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SUPPLY CHAIN DIGITAL TRANSFORMATION AS A DRIVER OF NATIONAL ECONOMIC DEVELOPMENT: CHINA'S EXPERIENCE

Sun Ke, PhD student
Scientific supervisor – Doctor of Economics, associate professor Yakushenko K. V.
Belarusian National Technical University
Minsk, Belarus

Abstract. Based on the experience of Chinese industrial enterprises, this paper would examine key drivers of supply chain digitization and propose an organizational-economic mechanism model to demonstrate its role in advancing macroeconomic development.

Keywords: digital economy, supply chain, digital transformation, organizational economic mechanism, China.

In the digital age today, data is a strategic resource, and technology is a competitive factor; the basis of the economy has shifted from tangible assets to digital ecosystems. The degree of development in a country depends less on its natural resources or low-priced labor but more on the capability of its firms to integrate into global value chains through technology. Supply chain digitalization plays an especially critical role in being the backbone of contemporary industry. While micro-level digitalization and the macro digital economy have been extensively researched, the comprehensive effect of corporate supply chain transformation on the national economic structure and growth remains largely unexplored. This research thus wonders: How does supply chain digitalization at the enterprise level create multiplier effects and delineate new paths for national economic development? This study looks at the experience of China under its strategies like "Industry 4.0" and "Made in China 2025", identifies sustainable patterns of digitalization, and demonstrates their role in enhancing the competitiveness and resilience of the nation in the volatile global markets.

At present, Chinese industrial enterprises are rapidly transitioning from traditional linear models to digital, networked, and intelligent supply chain ecosystems. Leading firms are developing data-driven "digital twins" that allow real-time, end-to-end visibility, and enhance collaborative dynamics

across the supply chain [1]. Key technological trends underpinning this transformation include: the Internet of Things, which deploys sensors on physical assets to allow real-time tracking and predictive maintenance; Big Data and AI, which process large-scale information to support accurate demand forecasting, dynamic inventory optimization, and early risk detection; and Blockchain, which, though still in a relatively early stage, reinforces transparency and trust in applications such as cross-border trade and product traceability [2]. All these trends surface very clearly in the macro-level data presented in Table 1, showing a very neat progressive adoption pattern: IoT has the highest adoption rate at 68 % in 2024, thus laying the base for supply chain visibility; Big Data & AI show the fastest growth-rising from 35 % to 60 %-and point toward a movement to "intelligent decision-making"; and Blockchain adoption has grown steadily from 12 % to 25 %, showing its increasing recognition as a tool for trust-building. The integrated application of these technologies yields significant competitive advantages, including gains in efficiency through automated processes and intelligent algorithms, enhanced transparency that reduces the bullwhip effect through full supply chain visibility, and resilience that allows quick responses to disruptions using simulation and predictive analytics. These different micro-level improvements collectively contribute to overall efficiency enhancement in Chinese manufacturing, a micro-foundation that translates enterprise-level operational strengths into national-level industrial competitiveness.

Table 1 – Adoption Rates of Key Digital Technologies in Chinese Industrial Enterprises

Technology Category	**2021**	**2023**	**2024**
Internet of Things (IoT)	42 %	58 %	68 %
Big Data and AI	35 %	50 %	60 %
Blockchain	12 %	20 %	25 %

This paper proposes a multilayer organizational-economic mechanism model as its core theoretical innovation to systematically realize and maintain the digital transformation of supply chains. Such a comprehensive framework consists of four tiers that are functionally related and operate in concert for strategic integration of vision, operations, technology, and performance measurement: The Strategic Layer establishes the overall vision

and roadmap for digital transformation, ensuring alignment with both corporate development goals and national industrial policy directions through determination of the priorities for basic transformation and resource allocation. The Process Layer enables holistic reengineering of cross-functional operations that involves procurement, production, warehousing, logistics, and distribution through organizational silos, allowing seamless information exchange along the value chain [3]. The Technology Layer provides essential infrastructural support through integrated technological enablers consisting of IoT systems, algorithms for artificial intelligence, blockchain protocols, big data analytics, all underpinned by rigorous data governance frameworks ensuing security and interoperability. The Performance Evaluation Layer institutionalizes continuous improvement through a balanced scorecard of integrated financial and operational metrics, supplemented by strategic incentive mechanisms that track and reinforce value creation through the entire transformation journey.

The model's effective operation requires sophisticated integration of both internal and external resources: organizations must achieve synergistic alignment across strategic planning, organizational structures, operational processes, and technological capabilities, while externally cultivating digital platform ecosystems that facilitate secure data sharing, risk distribution, and benefit allocation among supply chain partners. This coordinated value maximization-manifested through significantly reduced operational costs, dramatically improved market responsiveness, enhanced customer satisfaction, and accelerated innovation cycles-generates substantial positive externalities that spill over into the national economic sphere through three primary channels: industrial linkage effects that upgrade adjacent sectors, technological spillover effects that diffuse innovation capabilities, and employment multiplier effects that create higher-skilled jobs [4]. Consequently, this mechanism actively promotes structural economic advancement toward high-technology, high-value-added industries while strengthening national economic resilience and upgrading global value chain positioning.

The model's practical efficacy, however, depends on a number of critical enabling foundations: government policy provides the necessary direction and regulatory certainty through cohesive industrial strategies such as “Made in China 2025” and comprehensive data governance legislation that collectively shape the transformation landscape; talent development and organizational culture need to nurture both technical-digital hybrid

competencies and collaborative, data-driven mindsets to overcome institutional inertia and change resistance; technical infrastructure-particularly ubiquitous 5G networks, scalable cloud computing services, and mature industrial internet platforms-determines the accessibility and participation threshold for SMEs within the digital ecosystem; while data security standards and interoperability protocols constitute the essential trust foundation for cross-organizational collaboration by providing seamless and secure data exchange while maintaining information integrity across a variety of technological systems. Supply chain digitalization presents one pathway toward technology- and efficiency-led growth for China against the backdrop of a fading demographic dividend, supports "dual circulation" and the climb up global value chains. For other economies, China's experience underlines phased digitalization via strategic policy, infrastructure, and pilot leadership.

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1. Zhu, H. The role of digital transformation in supply chain efficiency and economic output / H. Zhu // Environmental Science and Pollution Research. – 2024. – Vol. 31, № 3. – P. 3656–3668.

2. Ning, L. The impact of digital transformation on supply chain capabilities and supply chain competitive performance / L. Ning, D. Yao // Sustainability. – 2023. – Vol. 15, № 13. – Art. 10107.

3. Sun, F. Enhancing global supply chain distribution resilience through digitalization: Insights from natural resource sector of China / F. Sun, Z. Qu, B. Wu [et al.] // Resources Policy. – 2024. – Vol. 95. – Art. 105169.

4. Shi, Y. Comparative analysis of digital economy-driven innovation development in China: An international perspective / Y. Shi, F. Wei // Journal of the Knowledge Economy. – 2025. – Vol. 16, № 1. – P. 4422–4464.