

Research on the Impact of Digital Economy Empowerment on Urban Modernization in the Yellow River Basin

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Abstract

With the rapid development of information technology, the digital economy, as an important engine of the global economy, is profoundly reshaping the path of urban modernization. This paper will take the Yellow River Basin as a case study, focusing on exploring how the digital economy can empower urban modernization development. How the empowerment of the digital economy affects all aspects of cities directly and indirectly. As one of the key driving forces for global economic development today, the digital economy has promoted industrial upgrading and innovation, injecting new vitality into the urban economy. At the same time, the widespread application of digital technology has greatly improved the ecological environment quality and social governance level of cities. This paper provides useful insights and suggestions for the process of urban modernization through in-depth research on the impact of digital economy empowerment on urban modernization in the Yellow River Basin.

Keywords

Digital Economy; Empowerment; Modernization Development; Yellow River Basin.

1. Introduction

In the current information age, the digital economy has become an important driving force for global economic development, and its impact has deeply integrated into various fields, especially playing an increasingly significant role in the process of urban modernization. The empowerment of the digital economy, as a new feature of the digital era, has injected new vitality into urban development, prompting cities to achieve remarkable achievements in industrial upgrading, innovative development, green sustainability, and other aspects.

The empowerment of the digital economy has shown multiple manifestations in urban modernization. Firstly, the widespread application of digital technology is driving industrial upgrading, changing the production methods and business models of traditional industries. Taking intelligent manufacturing as an example, digital production lines can achieve intelligent control and refined management of production processes, thereby improving production efficiency, reducing resource waste, and achieving industrial upgrading and transformation. The empowerment of the digital economy has also accelerated the development of urban innovation, building an open and collaborative innovation ecosystem. Digital technology provides a broader development space for people's creativity and innovation, promoting cross-border cooperation and resource sharing. In the digital environment, innovators can quickly incubate and promote new products and businesses, accelerate the transformation of innovative achievements, and continuously inject new momentum into the modernization development of cities.

The empowerment of the digital economy has also played a positive role in promoting green and sustainable development in cities. Through digital monitoring, big data analysis, and other

means, cities can more accurately monitor environmental pollution and resource utilization, and formulate targeted environmental policies and measures. The application of digital technology has effectively controlled environmental indicators such as energy consumption and waste emissions in cities, laying a solid foundation for achieving sustainable development goals.

As an emerging economic form, the digital economy deeply integrates information technology with traditional industries, not only giving birth to new industrial forms, but also providing strong support for the comprehensive promotion of urban modernization. China's exploration of empowering urban modernization with the digital economy began in the late 1990s, when the introduction and popularization of the Internet was an important driving force behind the emergence of the digital economy. The information technology industry has also begun to emerge, and the internet has gradually penetrated into people's lives and economic activities. With the passage of time, the Chinese government has gradually proposed a development strategy of "promoting modernization through informatization", combining digital technology with economic and social development, and achieving breakthrough progress in the construction of smart cities. For example, Shenzhen, as one of the models of China's digital economy, has improved the management efficiency and quality of life of citizens by introducing intelligent technology. In fields such as intelligent transportation, intelligent environmental protection, and intelligent healthcare, the application of digital technology has made urban functions more intelligent and efficient.

However, empowering urban modernization with the digital economy also faces some challenges. The issue of the digital divide has led to imbalanced urban development, and information security risks also pose a threat to the sustainable development of the digital economy. In order to achieve a healthy combination of digital economy and urban modernization, China still needs to further strengthen digital education and talent cultivation, improve the quality of human capital, and adapt to the development needs of the digital era. At the same time, the Yellow River Basin also faces many challenges in the process of urban modernization. The digital economy, as an emerging force, provides new opportunities and hope for the modernization of cities in the Yellow River Basin. This article will take the Yellow River Basin as an example to deeply explore how the digital economy empowers urban modernization in the Yellow River Basin, and the profound significance contained in this process.

Taking the Yellow River Basin as an example for research has important practical significance. Firstly, the Yellow River Basin has a vast territory, covering multiple provinces and cities, with abundant resources and complex development status. Therefore, in-depth research on the application of digital economy in the Yellow River Basin helps to comprehensively understand the empowering role of digital economy in urban modernization from multiple dimensions. Secondly, as an important agricultural production area in China, the Yellow River Basin is expected to be empowered by the digital economy to promote agricultural modernization, improve agricultural production efficiency, and improve farmers' quality of life. In addition, the Yellow River Basin also contains rich cultural heritage and historical accumulation, and the empowerment of the digital economy provides new opportunities for the development of the cultural industry.

In summary, the important role of digital economy empowerment in urban modernization is evident. The widespread application of digital technology has created more development opportunities for cities, driving them to new heights in industries, innovation, and environmental protection. This paper will delve into the specific manifestation of digital economy empowerment in urban modernization, providing strong support and reference for the sustainable development of cities in China, and contributing to the prosperity and progress of cities in the future.

2. Research Status and Development Trends at Home and Abroad

2.1. Current Status and Development Trends of Foreign Research

The digital economy in foreign countries started early and developed rapidly. Its theoretical research and industrial system are becoming increasingly perfect, and good attempts have been made in practice. In terms of theoretical research, Tokatli (2014) believes that the penetration of digitization plays a crucial role in reducing unit labor costs. The United Nations Conference on Trade and Development (2015) believes that enterprises can achieve economies of scale and scope through the integration of industrialization and development, the development of new market channels, the reduction of transaction costs, and the creation of a large number of job opportunities. Freund et al. (2016) analyzed the mechanism and transmission of the effects of the digital economy, and believed that the digital economy leads to a decrease in value chain transaction costs by providing more comprehensive services. Sutherland (2018) believes that data, as a core component of promoting the development of the digital economy, plays an important role in the development process. Banalieva et al. (2019) believe that the development of the digital economy has driven regional innovation effects, promoting the realization of industrial economies of scale and scope. Brynjolfsson et al. (2019) pointed out that digital technology not only enables technological innovation, but also has the ability to change innovation, and can even innovate on a broader scale. Karieva et al. (2021) believe that the popularization of the digital economy has played an important role in promoting regional development. Adamu et al. (2020) found through research that the innovation of digital equipment provides opportunities for the development of the digital economy. In the context of the COVID-19, scientific and technological progress promotes the application of digital technology in government, industry, education and other fields. In terms of empirical research, scholars from various countries have different research directions, mainly divided into two categories: the contribution of the digital economy to regional economic growth and the contribution to the upgrading of traditional industries.

Developed countries have conducted in-depth research on how the digital economy can assist urban modernization. For example, the United States has achieved many successful experiences in the construction of smart cities. Silicon Valley and other technology centers actively promote the integration of digital technology with urban infrastructure, transportation, energy management, and other fields, promoting innovative development and sustainable growth of cities. European countries have also made extensive explorations in empowering urban modernization through the digital economy. Cities such as London in the UK and Amsterdam in the Netherlands have introduced cutting-edge technologies such as big data and artificial intelligence in the construction of smart cities, optimizing urban governance and public services, and improving the quality of life and environmental sustainability of cities.

In addition, Asian countries have also made significant progress in empowering urban modernization through the digital economy. Cities such as Seoul in South Korea and Tokyo in Japan have utilized digital technology to build demonstration areas for smart cities, promoting the digital transformation and development of cities. Singapore actively promotes the deep integration of digital economy and urban modernization in the construction of a smart country, improving the city's innovation ability and global competitiveness.

Overall, foreign studies have shown that the empowerment of the digital economy has played an important role in urban modernization, not only promoting economic growth and innovative development of cities, but also improving the quality of life and sustainability of cities. The experience and practices of various countries in empowering urban modernization with the digital economy have reference significance for China's practice in promoting urban modernization, and also provide reliable reference for the research of this paper.

2.2. Domestic Research Status and Development Trends

In recent years, the digital economy has continuously promoted the transformation of production methods, lifestyles, and public service methods, providing strong endogenous impetus for the sustained and healthy development of China's economy, and promoting the optimization and upgrading of regional industrial structures. Building a modern new industrial system based on the digital economy, how to seize the opportunity of digital development and enjoy the emerging factor dividends brought about by digital transformation has gradually attracted the attention of the Chinese government and enterprises, becoming a new focus of research. In terms of theoretical research, He Xiaoyin (2013) pointed out that digital technology has strong diffusion and innovation capabilities, further blurring industry boundaries, and promoting the transformation of traditional industries and the optimization and innovation of organizational forms. Wang Linsheng (2016) pointed out that the internet has become the most fundamental productive force in today's social and economic development, greatly promoting the adjustment and transformation of industrial development methods. Zhang Boxu et al. (2017) believe that the Internet improves the efficiency of manufacturing production systems and optimizes the manufacturing industry chain system from four aspects: intelligent manufacturing, intelligent factories, intelligent systems, and intelligent industries. Under the environment of "Internet plus", Dan Bin et al. Xiong Lei et al. (2018) analyzed from the perspective of industrial chain restructuring and believed that the integration of the Internet and the manufacturing industry has a positive promoting effect on technological innovation and structural restructuring of the manufacturing industry. Zhang Yuzhe (2018) analyzed the role of information technology in driving industrial structure upgrading from two perspectives: the traditional inventory field and the emerging incremental field. Wang Juan (2019) pointed out after analysis that the industrialization of the digital economy and industrial digitization have promoted China's economic transformation; The evolutionary path of economic growth is from changes in input and proportion of factors to changes in resource allocation patterns, and then to changes in total factor productivity. Song Yang (2019) analyzed the essential characteristics of the digital economy and studied it from two perspectives: external performance and internal motivation. He believed that the digital economy has a positive promoting effect on the improvement of the quality of China's economic development. Liu Shuchun (2019) analyzed the key points of high-quality development of the digital economy from four perspectives, believing that the digital economy will promote high-quality development in China.

Firstly, the Chinese government attaches great importance to the role of the digital economy in promoting urban modernization and has successively introduced a series of policy measures to promote the application of digital technology in urban development. For example, China has formulated the "Digital China Construction and Development Strategy", which clearly proposes to promote the deep integration of the digital economy and the real economy, promote the construction of smart cities, and promote innovative urban development. At the same time, China has also strengthened the construction of digital infrastructure, promoting the widespread application of cutting-edge technologies such as 5G and the Internet of Things in cities, providing strong support for empowering urban modernization with the digital economy. Secondly, many cities in China have begun to actively explore the application of digital economy in urban development and have achieved significant results. For example, as one of China's innovative cities, Shenzhen has leveraged the power of the digital economy to promote industrial upgrading and innovation and entrepreneurship, becoming one of the important centers for global technological innovation. In addition, Shanghai has achieved refinement and intelligence in urban management by building a smart city platform, improving the operational efficiency and service level of the city.

In addition, some research institutions and universities have also conducted in-depth research in the field of digital economy empowering urban modernization. They focus on the application

of digital technology in urban planning, traffic management, environmental protection, and explore the impact mechanism and path of the digital economy on urban modernization. At the same time, some local governments are actively exploring the application of digital economy in rural revitalization, promoting the upgrading and modernization of rural industries through digital means.

Overall, the current research status in China indicates that empowering urban modernization with the digital economy has become an important trend and strategic direction for urban development in China. The Chinese government, cities, and research institutions are closely collaborating, constantly innovating and exploring to promote the widespread application of digital economy in urban modernization and achieve comprehensive modernization of urban development. The in-depth research in this field provides strong support for China's exploration and practice on the path of urban modernization, and also provides rich resources and experience for the in-depth development of this study.

3. The Embodiment of Digital Economy Empowerment in Urban Modernization Development

The estimated coefficients of digital economy in the upper and middle and lower reaches of the Yellow River Basin are both positive, indicating that digital economy has a promoting effect on high-quality economic growth in both the upper, middle and lower reaches of the Yellow River Basin; The middle and lower reaches of the Yellow River Basin are densely populated, with numerous industries and a solid foundation for development, and are rapidly integrating with the real economy. The upstream region has relatively backward economy, low industrial agglomeration and population density, limited development scale, and some areas have fragile ecological environment. At present, digital economy and digital technology are more applied to low-level production and life fields, rather than high-value industrial transformation and upgrading. Therefore, the impact of digital economy on the high-quality development of the Yellow River Basin economy is smaller in the upstream regions than in the middle and downstream regions.

3.1. The Empowerment of the Digital Economy has Played an Important Role in Promoting Industrial Upgrading

The development of modern cities not only requires diversification of industries, but also high-quality development of industries. The application of digital technology has enabled traditional industries to deeply integrate with information technology, thereby improving the intelligence level of the industry. Taking the manufacturing industry as an example, digital production methods make the production process more refined and efficient, thereby improving product quality and production efficiency. In addition, the empowerment of the digital economy has also given rise to emerging industries such as artificial intelligence and the Internet of Things, providing new opportunities for the optimization and upgrading of urban industrial structures. In terms of urban industrial upgrading, the empowerment of the digital economy has promoted the intelligence and digital transformation of traditional industries. Manufacturing enterprises in the Yellow River Basin have achieved monitoring and management of production processes by introducing IoT technology, thereby improving production efficiency and product quality. For example, a traditional textile factory has introduced intelligent sensors to monitor the operation status of production equipment in real time, identify and solve problems in a timely manner, reducing production failure rates and increasing production capacity. These measures not only promote the development of enterprises, but also promote the upgrading and optimization of the entire urban industrial chain.

3.2. The Empowerment of the Digital Economy Plays a Key Role in Urban Infrastructure Construction

Urban transportation is an important symbol of modernization, and the application of digital technology in traffic management has brought convenience to cities in the Yellow River Basin. The intelligent transportation system optimizes traffic flow allocation and reduces traffic congestion through real-time data collection and analysis. For example, the city has introduced an intelligent bus system, where passengers can query the bus location and arrival time in real-time through mobile apps, arrange their travel reasonably, and reduce waiting time and congestion. In addition, digital technology has improved urban energy management, achieved intelligent monitoring and allocation of energy, and improved energy utilization efficiency.

3.3. The Empowerment of the Digital Economy has Also Brought Significant Impact in the Field of Social Services

Medical and health care is a key area of concern for the people, and digital technology has injected new vitality into medical services. The cities in the Yellow River Basin have introduced remote medical systems, which enable remote communication between doctors and patients through video calls and remote diagnostic technology, providing timely medical consultation and treatment services for residents in remote areas. At the same time, digital technology has also promoted the sharing and optimized utilization of educational resources, allowing urban residents to access high-quality educational resources through online learning platforms, enhancing opportunities for lifelong learning.

3.4. Empowering the Digital Economy to Promote Sustainable Urban Development

Modern cities are facing problems such as environmental pollution and resource scarcity, and the application of digital technology provides new ways to solve these problems. Through digital monitoring and data analysis, cities can have a more accurate understanding of environmental conditions, thereby formulating more targeted environmental policies. In addition, digital technology provides new means for environmental monitoring and governance. The cities in the Yellow River Basin have introduced an air quality monitoring network to monitor air pollution indicators in real time, predict the trend of air quality changes through big data analysis, and take timely emission reduction measures to improve urban air quality. Digital technology also plays an important role in environmental protection fields such as water pollution control and garbage classification, promoting the sustainable development of urban ecological environment.

3.5. Empowering the Digital Economy to Improve Urban Governance and Public Services

The application of digital technology has made urban management more efficient and refined, promoting the modernization of urban governance. For example, the construction of smart cities has improved the management level of urban transportation, environmental protection, public safety, and other aspects through digital means, providing more convenient and high-quality public services. The empowerment of the digital economy also promotes interaction between the government and citizens, promoting transparency and democratization of government decision-making.

In summary, the empowerment of the digital economy has reflected multiple important impacts in the development of urban modernization. Industrial upgrading, innovative development, sustainable development, and improvement in urban governance all benefit from the widespread application of digital technology. The empowerment of the digital economy not

only provides new opportunities for urban development, but also brings broader prospects for the path of urban modernization.

4. The Enlightenment of Digital Economy Promoting the Modernization of Urban Governance in the Yellow River Basin

This study takes the urban agglomeration in the Yellow River Basin as an example to explore the embodiment of digital economy empowerment in urban modernization development. Through empirical research on the impact of digital economy empowerment on urban industrial construction, productivity innovation, urban environmental improvement, and social inclusion, we have drawn the following conclusions:

4.1. The Empowerment of the Digital Economy has a Positive Impact on Urban Industrial Construction

Through the application and innovation of digital technology, urban agglomerations in different regions have achieved significant results in industrial structure adjustment and upgrading. The rise of emerging digital economy industries has driven the transformation of traditional industries, promoted the diversified development of urban industries, and enhanced the competitiveness and adaptability of industries.

4.2. The Empowerment of the Digital Economy has Played a Key Role in Enhancing Urban Productivity and Innovation Capabilities

The widespread application of digital technology has accelerated the innovation of production methods and business models, improving the production efficiency and competitiveness of cities. At the same time, the empowerment of the digital economy has also promoted the aggregation of innovative resources and the optimization of the innovation environment, promoting the improvement of urban innovation capabilities. In addition, the empowerment of the digital economy has had a positive impact on the improvement of urban environment and the improvement of residents' quality of life. The application of digital technology has brought innovative solutions in fields such as urban transportation, energy utilization, and environmental protection, improving the ecological environment of cities. At the same time, the empowerment of the digital economy has also provided more convenient public services for residents, improving the quality of life of urban residents.

4.3. The Empowerment of the Digital Economy has Played an Important Role in Promoting Social Inclusion and Reducing Regional Disparities

The popularization of digital technology has lowered the threshold for information acquisition and exchange, promoted the circulation and sharing of information, and reduced social inequality caused by information asymmetry. At the same time, the empowerment of the digital economy has also provided development opportunities for underdeveloped areas, narrowing the development gap between urban and rural areas and regions.

5. Conclusion and Suggestions

Conducting in-depth research on digital economy and urban development in urban agglomerations in the upper, middle, and lower reaches of the Yellow River Basin can fully demonstrate the high adaptability and industrial benefits of digital economy to urban modernization, providing more substantial guidance and support for practical applications.

In terms of improving productivity, the digital economy empowers cities with opportunities for intelligence and automation, thereby promoting the transformation and upgrading of production and manufacturing industries. Taking the urban agglomeration in the upper reaches

of the Yellow River Basin as an example, traditional agricultural production models are undergoing revolutionary changes. Through a digital agricultural management system, farmers can monitor real-time data such as soil moisture, temperature, and climate change, accurately regulate the planting and breeding processes of crops, and maximize the yield and quality of agricultural products. Similarly, in the manufacturing industry of cities, the introduction of digital production lines has made the production process more intelligent and efficient. The application of robots, IoT devices, and big data analysis technology not only reduces production costs, but also improves product standardization and stability, further expanding urban production capacity and market share.

In terms of innovation capabilities, the empowerment of the digital economy has promoted the formation and growth of the innovation ecosystem in cities. The vigorous development of digital technology has brought unprecedented innovation opportunities and stimulated the emergence of innovative enterprises. Taking the urban agglomeration in the middle reaches of the Yellow River Basin as an example, the digital economy has created a more equitable innovation platform for small and medium-sized enterprises. Through e-commerce and online markets, small and medium-sized enterprises can more conveniently promote and sell their products, reduce barriers to traditional channels, and promote the rapid transformation of innovative achievements. In addition, digitization also facilitates cross-border cooperation and innovation sharing among industries. Enterprises in different fields can achieve resource sharing through digital platforms, accelerate technological cross integration, and thus breed new products and services with greater competitiveness and market influence.

In terms of improving the quality of life of urban residents, the development of the digital economy has also directly affected people's daily lives. Through digital services and platforms, residents can more conveniently access various services, from healthcare to education and training, from financial services to cultural and entertainment. Taking the urban agglomeration in the lower reaches of the Yellow River Basin as an example, the popularization of mobile payment and e-commerce has enabled residents to no longer be limited by geography and time, and achieve a brand new consumption experience. At the same time, the digital economy also provides residents with more personal development opportunities. The rise of online education and remote work has enabled residents to have more flexible access to knowledge and job opportunities, improving their lifelong learning and career development abilities.

In summary, through in-depth case studies of different urban agglomerations in the upper, middle, and lower reaches of the Yellow River Basin, utilizing the coupling coordination model of digital economy and cities, analyzing digital infrastructure using entropy weight method, and analyzing from the perspectives of industrial structure, innovation ability, and social cognition, we can more fully explore the empowering effect of digital economy in urban modernization. This profound study provides policymakers with a richer theoretical basis, which will effectively guide and promote the deep integration of digital economy and urban modernization, promote balanced coordination of regional development, and take practical actions to meet future challenges and opportunities.

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