

Research on Digital Empowerment of Integrated Development of Agriculture, Culture and Tourism

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Abstract: Under the dual context of the rural revitalization strategy and the construction of Digital China, the integration of the digital economy with agricultural, cultural, and tourism sectors has become a key pathway to activate rural resources and promote industrial upgrading. By reconstructing the industrial chains of agriculture, culture, and tourism through digital technology, we can achieve efficient resource allocation, in-depth innovation in experiential development, and diversified value realization, thereby injecting new momentum into the sustainable development of rural areas.

1. Introduction

Agriculture, culture, and tourism integration represents a synergistic convergence of modern agriculture, cultural industries, and tourism sectors. It fosters collaborative development among multiple stakeholders. It also efficiently consolidates rural resources, production-living spaces, human capital, and market mechanisms to maximize the value of rural assets[1]. The integrated development model has significant theoretical value and practical implications for building modern rural industrial systems and promoting comprehensive rural revitalization.

Digital economy empowers of agricultural, cultural, and tourism integration means digital resources such as network information, data flow, technology, and platforms to strength efficient economic operations. The digital transformation of the agriculture, culture, and tourism industries is an inexorable trend. It can upgrade the components of agriculture, culture, and tourism industries to achieve high-quality development. The digital resources reshapes the technological foundations of agriculture, culture, and tourism industries. Industries integration systematically optimizing the organizational structures of agriculture, culture, and tourism. Collaborative development enhance productive activities and extend industrial value chains of agriculture, culture, and tourism industries. Then how to strengthen cross-industry collaborations among agriculture, culture, and tourism enterprises is an important task of research in the era of digital economy. Digital and smart technologies are rapidly transforming agriculture, culture, and tourism industries laying the foundation for comprehensive rural vitalization and high-quality development in the countryside in China.

2. The Mechanism of Digital Empowerment for Agriculture, Culture and Tourism Integration

2.1. Digital Enables Agricultural, Cultural and Tourism Industries to Expand Value-added Space

Digital agriculture, culture and tourism integration is a comprehensive transformation across the entire value chain toward data-driven production. Digital agriculture, culture and tourism integration has become a major focus, attracting numerous operators to engage in lively partake on the application of AI in art, cultural tourism, creative agriculture, and other fields. As digital

technology penetrates deeply into the agriculture, culture and tourism integration, a cross industry transformation driven by “technology + Agri-cultural Tourism” is unfolding. Nevertheless, challenges and concerns cannot be ignored. Homogenization in content innovation and superficial application of digital technologies have become prominent bottlenecks, with many products merely engaging in simple technical stacking. Priority should be given to the in-depth application and development of disruptive digital technologies in Agriculture, culture, and tourism integration.

China's abundant agriculture, culture, and tourism resources, comprehensive industrial system and vast application scenarios provide favorable conditions for the development of a "smart economy." In recent years, China's digital transformation has accelerated, making digital service scenarios such as cashless payments and QR-code ordering a routine part of everyday life. Meanwhile, as China's visa-free “circle of friends” continues to expand, inbound tourism and business travel have gained strong momentum.

To leverage digital technologies for driving social development efficiently, robust digital infrastructure alone is not enough. It is equally crucial to accelerate data flows, promote the transformation of data into a true factor of production, and fully unlock its value. Digital agriculture, culture, and tourism are the true factor of production to vitalize rural economies. The deep integration of the digital economy and the agriculture, culture, and tourism industries will enable the transformation and upgrading of traditional industries, create new industries and new business forms and models, and become a new engine for strengthening economic development.

2.2. Digital Empowerment the Agriculture, Culture, and Tourism Industries to Innovate Consumption Scenarios

The murals, sculptures, carvings and inscriptions in Mogao Caves, Maiji Mountain Grottoes, Yungang Grottoes and Longmen Grottoes have been recreated as digital art, conveying the aesthetic pursuits, cultural spirit and values intrinsic to ancient Chinese grotto art, making the cultural heritage radiate renewed vitality in the changing times. For example, the inscriptions in Longmen Grottoes are brought back to life by AI algorithms and augmented reality (AR) infrared triggering technology. Digital technology also plays a pivotal role in the preservation and revitalization of cultural relics, making them come alive. When the audience touch a character, it regenerates in oracle bone, inscriptions, official script, cursive, running script and other fonts. Digital technology allows diverse stakeholders collaborative innovation across the agriculture, culture, and tourism industries at relatively low costs. It shifts agriculture, cultural industries, and tourism from relying solely on internal resources to fostering cross-industry and cross-regional partnerships[2]. Developing the digital economy is a strategic choice to seize fresh opportunities in the new round of technological revolution and industrial transformation.

All this has greatly boosted the dynamism for integrated development of the digital and integrated agricultural, cultural, and tourism development. Digital technology is penetrating various industries and fields much faster than before, and the focus of integration is shifting from the field of consumer services to production and manufacturing, with the role of digital technology evolving from an auxiliary tool to a major engine of innovation and development. This is promoting ubiquitous connectivity of various types of resources and production factors, the elastic supply of services, and the efficient distribution of platforms, while also spurring profound changes in new consumption scenarios such as creative agriculture. For example, it includes agricultural complexes, leisure farms, handicraft cooperatives, intangible cultural heritage villages, homestays and cultural shops, rural camping, cultural tourism e-commerce, floral economy and digital farmland. These innovative scenarios enrich the content of agricultural-cultural-tourism integration products and enhance consumer satisfaction. It also achieve positive outcomes in boosting agricultural efficiency, promoting cultural protection and developing tourism in rural areas.

2.3. Digital Economy Improve the Efficiency of Integration of Agriculture, Culture and Tourism

While being rapidly integrated into all links of production, distribution, circulation, and consumption, data have accelerated the connectivity between online and offline activities, work and

life, and domestic and international markets. They have made supply more targeted, stimulated emerging demand, reshaped economic models, and amplified the multiplier effects on improving production efficiency. As the defining production factor of our age, data have spawned new opportunities for a synergistic development model of "agriculture + cultural innovation + tourism". Thanks to data's explosive growth, aggregation, and sharing, as well as rapid availability, circulation, and application, all business entities are focusing intently on data-driven development and striving to improve their ability to manage, develop, and use data so as to unlock their enormous value.

The operators of the agriculture, culture, and tourism industries explore rural areas' unique value propositions through data analysis of tourist preferences and consumption patterns. Digital marketing segmentation enables targeted design or optimization of agricultural-cultural-tourism products and enriched service offerings to elevates consumer experiences in rural areas.

2.4. Digital Empowerment the Upgrading of Agricultural, Cultural and Tourism Industries

Artificial intelligence is becoming as essential as the internet itself, offering transformative potential for the agriculture, culture, and tourism industries when used responsibly and ethically. By analyzing visitor flows, travel preferences and seasonal peaks, local operators can now anticipate challenges like overcrowding and over-tourism. The role of data as a key factor in empowering various industries will become increasingly prominent, digital technology innovation and industrial innovation will integrate more deeply, and the clustering effect of digital industries will continue to grow.

Innovation is the lifeblood of enterprises and the most powerful driver of industrial competitiveness. China's smart agriculture, culture, and tourism have entered a phase of deep integration. More innovation resources need to be channeled to enterprises, with a strong emphasis on nurturing specialized and sophisticated small and medium-sized enterprises that produce new and unique products. Driven by the market, enterprises aims to promote supply-demand alignment across upstream and downstream sectors. In addition, support for agriculture, culture, and tourism integration innovation centers should be strengthened by the cultivation of the industrial ecosystem[3].

3. The Dilemma of Digital Empowerment for the Integration of Agriculture, Culture and Tourism

3.1. It is Difficult to Implement Digital Technology

Developing new quality productive forces in the agricultural sector includes utilizing biotechnology in breeding, as well as using drone technology, AI and digital technology. These applications can effectively change the development of agricultural production, which is of great significance for accelerating the modernization process of agriculture. In mountainous regions, poor roads hampered transport and increase cost of digital infrastructure leads to the limited digital infrastructure coverage. On one hand, the integration of agriculture, culture, and tourism needs direct farm-to-hub shipment, slashing time and cost. But the underdeveloped infrastructure in vast rural areas poses significant barriers to cross-industries integration. There has insufficient investment in the countryside make it difficult to widely adopt hardware facilities like artificial intelligence systems. On the other hand, the integration of agriculture, culture, and tourism requires breaking traditional development paradigms in the countryside. The complex for digital applications challenge conventional infrastructure construction approaches. The digital infrastructure in vast rural areas still in its exploratory phase[4].

3.2. Industrial Integration Costs are High

The application of digital technology in the the integration of agriculture, culture, and tourism and rural areas not only brings changes to traditional production modes, but also introduces a new development model that aims to promote standardized, large-scale industrial production. However,

the industrial integration costs in the agriculture, culture, and tourism are still high. On one hand, the integration of agriculture, culture, and tourism involves multiple fields such as farming, cultural industries, and tourism. Each industry has its distinct stakeholders and demands. This creates significant disparities in interests among various parties. It usually leads to ineffective synergy in resource development and a lack of systematic, comprehensive planning for projects. Then the fragmented phenomena emerge during the development of agricultural-cultural-tourism integration. On the other hand, the integration faces substantial difficulties. Firstly, it primarily manifested in the lack of organic combination between agricultural resources, cultural assets, and tourism initiatives. Secondly, the slow development of new agricultural-cultural-tourism models for the most rural areas still rely on traditional agricultural operations. Finally, the absence of effective industrial chain coordination mechanisms leads to insufficient integration between agricultural product processing and cultural tourism industries, inadequate exploration and innovative utilization of local cultural resources [5]. The difficulties collectively diminish the appeal of the agriculture, culture, and tourism and hinder the realization of industrial convergence's multiplier effect.

3.3. Market Demand and Human Capital are Facing Challenges

The integration of agriculture, culture and tourism has been bolstered by emerging market demands and high-quality talent pools. Meanwhile, the digital economy raises new requirements for both market supply and workforce qualifications. However, this convergence presents dual challenges. Firstly, some agriculture, culture and tourism projects that rely heavily on seasonal agricultural products or natural landscapes face operational difficulties during off-seasons. It leads to significant market demand declines and hinder brand recognition. Secondly, evolving consumer preferences demand diversified experiential offerings and personalized services. The industry must evolve from traditional sightseeing models to visitor-centric experiences. The transformation requires continuous innovation in project design to deliver richer immersive engagement. Moreover, the digital economy imposes higher skill thresholds on professionals[6]. Despite growing market demand for specialized agriculture, culture and tourism talents, structural mismatches persist. Rapid industry expansion outpaces academic training for educational systems lack programs cultivating interdisciplinary experts. The challenges have created a disconnect between theoretical education and practical application. It still has persistent barriers in bridging academic knowledge with real-world implementation.

4. Optimized Path of Digital Empowerment for integration of Agriculture, Culture and Tourism

4.1. Addressing the Digital Transformation of Agricultural, Cultural, and Tourism Industries

China's active promotion of scientific and technological innovation for agricultural modernization, as well as moderated economic operations for rural modernization, lead to higher productivity and better livelihoods. Thanks to China's 5G telecom advancement, technologies including the internet of things, big data and the Beidou Navigation Satellite System are being widely applied in crop production, enabling practices such as precision seeding, smart irrigation and the use of drones for plant protection. To strengthen the integration of agriculture, culture and tourism, governments should provide crucial digital technical support for the accelerated improvement of a modern agricultural management system, the orderly revitalization and leveraging of rural resources, the innovation of investment and financing mechanisms for rural revitalization, and the promotion of the two-way flow of urban and rural factors.

4.2. Innovate and Enrich Digital Marketing Scenarios

Mechanisms for data asset ownership, trading, and benefit distribution should be explored to foster an environment conducive to innovation in agriculture, culture, and tourism integration. Regarding enterprise practice, strengthening technological breakthroughs and enhancing innovation capacity are imperative. Companies should embrace long-termism, uphold the principle of "content

is the core”, and cultivate high-quality intellectual properties that embody the spirit of Chinese aesthetics and the ethos of the times. As for consumer experience, cultivating a rational market and unleashing consumption potential are crucial. Greater efforts should be made to enhance the accessibility and inclusiveness of digital agriculture, culture, and tourism products, promote age-friendly and barrier-free services. The enterprises should implement digital marketing strategies and leverage digital platforms to vigorously promote their development initiatives.

4.3. Innovative Integration of Agricultural, Cultural, and Tourism Industries and Advancing Its Development Capabilities

Regional disparities in development are also evident, as high-quality resources and innovative capabilities remain concentrated in economically advanced cities, leaving significant gaps in rural regions. Moreover, shortcomings persist in frontier technologies such as advanced rendering engines and digital infrastructure platforms. Looking ahead, advancing the digital agriculture, culture and tourism industries from “quantitative accumulation” to a “qualitative leap” will require concerted efforts from multiple stakeholders. In terms of policy support, it is essential to deepen factor allocation and strengthen development foundations. Efforts should be accelerated to improve the national big data system of agriculture, culture and tourism, establish a comprehensive national standards framework covering technical interfaces, content quality, and copyright protection, and promote cross-industry integration of agriculture, culture and tourism resources.

5. Conclusion

The integration of digital economy and agriculture, culture and tourism is the "golden key" to rural revitalization. It needs to be supported by technology, rooted in culture and based on people's livelihood, so as to build a virtuous circle of "digital empowerment, cultural value-added and tourism feedback", and help realize the comprehensive realization of strong agriculture, beautiful countryside and rich farmers.

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