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The Impact of Digital Transformation on Global Value Chains

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ABSTRACT
This article explores the impact of digital transformation on global value chains, focusing on aspects such as technological innovation, resource optimization, and value chain restructuring. Digital transformation, driven by technologies like artificial intelligence, big data, the Internet of Things, and cloud computing, enables enterprises to enhance operational efficiency, improve decision-making accuracy, and optimize customer experiences. This transformation helps reduce production and transaction costs, enhance research and development processes, integrate internal and external innovation resources, and promote collaborative innovation along the supply chain. Additionally, digital transformation optimizes resource allocation by accurately matching supply and demand, lowering investment thresholds, and improving resource utilization efficiency. It also creates new data value chains, reshapes traditional value chains, and elevates enterprises' positions within the global value chain through technological innovation and business model optimization. Finally, this article emphasizes the profound impact of digital transformation on enterprise competitiveness, while also highlighting the importance of sustainable development.

KEYWORDS
Digital Transformation; *Global Value Chain*; *Technological Innovation*

1 Introduction

With the rapid development of digital technology, the global economy and business landscape are undergoing profound changes. Digital Transformation refers to the process by which enterprises adopt digital technologies (such as artificial intelligence, big data, the Internet of Things, and cloud computing) to comprehensively innovate and optimize their business processes, business models, and customer experiences[1]. This transformation not only affects internal operations but also significantly alters the role and position of enterprises within the global value chain. This article aims to explore the multifaceted impact of digital transformation on global value chains, analyzing aspects such as technological innovation, resource optimization, and value chain restructuring, while providing in-depth understanding through real-world examples.

2 Background and Concept of Digital Transformation

2.1 Definition and Characteristics of Digital Transformation

Digital transformation is the process by which enterprises utilize digital technologies to achieve comprehensive optimization and innovation in business processes, business models, and customer experiences. Its characteristics include: Technology-Driven: Leveraging emerging technologies such as artificial intelligence, big data, the Internet of Things, and cloud computing to enhance

operational efficiency and decision-making capabilities. Data-Driven: Promoting data-based decision-making by collecting, analyzing, and visualizing data to improve the accuracy and timeliness of decisions. Customer Experience Optimization: Improving customer interaction and service processes using digital technologies to enhance customer satisfaction and loyalty. Business Process Reengineering: Redesigning and optimizing business processes to reduce redundancy and increase efficiency[2].

2.2 Concept of Global Value Chain

The Global Value Chain (GVC) refers to the network of value-adding activities distributed and coordinated globally, encompassing the entire process from concept to delivery of products or services to the final consumer. The global value chain includes stages such as product design, production, marketing, distribution, and after-sales service, with each stage potentially occurring in different countries or regions to fully utilize the resources, technologies, and market advantages of various locations.

3 Major Impacts of Digital Transformation on Global Value Chains

3.1 Enhancing Enterprise Embedding in the Global Value Chain

Digital transformation enhances enterprise embedding in the global value chain through technological progress and reconfiguration of factor endowments. This is reflected in the reduction of costs, improvement of efficiency, and enhancement of competitiveness[3]. The application of digital technologies effectively lowers production and transaction costs. For instance, through automation technologies, enterprises can reduce dependence on manual labor, increase production flexibility and precision, and use industrial robots to replace numerous manual operations, thereby lowering labor costs and errors, further reducing production costs. Utilizing big data analysis and artificial intelligence technologies, enterprises can more accurately predict market demand, optimize production and inventory management, and improve operational efficiency by automatically adjusting production parameters through machine learning algorithms, enhancing production efficiency and product quality, and reducing equipment downtime. Digital transformation enables enterprises to respond more flexibly to market changes and customer demands by monitoring market dynamics and competitors' activities in real-time, quickly adjusting production and sales strategies. Additionally, digital transformation enhances customer service levels by using Customer Relationship Management (CRM) systems to provide customized products and services based on customers' historical behaviors and preferences, thereby increasing customer satisfaction and loyalty and enhancing competitiveness in the global market.

3.2 Promoting Technological Innovation

The application of digital technologies accelerates technological innovation within enterprises, improving R&D efficiency and capability, shortening R&D cycles, and enhancing the ability to integrate external innovation resources, thus driving innovation collaboration and integration within the industry chain[4]. This is evident in the acceleration of R&D processes using digital technologies, such as simulation and modeling technologies that allow enterprises to test and optimize product designs in virtual environments, shortening product development cycles, reducing the number of physical prototypes and tests, lowering R&D costs, and speeding up product launches. Digital technologies enable better integration of internal and external innovation

resources through open innovation platforms, allowing enterprises to collaborate with external partners to develop new products and technologies, promoting the sharing and collaboration of information and technologies, thereby improving innovation efficiency and success rates. Moreover, digital technologies promote collaborative innovation among upstream and downstream enterprises in the industry chain by enabling real-time monitoring and coordination of supply chains through the Internet of Things, enhancing supply chain agility and responsiveness, reducing inventory backlogs and supply chain disruptions, and improving overall supply chain efficiency and flexibility.

3.3 Optimizing Resource Allocation

Digital transformation enables enterprises to more accurately match supply and demand, improving resource utilization efficiency[5]. For example, by utilizing big data analysis, enterprises can more accurately predict market demand, optimize production and inventory management, and reduce resource waste. Analyzing historical sales data, market trends, and consumer behaviors allows enterprises to forecast future market demand, develop reasonable production plans and inventory strategies, and reduce the risk of inventory backlogs and product obsolescence. The application of digital technologies lowers investment and technology thresholds across industries. Through cloud computing and platform services, small and medium-sized enterprises (SMEs) can access advanced technologies and services at lower costs, enhancing their competitiveness within the global value chain. Cloud computing services provide flexible computing and storage resources that SMEs can purchase and use as needed, reducing initial investment costs in hardware and software. Platform services offer a wealth of applications and tools, enabling SMEs to quickly deploy and apply them, thereby improving operational efficiency and market competitiveness. Through the Internet of Things, enterprises can achieve real-time monitoring and management of equipment and resources, enhancing resource utilization efficiency. The Internet of Things can connect production equipment, storage facilities, and transportation tools, enabling real-time monitoring and management of their operational status. For instance, IoT sensors allow enterprises to monitor equipment operational parameters and environmental conditions in real-time, promptly identifying and resolving issues, thereby improving equipment utilization rates and production efficiency.

3.4 Creating and Reshaping Value Chains

Digital transformation not only enhances operational efficiency but also creates new data value chains[6]. In the digitalization process, data becomes an essential production factor, with data value chains influencing traditional value chains and changing enterprises' positions within value chains. This is evidenced by the creation of data value chains, where digital technologies enable enterprises to collect, analyze, and utilize large amounts of data, creating new data value chains. For example, through big data analysis, enterprises can gain deep insights into market demands and customer behaviors, optimize products and services, and improve customer satisfaction and loyalty. Big data analysis can extract information from multiple data sources, including customer purchase records, social media interactions, and equipment sensor data, providing comprehensive market insights. Retail enterprises, for instance, can analyze customer purchase behaviors to develop personalized promotional strategies, increasing sales and customer satisfaction. Digital technologies also reshape the structure and operation of traditional value chains. Through e-commerce platforms, enterprises can directly interact with final consumers, shortening intermediary links, improving operational efficiency, and increasing profit margins. E-commerce platforms not only offer new sales channels but also change the interaction mode between enterprises and consumers. For example, enterprises

can directly obtain consumer feedback through online platforms, promptly adjusting products and services to enhance market competitiveness. Additionally, e-commerce platforms support the digital management of supply chains, increasing supply chain transparency and coordination[7]. Digital transformation enables enterprises to occupy higher positions within global value chains. Through technological innovation and business model optimization, enterprises can enhance their competitiveness and influence in the global market. Technological innovation not only increases product added value but also strengthens enterprises' market discourse power. For example, high-tech enterprises continuously innovate and upgrade products, thereby enhancing their positions and influence in the global market.

4 Conclusion

Digital transformation has a profound impact on the role and position of enterprises within global value chains. Through technological innovation, resource optimization, and value chain restructuring, digital transformation enhances enterprises' global competitiveness. However, the impact of digital transformation on global value chains varies across different enterprises and regions, requiring tailored strategies to maximize the benefits of digital transformation. Furthermore, digital transformation promotes green development within enterprises, driving efficient operations while fulfilling social responsibilities and enhancing social value. In the future, enterprises should actively advance digital transformation, fully utilizing digital technologies to improve operational efficiency and competitiveness, while focusing on green development to achieve sustainable development goals. Governments and regulatory bodies should also strengthen support and guidance for digital transformation and green development, promoting higher value creation and sustainable development within global value chains.

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