weak at present, the design and development of tourism products are not mature, the market positioning and customer segments are not clear, and the marketing management mode needs to be further upgraded. The rapid development of the Internet has brought vitality and vigor to the competition of the tourism market, but it has also brought impact to the rural tourism which is in the inferior position of digital. The

introduction of digital technology in rural development is not only conducive to the optimization and upgrading of rural tourism, but also an important channel to bridge the rural "digital divide" and bridge to reduce the disparity between urban and rural areas and attain common prosperity. How to use digital technology to cross the "digital divide" of rural tourism and provide strong impetus for the development of rural tourism still needs more exploration and practice.

Need to improve the integration mechanism of the cultural tourism industry

In the context of new quality productive forces, digital technology has brought new opportunities for rural industrial integration, but the problem that the industrial coordination mechanism is not yet perfect is still prominent, especially the industrial integration model of "cultural tourism +" and "+ cultural tourism" is not sufficiently developed (Wang et al., 2024).

With its technological advantages and innovation mode, the digital economy effectively breaks through the many limitations faced by the traditional cultural tourism industry in the dimension of time and space, creating an opportunity for the transformative development of the cultural tourism industry. At the same time, relying on its rich resource endowment and extensive market foundation, the cultural tourism industry provides diversified application scenarios and in-depth development directions for the expansion of the digital economy, and thus builds a close industrial relationship between the two. Through in-depth analysis and accurate adjustment of the collaborative mechanism in the process of the integration of the two, innovative reshaping of the presentation mode of cultural and tourism products with the help of cutting-edge technologies, in-depth exploration and organic integration of multiple factors to expand the boundaries of consumption scenes, has the potential to foster the integration of the digital economy with the cultural and tourism industries. This, in turn, can comprehensively empower the coordinated development of the regional economy, society, and culture, thereby laying a firm groundwork for enhancing the regional comprehensive competitiveness (He & Chen, 2024). Amid the integration of culture and tourism, which is guided by new-quality productivity, a crucial question remains: how can digital technology be harnessed to drive substantial transformations in the development of rural tourism resources, product design, marketing strategies, consumer behaviors, presentation content, business models, and other aspects? Additionally, how can we facilitate the rapid circulation of tourism production factors across various fields and industries and stimulate the emergence of new supply-demand relationships within the cultural and tourism sectors? These are still significant issues that demand attention.

Shortage of digital cultural tourism talents

In the process of the vigorous development of rural tourism, the shortage of digital cultural tourism talents has become increasingly prominent, and the professional training of on-the-job practitioners needs to be implemented and improved. From the perspective of talent supply, the degree of "aging" and "hollowing out" in rural areas continues to deepen, making the shortage of digital talents and the problem of talent return more severe (Wang et al., 2024). At the same time, the enrollment of China's digital cultural travel professional started late, and large-scale enrollment was concentrated in the past three years. As a typical interdisciplinary discipline, the training of digital cultural tourism professionals not only requires a solid theoretical foundation, but also relies on rich practical experience. This training characteristic inevitably leads to the time difference between talent training and market delivery, and it is difficult to quickly meet the urgent needs of the development of rural digital cultural tourism.

From the current situation of the on-the-job personnel, the overall professional level of the current rural tourism practitioners is low, and the relevant skills of digital cultural travel are seriously insufficient. When carrying out professional skills training, due to the disconnection between the training content and the actual demand, the lack of pertinence of training methods and other reasons, the training effect is not satisfactory. In addition, the rural digital tourism professional skills training system is not perfect, the lack of scientific and reasonable evaluation mechanism, can not effectively measure the training results and talent ability improvement degree, and further hinder the construction and development of rural digital cultural tourism talent team.

The practical path of cultural and tourist integration enabled by digital technology

Empower product innovation with digital technologies

In the process of rural tourism resource planning, remote sensing technology (RS), geographic information system (GIS), big data analysis technology, Internet of Things technology (IoT), intelligent decision support system (DSS) and other digital technologies can be used to make reasonable planning for rural tourism development and optimize resource allocation. Combine the history and culture, folk customs and natural resources of the countryside to design tourism products, do their own market positioning and customer segmentation, and pay attention to the brand construction of rural tourism. First of all, remote sensing technology (RS) is used to integrate rural geographic information, plan the use of various natural resources, tap potential tourism resources, assess the quality of ecological environment, prevent over-exploitation and waste of resources, check water pollution, soil erosion and tourism waste accumulation, and make timely adjustment, management and follow-up. Secondly, the use of geographic information

system (GIS) for tourism resource integration planning, combined with the distribution of scenic spots, accommodation, catering and transportation facilities in rural tourism distribution, design tourism resource maps, tourist sightseeing routes, but also provide directions for the improvement of rural facilities, tourism project development analysis and planning; Third, the rural tourism market is segmented through big data analysis technology, the data of tourists' behavior preference is analyzed, and tourism plans suitable for different consumer groups are formulated and tourism products are designed efficiently. Fourth, the use of Internet of Things (IoT) technology for intelligent management of rural tourism scenic spots, real-time monitoring of tourist flow, environmental information, equipment conditions in scenic spots, to improve the efficiency of traffic management, catering services, and human resources allocation in scenic spots; Fifth, the intelligent decision support system (DSS) is used to integrate and analyze the data results of the above technologies, establish data models and simulation analysis according to the actual situation of rural tourism development and operation, clarify product positioning and tourist market, and comprehensively put forward decision-making suggestions.

Improve rural digital infrastructure
To enhance network-digital marketing, leverage digital technology to optimize tourism services, boost the digital growth of rural tourism, and close the "digital gap". First and foremost, enhancing rural digital infrastructure is fundamental to promoting the development and all-round revitalization of rural cultural tourism. On one side, it is imperative to realize complete 5G network and fiber-optic broadband coverage and integrate digital network signals into rural "new infrastructure" (Tang, 2025). On the other hand, it is necessary to add and update rural digital tourism equipment, regular maintenance and upgrading. By consolidating the digital infrastructure, bridge the "digital divide", eliminate the obstacles of information acquisition and digital technology application, and propel the progress of rural digital tourism. Secondly, with the vigorous development of online social media, all kinds of tourism products pay more and more attention to online marketing, which provides an opportunity for the iterative upgrading of rural tourism marketing model, and also instill a strong impetus for the sustainable development and improvement of rural tourism. The application of AR/VR technology, short video and live broadcast to rural tourism publicity can enrich marketing means and realize the protection, inheritance and dissemination of rural cultural values. For example, in 2022, Huangling Village follows the digital wave, innovatively opens the group purchase function on the online platform, and begins to use emerging marketing methods such as live broadcasting and video delivery. Video marketing has a huge impact. In the first quarter of 2023, more than 50% of tourists in Huangling Scenic Area were attracted by short video marketing. Before that, the average annual income of villagers in Huangling Village was 3,500 yuan, but after adopting digital marketing technology, the figure has climbed to 56,000 yuan(People's Daily Online, 2024). Finally, leverage digital technology to enhance the informatization level of rural tourism,optimize rural tourism online services and digital scenic spot construction. Specifically, relying on platforms such as small programs and apps, it provides online tourist route planning, play guides, and accommodation and catering recommendation services, and integrates online booking and payment functions to enhance tourist experience. In addition, establish and improve the online rural tourism evaluation system, based on the questions and data feedbacks from tourists, timely adjust and optimize the service content, and actively interact with tourists, so as to improve tourists' satisfaction and enhance their willingness to visit again.

Overcome obstacles in the cultural and tourism integration mechanism
In the era of new quality productive forces, digital technology, as the core driving force of cultural and tourism development, opens up a new path for the deep integration of cultural and tourism, and can effectively solve the problems in the integration mechanism and practice path. In terms of integration mechanisms, digital technologies can help governments formulate policies, build collaborative systems, and break down institutional barriers. Through big data analysis of the current situation and trend of the cultural and tourism industry, accurate prediction and formulation of forward-looking policies, to provide strong policy support for the integration of the cultural and tourism industry. At the same time, the use of blockchain, Internet of things, artificial intelligence and other technologies to build a sound supervision and early warning system, in the process of promoting the deep integration of various elements, fields and industries of cultural and tourism, to ensure the stable and efficient operation of the integration mechanism.

In practical applications, big data is employed to conduct in-depth analyses of the characteristics of the cultural tourism industry and other industries, accurately find the entry point for deep integration, provide innovative integration ideas, break the barriers of departments and industries, and overcome the drawbacks of information asymmetry and segmentation in the traditional integration mechanism. Promote the comprehensive optimization of rural tourism resources development, product design, marketing means, consumer behavior, presentation content and business model, and build an organic integration ecology. To be specific, the first is to tap the development potential of rural characteristic resources, and achieve personalized and creative product design based on big data; The second is to use digital marketing channels to expand the market, and guide consumption upgrading through intelligent recommendation and mobile payment; The third is to use 3D display and other technologies to enrich the form of presentation, and build an innovative business model that integrates online and offline. By promoting the efficient flow

of tourism production factors, the new supply and demand of cultural tourism are generated, and the rural cultural tourism industry is promoted to a new stage of high-quality development.

Cultivate digital tourism talents through multiple channels

First of all, the richness of online course resources on the Internet has laid a solid foundation of educational resources for the training of rural tourism professionals. With its advantages, learners can access a variety of high-quality digital travel-related courses to meet their professional learning needs. Secondly, adjust and optimize the opening and training mode of the major of digital culture travel in real time, expand the opening scope of the major in different regional colleges and universities as needed, and appropriately increase enrollment plans. At the same time, we should attach great importance to the cultivation of students' digital technology application ability, and improve their mastery of digital technologies such as big data analysis and virtual reality technology application. In the process of training digital tourism talents, the curriculum should be dynamically updated, the proportion of practical courses should be increased, and students should be encouraged to actively participate in practical exploration, so as to realize the efficient supply of rural digital tourism talents. Finally, government departments can accurately introduce welfare and subsidy policies to attract talents, and enterprises can adjust the treatment and salary level of rural tourism talents accordingly, so as to enhance the attractiveness of rural digital tourism positions and attract more high-level and professional talents to participate in rural tourism construction.

Discussion

Theoretical and Practical Significance

Firstly, this study illustrates the significant function of digital technology in the integration of rural cultural tourism from both theoretical and practical perspectives. The concept of new-quality productivity offers a theoretical framework for comprehending the digital transformation of the cultural tourism industry. In practice, the mechanism of supply-demand adjustment and digital innovation is clarified, which offers practical guidance for the evolution of rural tourism. Secondly, in contrast to previous research, this study not only expounds on the role of digital technology in the integration of culture and tourism but also delves deeply into the specific dilemmas and practical approaches within the rural context.While previous studies have focused on the role of digital technologies in the cultural tourism industry in general, this study fills a gap in rural research, especially in terms of the "digital divide" and the unique talent shortage in rural areas. Finally, this study is of great significance for policy making and industrial development. On the one hand, in policy making. The government should focus on narrowing the "digital divide" in rural areas, invest in digital infrastructure construction, formulate policies to attract talents, and promote the improvement of the integration mechanism of cultural and tourism industries. On the other hand, for the industry. Rural cultural tourism enterprises should actively adopt digital technology, innovate product design and upgrade marketing models to meet the changing needs of tourists.

Limitations and Future Research Directions

The study has some limitations. The data used is mainly based on literature review, and more in-depth empirical research, such as field surveys and case studies, is needed to further validate the proposed mechanisms and paths. Future research could focus on the long-term impact of digital technology on rural cultural tourism development, the dynamic changes of the "digital divide" in rural areas, and the development of more effective talent training and retention mechanisms.

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