Information Systems and Economics (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/infse.2025.060119
ISSN 2523-6407 Vol. 6 Num. 1

Development of digital economy from the perspective of political economy

Fengyun Wei*

School of Shipping Economics and Management, Dalian Maritime University, Dalian, Liaoning, 116026, China
**Corresponding author*

Keywords: Digital economy, relations of production, data elements, policy guidance, The Marxist political economy

Abstract: Based on the analysis framework of Marxist political economy, this paper uses the method of combining theoretical analysis and case study, and deeply discusses the development characteristics, internal contradictions and development trends of digital economy. It is found that the digital economy not only improves production efficiency, but also brings problems such as labor alienation and data monopoly. As a new factor of production, the value creation and distribution mechanism of data needs to be improved urgently. The development of the digital economy needs to seek a balance between technological innovation and social equity, and promote high-quality economic development.

1. Introduction

The report to the 19th CPC National Congress pointed out that new growth areas will be formed in areas such as medium-and high-end consumption, innovation-led, green and low-carbon, digital economy, modern supply chains, and human capital services. At present, as a new growth point, one of the new momentum of digital economy is booming, constantly drive the assets ownership, organization, employment patterns and consumption innovation, both for the 21st century marxist political economy innovation development injected new connotation, also to promote our economy to achieve high quality development into a new era. In the context of accelerating information technology iteration, the digital economy is reshaping the global economic growth pattern(figure 1). Based on the analytical framework of Marxist political economy, the essence of its rise is the historical necessity of the dialectical movement of productive forces and production relations. The law of productivity decision and counterreaction of production relations revealed by this theoretical system show double dimension in the evolution of digital economy: on the one hand, digital technology, as the element of new quality productivity, drives the paradigm change of traditional production mode; on the other hand, technological transition forces the adaptive reconstruction of enterprise organization, market trading mechanism and distribution relationship. Based on the theoretical concerns of business Administration (economics), it is of practical significance to analyze the resource allocation logic, enterprise operation paradigm and competitive ecological evolution in digital economy, which has practical significance to guide enterprises to formulate

digital strategy. This study intends to take the principle of political economy as a tool to systematically explain the internal mechanism, essential characteristics and influence path of the development of digital economy, so as to provide theoretical support for the construction of economic governance theory in the digital era.

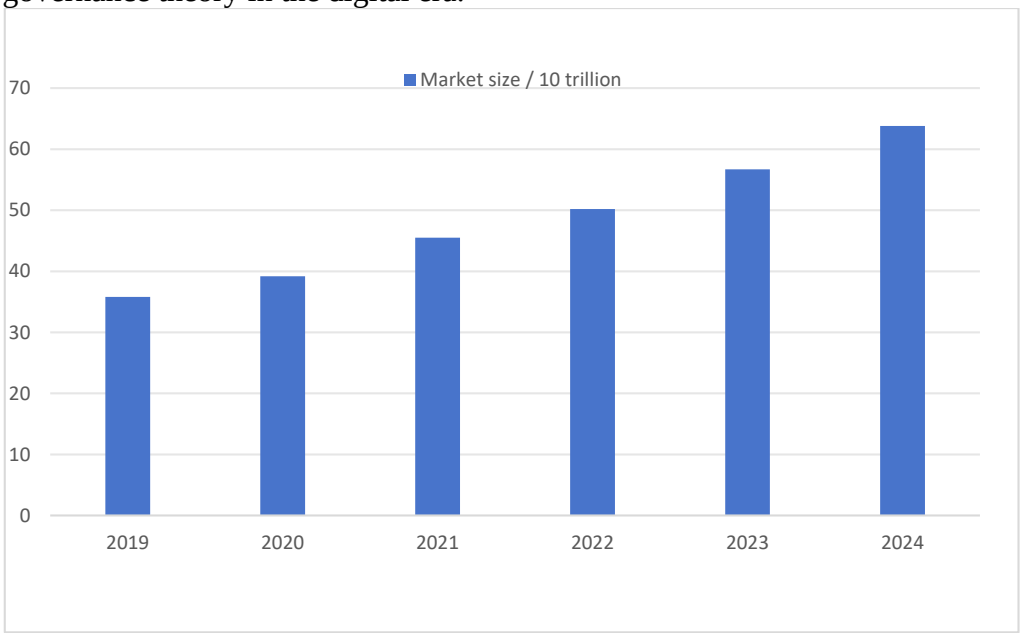

Fig.1 Forecast chart of China's digital economy market scale trend in 2019-2024

2. Productivity change in the development of the digital economy

2.1 Digital technology becomes the core element of productivity

In the era of digital economy, the technology cluster with data as the core breaks through the boundary of traditional production factors. Through the full life cycle management of multi-source heterogeneous data, big data technology builds the intelligent center of decision support. The value of which lies not only in the accumulation of data volume, but also reflects in the mining of data correlation through algorithm model, and promotes the evolution of enterprises from empirical decision to the closed-loop optimization of "data-knowledge-action"[1]. For example, the manufacturing industry realizes the accurate matching between the demand side and the supply side through the development and design of the consumer data. This data-driven resource allocation mode is essentially a reconstruction of the allocation logic of productivity elements. Cloud computing technology completes the digital migration of production materials by building an elastic computing infrastructure. Different from the physical exclusive mode of traditional IT architecture, the virtualization resource pool realizes the social sharing of computing power, and enables small and medium-sized enterprises to obtain industrial-level computing power at marginal cost. This technology universality breaks the scale barrier of productivity elements [2]. The productivity of artificial intelligence technology presents two dimensions: at the production end, the machine learning algorithm is embedded in the manufacturing process, upgrading the traditional production line to a digital twin system with self-optimization ability; at the server, natural language processing technology constructs the human-computer interface, and the intelligent customer service system realizes real-time and personalized service response through intention identification and knowledge reasoning. This technology penetration not only improves the efficiency of a single link, but also promotes the evolution of labor materials to "intelligent tools", marking the development of

productivity into the stage of "technology-enhanced". The innovation of blockchain technology lies in building a distributed trust mechanism and refactoring production relationships through consensus algorithms and smart contracts. In the supply chain scenario, tamper-proof chain data records to eliminate information asymmetry, the traditional rely on intermediary trust cost into algorithm trust technology cost, the mediation governance model, is essentially the new interpretation in the digital age.When transaction costs for technological progress significantly reduced, enterprise boundary and market efficiency will be redefined [3].

The collaborative evolution of the four major technology communities has formed a complete productivity chain of "data element activation-computing power facility support-intelligent decision drive-trust mechanism guarantee". This technology system breaks through the limitation of "labor + capital" in the era of industrial economy, constructs a new quality productivity paradigm with digital technology as the core, and promotes the rapid development of economy and society [4].

2.2 Digitalization and intelligent transformation of labor tools

The iteration of labor tools in the era of digital economy is essentially the technical concrete process of Marx's theory of "general intelligence". Different from the tool system with physical machinery as the core in the industrial age, the contemporary labor tools present the ternary structure of "digital twin-algorithm decision-making-man-machine collaboration". In the manufacturing field, the automated production line upgrades the traditional fixed station to the dynamic and adjustable flexible manufacturing unit through the real-time mapping of the sensor network and the digital twin model [5]. This upgrade is not only the efficiency improvement, but also the transition of the production means from "physical assets" to "digital assets". For example, the digital programming system broke the experience dependence, make the machining accuracy control from "manual calibration" to "algorithm definition", the transformation of technical logic, essence is labor tools of laborer skills reconstruction from physical leading operation ability, turned to digital literacy leading system control ability. The application of intelligent robot marks the enhancement of the subjectivity of labor tools. Through the coupling of force feedback control and deep learning algorithm, industrial robots can not only complete high-risk tasks such as precision assembly, but also form a closed-loop evolution of "teaching-learning-optimization" in the human-machine collaboration scenario. This change of tool attributes promotes the labor process from "human adaptation to machine" to "machine to human": in the automobile manufacturing workshop, the cooperative robot dynamically adjusts the operation path through visual recognition, which not only guarantees the man-machine safety, but also retains the decision-making space of workers on complex scenes [6]. The digital transformation of labor tools is essentially a process of "empowerment-reconstruction" of technology to labor ability. The parametric design of CNC machine tools requires workers to master the digital modeling language, and the operation and maintenance of intelligent robots need to understand the logic of machine learning. The formation of these new skills marks the transition of labor ability from "experience accumulation" to "algorithm understanding". From the perspective of productivity theory, this tool evolution not only improves the efficiency of a single link, but also promotes the labor form from "physical expenditure" in the industrial age to "intellectual output" in the digital age through the co-evolution of tool-skill-organization. It confirms Marx's conclusion that "labor data is the measuring instrument of laborer development".

3. Adjustment of production relations in the development of digital economy

Digital economy has promoted a profound digital transformation in the organizational form of enterprises. Traditional enterprises mostly adopt hierarchical and hierarchical organizational

structure, with multiple levels of information transmission and slow decision-making process, so it is difficult to respond to market changes quickly. In the era of digital economy, enterprises have built a flat organizational structure to reduce the management level, so that information can be transmitted efficiently and quickly within enterprises, and improve the timeliness and accuracy of decision-making. The rise of platform organizations marks a paradigm shift in production relations. Through the modular encapsulation of digital resource pool, enterprises decouple research and development, production and marketing into reusable "digital components", and external subjects can realize capability call on-demand through API interface. This "distributed collaboration" breaks through Penrose's theory of resource constraints. For example, automobile manufacturers integrate the design resources of more than 200 suppliers and shorten the product development cycle by 60%. Its essence is to transform the uncertainty of market transactions into algorithmic certainty within the organization. We need to optimize the supply chain process to reduce inventory costs and enhance the overall efficiency and competitiveness of the supply chain. In the dynamic aggregation of virtual enterprises, cross-regional R & D teams can form a temporary consortium within 72 hours to complete the collaborative design of precision components. This "plug and play" mode converts the employment relationship into a task contract through digital identity authentication and contribution value quantification algorithm, jointly completing specific projects or business tasks, and gives full play to the advantages of resources and capabilities of all parties. Platform enterprises build a digital platform to provide trading places and services for the supply and demand parties, integrate the upstream and downstream resources of the industrial chain, create new business models and value creation methods, and change the operation and competition mode of traditional enterprises.

4. The impact of digital economy development on economic structure and social development

4.1 Promote the optimization and upgrading of the industrial structure

The optimization of industrial structure by digital economy is essentially the embodiment of technology-economic paradigm transformation at the industrial level. This reconstruction follows the triple logic of traditional industry empowerment, emerging industries, and industrial co-evolution. In the manufacturing field, digital technology promotes the transformation of Taylor production mode to digital twin driven flexible manufacturing through the progressive penetration of process digitalization-equipment intelligence-decision-making algorithm. Such as industrial Internet platform for the manufacturing link of the customized production cost reduction theory, the essence is Marx "labor data intelligence" predicted contemporary practice. When the parameters of CNC machine tools by the consumer data in real time definition, the production process has been from "standardized replication" to "personalized creation". The industrial upgrading in the agricultural field presents the characteristics of technology embedding-process reengineering and value reconstruction. Through the coupling of Internet of Things sensors and climate models, the precision agriculture system transforms empirical planting into data-driven dynamic regulation. This transformation is efficiency improvement. The traditional industrial attribute of "relying on the weather" is evolving to the intelligent agriculture of "data raising farmland". The digital transformation of the service industry is manifested as "scene deconstruction, capability modularity and value network reconstruction". In the financial sector, for example, block chain technology of payment clearing mediation, make the transaction cost theory in digital space: when intelligent contract automatically perform alternative manual check, the marginal cost of financial services close to zero, the technical dividend to promote traditional financial institutions from "institutional center" to "user center". The essence of online practice in education, medical care and other fields is to decouple knowledge, diagnosis and treatment and other service products into reusable digital

components, and realize cross-regional on-demand supply through the cloud computing platform. This evolution of "service productization" marks the qualitative leap of the service industry from labor-intensive to technology-intensive.

4.2 Promoting the coordinated development of regional economy

The empowerment of digital economy to regional coordination is essentially an extension of the technology-economic paradigm transformation in the spatial dimension. The traditional regional development follows the logic of geographical proximity, and the flow of factors is limited by transportation costs and information barriers, leading to the solidification of the core-edge structure. Space deconstruction ability of digital technology, through the force network-data elements-intelligent algorithm of 3 d linkage, broke the muar dal cycle cumulative causal regional locking effect, for example, when Guizhou force resources can support the intelligent manufacturing of Yangtze river delta, the high asia ecological data can participate in eastern carbon trading, geographical distance is no longer the core of elements configuration constraints. This change confirms Perex's judgment about the penetration period of technological revolution: digital technology is shifting the regional competition from resource endowment competition to the competition of digital governance ability. The inclusive supply of digital infrastructure has built the underlying support for regional coordination. Different from the spatial siphon effect of traditional infrastructure, new facilities such as 5G base stations and industrial Internet have significant characteristics of diminishing marginal cost. To the "East Data West Computing" project, for example: Its essence lies in rebalancing network space power, enabling renewable energy-rich western regions to supply computing resources for the digital economy. This bidirectional flow of "computing to the west, data to the east" not only alleviates energy consumption pressure in the east, but also injects new momentum into western data-driven industries, thereby reconstructing regional development potential. At the same time, the digital economy has also brought new industries and business models, bringing huge leaps to the underdeveloped regions. For example, e-commerce has helped the featured agricultural products and handicrafts in remote areas to enter the whole country and even the world, thus promoting the development of agriculture and farmers' income. The digital economy also promotes industrial transfer and cooperative innovation between regions. In economically developed areas, by transferring their non-core business and manufacturing links to backward areas, thus driving the development of related industries in backward areas. Among regions, the use of digital technology can share innovation resources, let innovation subjects interact, and conduct technology research and development and achievement transformation together, so as to improve the innovation strength of the whole region, shorten the development gap between regions, and promote the coordinated development of regional economy.

5. Case Analysis: The digital economy innovation practice of Alibaba's "Rhino Intelligent Manufacturing" platform

In 2023, Alibaba integrated 200 suppliers through the "Rhino Intelligent Manufacturing" platform, shortening the development cycle of new product development to 7 days. This innovative practice fully embodies the huge advantages of the digital economy in optimizing the allocation of resources and improving production efficiency. From the perspective of political economy, the platform uses big data and artificial intelligence technology to accurately connect both ends of supply and demand, and realize the efficient flow and optimal allocation of production factors. Through the data-driven flexible production mode, the platform not only reduces the inventory cost, but also improves the market response speed, and enhances the competitiveness of enterprises. This shows that the digital economy can effectively solve the mismatch between supply and demand in

traditional industries, promote industrial upgrading, provide a new impetus and model for high-quality economic development, and also provide a useful reference for the digital transformation of other industries.

6. Summary

Exploring the development of the digital economy from the perspective of political economy clearly demonstrates the profound changes caused by many aspects of productivity, production relations, economic structure and social development. In the future, we need to continue under the guidance of Marxist political economy and business administration (economics), thoroughly study the laws of the digital economy's development, and develop a set of scientific and reasonable policies to guide the healthy and sustainable development of the digital economy. This will ensure it plays the most significant role in promoting economic growth and social progress, achieving the goals of economic and social development.

References

[1] Guo Shaofei, Zeng Min. Research on China's Foreign Economic Development Strategy from the Perspective of Political Economy of Socialism with Chinese Characteristics in the New Era [J]. Das Kapital, 2019,15 (00): 196-204.
[2] Chen Xiaoying, Song Pei, et al. Digital economy development and industrial structure transformation—is based on the perspective of supply and demand synergy [J / OL]. Exploration of economic issues, 1-22 [2025-03-14].
[3] Guo Jie. Seven regions were approved to carry out the construction of the digital economy innovation and development pilot zone [N]. Securities Times, 2025-03-14 (A07).
[4] Chen Bo, Geng Shu. The Growth of China's Private Economy from the Perspective of Political Economy and Sociology—Review of Power Structure, Political Incentive and Economic Growth: An Analysis of Political Economy Based on the Experience of The Development of Zhejiang Private Economy [J]. Research on Social Development, 2021,8 (01): 226-240 + 246.
[5] Zhang Zhanbin. The development of the sharing economy from the perspective of the political economy of socialism with Chinese Characteristics [J]. China trade economy, 2020, (11): 16-18.
[6] Zhao Yuechi, Zhang Zhihua. Rural digital economy from the perspective of the political economy of cross-cultural communication [J]. News and Writing, 2019, (09): 12-20.