

Research on the Mechanism and Path of Digital Economy Enabling the Integrated Development of Rural Industries

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Abstract: With the accelerated advancement of global economic digitalization, the digital economy has emerged as a crucial force driving high-quality economic development. Rural areas, as a pivotal element in national development strategies, face challenges such as resource dispersion, limited markets, and technological lag, necessitating revitalization through industrial integration. The digital economy, through means such as technological innovation, resource integration, and market expansion, offers new pathways for the integrated development of rural industries. Digital technologies not only transform traditional production methods but also reshape the value chains of rural industries, advancing the optimization and upgrading of rural economic structures. Investigating how the digital economy empowers the integration of rural industries represents both a theoretical innovation and a practical exploration, providing new momentum and guidance for rural revitalization. This research will delve into the specific applications of the digital economy within rural industries and its mechanisms for promoting industrial integration, thereby offering theoretical foundations and practical references for policy formulation and industrial practices.

Keywords: Digital economy; Rural industry; Integrated development; Mechanisms; paths

1. Introduction

The digital economy is rapidly reshaping the global economic landscape, prompting governments and enterprises alike to strategically position themselves for future competitive shifts. Rural areas, as a vital component of economic development, have long faced significant developmental challenges due to limited resources and outdated technology. Traditionally, rural industries have been dominated by primary sectors, characterized by short industrial chains and low added value, making it difficult to achieve economies of scale. However, the advent of the digital economy presents new development opportunities for rural industries. Empowered by digital technologies, these industries are poised to overcome existing obstacles and achieve leapfrog development. Digital technologies not only facilitate the transformation and upgrading of production methods in rural industries but also promote deep integration between industries through resource consolidation and market expansion. Investigating the mechanisms and pathways for the digital economy to empower the integration and development of rural industries is both a contemporary necessity and an inevitable choice for rural revitalization strategies. This exploration will provide new theoretical and practical support for the sustainable development of rural economies.

2. The concept and development status of digital economy

The digital economy represents an economic model driven by digital technology, encompassing a range of activities grounded in information and communication technology. Its essence lies in the collection, analysis, and application of data, leveraging digital technology to optimize resource allocation and enhance production efficiency. With the rapid advancement of emerging technologies such as the internet, artificial intelligence, and big data, the digital economy is progressively extending beyond traditional e-commerce and internet services into manufacturing, agriculture, finance, education, and healthcare, profoundly influencing and reshaping the global economic landscape. The swift development of the digital economy presents unprecedented challenges and disruptions to conventional economic models. Traditional models have long grappled with issues such as information asymmetry, inefficient resource use, and market limitations. In contrast, the digital economy, through the efficient

utilization of data and continuous technological innovation, has driven effective solutions to these issues ^[1]. For instance, the rise of e-commerce platforms has shattered temporal and spatial constraints, significantly broadening market boundaries; big data analytics enable companies to more accurately understand consumer needs, facilitating personalized and intelligent production; artificial intelligence and the Internet of Things technologies have spurred the advancement of smart manufacturing, greatly enhancing production efficiency. Today, the digital economy has emerged as a new engine of global economic growth. Particularly in the wake of the COVID-19 pandemic, the acceleration of digital transformation has led governments and businesses worldwide to increase their investments in the digital economy, aiming to secure a competitive edge in the new round of global economic competition. China, as one of the world's largest digital economies, has achieved remarkable successes in this field, producing globally influential internet companies and continuously advancing digital economic development through policy support and technological innovation. However, the rapid rise of the digital economy has also introduced new challenges such as the digital divide and data security, which need to be addressed in future development. Against the backdrop of intertwining globalization and localization, the development of the digital economy is not only an inevitable result of technological progress but also a crucial pathway for the transformation of economic and social development. Its empowerment of rural industries is not only a vital means for driving rural revitalization but also a key component for achieving comprehensive and sustainable socio-economic development.

3. Mechanism Analysis of Digital Economy Enabling Integrated Development of Rural Industries

3.1. Technological innovation mechanism

Technological innovation plays a pivotal role in empowering the integration and development of rural industries within the digital economy, serving as the core driving force behind the transformation and upgrading of rural industries. Modern digital technologies, such as big data, the Internet of Things, artificial intelligence, and blockchain, are profoundly altering the production methods and operational models of traditional rural industries. The application of big data enables meticulous management across all stages of agricultural production, processing, and sales, thereby enhancing production efficiency and product quality. For instance, through IoT technology, agricultural production can achieve real-time monitoring and data analysis of climate, soil, and crop growth conditions, allowing for precise adjustments in production strategies, reducing resource waste, and maximizing output efficiency. The use of artificial intelligence in agriculture facilitates automated operations through intelligent devices and systems, such as smart irrigation systems and drones for pesticide spraying, which not only boosts labor productivity but also lowers production costs. Simultaneously, the introduction of blockchain technology provides a reliable platform for tracing the origin and ensuring the quality of agricultural products, thereby increasing consumer trust and enhancing market competitiveness. Technological innovation extends beyond merely improving production efficiency and quality; it also fosters seamless integration across production, distribution, and sales through the establishment of digital platforms, thereby promoting the extension and optimization of rural industrial chains ^[2]. This technology-driven innovation mechanism transitions traditional rural industries from a singular production model to a diversified, intensive, and efficient approach. Technological innovation not only breathes new life into rural industries but also facilitates the organic integration of resources and markets between urban and rural areas, laying a solid foundation for the sustainable development of the rural economy.

3.2. Resource integration mechanism

The mechanism of resource integration plays a crucial role in empowering the integration and development of rural industries through the digital economy. Digital technologies enable the reorganization and optimization of originally fragmented rural resources, thereby enhancing overall efficiency. Supported by digital platforms, traditional resources such as land, labor, and capital in rural areas are combined with new resources like data, information flow, and network traffic, creating a new ecosystem of resource sharing and complementarity. The proliferation of e-commerce platforms has allowed geographically remote agricultural products to overcome regional limitations and reach national and even global markets, significantly expanding sales channels and market scope. Under the influence of this resource integration mechanism, rural areas have evolved from traditional resource exporters to entities that, through deep integration with urban resources, create a complementary urban-rural pattern. The digital economy facilitates information symmetry and optimized resource

allocation, enabling the full exploration and utilization of high-quality, distinctive rural resources. Various cooperatives and digital platforms are also aiding farmers in accurately aligning with market demands, achieving scaled operations and brand development. Resource integration not only enhances the overall competitiveness of rural industries but also drives the extension of industrial chains and the elevation of value chains, injecting new vitality into the comprehensive revitalization of rural economies.

3.3. Market expansion mechanism

The mechanism of market expansion plays a pivotal role in the integration and development of rural industries empowered by the digital economy. With the aid of digital technologies, rural industries have gained unprecedented opportunities for market expansion. The rise of e-commerce platforms, live-streaming sales, and social media marketing has enabled rural products to transcend local markets and reach consumers nationwide and even globally. Agricultural products now achieve a direct connection from the field to the table through these channels, shortening the supply chain, enhancing farmers' bargaining power, and increasing product value. Market expansion not only brings additional revenue sources to rural industries but also lays the foundation for the diversified development of the rural economy. Furthermore, the market expansion mechanism under the digital economy, driven by data-driven precision marketing, achieves efficient supply and demand alignment [3]. Consumer preferences and demands can be accurately captured through big data analysis, allowing rural enterprises to adjust product structures and marketing strategies, thereby enhancing market adaptability and competitiveness. Digital technology also makes it possible to build rural brands, allowing unique rural products to be disseminated and recognized on a broader scale, creating brand effects. The market expansion mechanism not only opens new avenues for rural industry development but also drives the comprehensive recovery and sustainable development of the rural economy.

3.4. Service enhancement mechanism

The mechanism for service enhancement plays a pivotal role in the integration and development of rural industries empowered by the digital economy, serving as a key factor in the comprehensive upgrade of rural industries. The extensive application of digital technology has not only revolutionized production methods but has also profoundly transformed service models and quality. Traditional agricultural services were often confined to offline technical guidance and market connections. However, under the empowerment of the digital economy, the service enhancement mechanism achieves comprehensive, round-the-clock coverage and improvement. The establishment of intelligent agricultural service platforms enables farmers to access the latest technical guidance, market information, and policy support anytime and anywhere. This digital and intelligent transformation of services has not only improved farmers' production skills and market awareness but has also significantly heightened their sensitivity to market changes and their ability to respond. Moreover, the service enhancement mechanism, through precise data analysis, provides farmers with personalized service solutions, thus increasing the scientific and accurate nature of agricultural production. The refinement of rural e-commerce service systems has facilitated smoother sales channels for agricultural products and ensured after-sales service, greatly enhancing consumer purchasing experiences and trust. Additionally, the application of financial technology has made rural financial services more convenient and inclusive. Through digital payments and online loans, farmers can obtain financial support more quickly and conveniently, alleviating the issue of funding shortages. The service enhancement mechanism not only fosters the modernization and transformation of rural industries but also promotes the equitable development of urban-rural services, laying a solid service foundation for the sustained and healthy development of the rural economy. The effective operation of this mechanism ensures that rural industries are no longer isolated entities but are deeply integrated with a broader market and service network under the guidance of the digital economy, demonstrating vibrant vitality and innovation [4].

4. Research on the Path of Digital Economy Enabling the Integrated Development of Rural Industries

4.1. Strengthening infrastructure construction

Strengthening infrastructure development is the primary pathway for empowering rural industries

through the digital economy, serving as a crucial support for rural revitalization. The lag in digital infrastructure constitutes a critical bottleneck to rural economic development. Establishing a high-speed, stable network environment, an intelligent logistics system, and convenient digital financial services can fundamentally enhance the connectivity of rural economies, both internally and externally. The deployment of new infrastructures, such as fiber optic broadband and 5G networks, provides technological support for rural areas to access the global market, enabling efficient flows of information, capital, and goods, thus overcoming the limitations of time and space. The improvement of intelligent infrastructure facilitates the implementation of novel industrial forms in rural areas, such as precision agriculture, smart livestock farming, and digital fisheries. Through the proliferation of Internet of Things devices, farmers can monitor crop growth conditions and livestock health in real-time, achieving a digital and intelligent transformation of agricultural production. This upgrade in infrastructure not only boosts production efficiency but also injects technological innovation into traditional rural industries. Enhanced logistics infrastructure enables rural products to swiftly connect with national markets, while the efficient operation of rural logistics systems addresses the previous difficulties in getting agricultural products out of villages. Rural industries empowered by the digital economy are no longer isolated units; under the support of robust infrastructure, they engage in close interaction and linkage with external markets. The establishment of a modern cold chain logistics system ensures the quality of fresh agricultural products, thereby enhancing market competitiveness. The widespread adoption of digital payments and financial services further facilitates farmers' participation in the digital economy. Strengthening infrastructure development is not merely a technical upgrade but also a transformation in mindset. Only with solid digital infrastructure support can rural industries truly integrate into the tide of the digital economy, unleashing endogenous potential and paving a new path for high-quality, integrated development.

4.2. Nurturing digital talents

Nurturing digital talent is the central pathway to empowering the integration of rural industries within the digital economy, and it is crucial for stimulating rural innovation and enhancing competitiveness. The rapid development of the digital economy has set new standards for talent quality, and the upgrading of rural industries urgently requires a substantial number of professionals with digital skills. The current scarcity of digital talent in rural areas has become a major bottleneck to industrial development, necessitating diverse and multi-faceted educational and training initiatives to build a workforce capable of driving digital transformation in the countryside. The cultivation of digital talent must extend beyond high-level technical experts to include widespread digital skills training for the broader farming population. For rural industries to truly integrate into the digital economy, traditional constraints must be overcome, and farmers' awareness and application of digital tools and technologies must be developed. By combining online and offline training models, farmers can acquire practical skills such as e-commerce, digital marketing, and data analysis, providing new means for income enhancement. Encouraging young people to return to rural areas and bringing digital economy concepts and skills back to their hometowns is essential for sustainable rural economic development. It is vital to foster collaborations between universities, research institutes, and enterprises with rural areas to establish digital talent training bases, promoting integrated development of industry, academia, and research. Providing rural youth with diverse growth pathways through enterprise internships and entrepreneurial incubation will facilitate their rapid integration into the digital economy. Cultivating digital talent is not only about imparting knowledge and skills but also infusing rural areas with youthful vigor and innovative potential. This initiative will continually drive the optimization and upgrading of rural industrial chains, stimulate endogenous development dynamics, and pave the way for talent-driven integration and development of rural industries ^[5].

4.3. Deepening industry-university-research cooperation

Deepening the collaboration between industry, academia, and research institutions represents a crucial pathway for empowering the integration and development of rural industries in the digital economy. It serves as a bridge that aligns technological innovation with industrial needs. The advancement of rural industries relies heavily on technological support, and the transformation and application of technological achievements necessitate close cooperation between industry, academia, and research. While universities and research institutions possess advanced technologies and research capabilities, these often fail to translate into tangible productive force without a strong connection to practical industry needs. By intensifying such collaboration, research outcomes can be swiftly applied to rural industries, facilitating the modernization and upgrading of traditional sectors such as

agriculture, forestry, and fisheries. This collaboration is not merely a conduit for technology transfer but also a vital platform for nurturing innovative talent. During the collaborative process, universities and research institutions gain insights into the genuine needs of rural industries, allowing them to adjust research directions and content to better support local economic development. Meanwhile, enterprises can leverage research capabilities to enhance their technological innovation, extending and upgrading their industrial chains. This model of cooperation injects new vitality into rural industries, enabling them to keep pace with the advancements of the digital economy. The complexity and diversity of rural industries, driven by the digital economy, require interdisciplinary and comprehensive solutions. Deepening industry-academia-research collaboration allows for the full utilization of various strengths, creating a diverse innovation ecosystem. By jointly establishing laboratories, research centers, and demonstration bases, cutting-edge technologies can be closely integrated with rural realities, not only elevating the technological level of rural industries but also generating additional value. This collaborative model propels rural industries from a traditional resource-dependent approach to an innovation-driven paradigm, providing robust technological and talent support for rural revitalization and industrial integration.

4.4. Optimizing the policy environment

The flourishing of the digital economy hinges upon a flexible, open, and innovation-supportive policy environment. In the process of rural industrial development, the direction and support of policies determine the depth and breadth of digitalization. When formulating and implementing policies, the government must thoroughly consider the actual conditions of rural areas to ensure the effective implementation of these policies. To better advance the rural digital economy, the optimization of the policy environment needs to encompass tax incentives, financing support, technology introduction, and other aspects, creating a comprehensive support system for rural digital transformation. Encouraging rural enterprises and individual economic entities to boldly innovate, reducing policy barriers and approval processes, and providing convenient conditions for their participation in the digital economy are essential measures to invigorate rural innovation. Particularly in terms of tax and financing policies, greater flexibility and preferential treatment are required to enhance the resilience and growth potential of nascent digital agriculture enterprises. Policy optimization should not only focus on direct support but also on creating a stable and equitable market environment. By strengthening the improvement of laws and regulations related to the digital economy, ensuring the legality and security of digital transactions, and boosting the confidence of rural residents and businesses in the digital economy, the government should also enhance oversight and evaluation of policy implementation. Timely adjustments based on market feedback are necessary to ensure the effectiveness and sustainability of policies. In the era of the digital economy, optimizing the policy environment is the cornerstone for promoting the integrated development of rural industries. Only within a proactive and orderly policy framework can rural areas truly achieve digital transformation, fully integrate into the modern economic system, and embark on a path of sustainable development. Policy guidance and support will become a powerful impetus for rural revitalization, paving the way for the future development of rural industries.

5. Conclusion

The rise of the digital economy has invigorated rural industries with newfound impetus, allowing them to chart novel development trajectories within a globalized context. Through technological innovation and resource integration, rural industries have transcended traditional production methods, achieving an extension of the industrial chain and an enhancement of value through digital transformation. In the future, as digital infrastructure becomes more refined, talent development advances, and policy environments are optimized, the potential of the digital economy to empower the integrated development of rural industries will be fully realized. The profound application of the digital economy will not only spur the prosperity of rural industries but also provide robust support for the comprehensive development of rural communities and the realization of rural revitalization strategies. Investigating the mechanisms and pathways in this field holds significant practical importance for advancing the transformation and upgrading of rural industries and achieving comprehensive and sustainable economic and social development.

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