



Research on Application Strategy of Big Data Analysis in Logistics Supply Chain Technology Innovation

* Yunying Kuang, Guoqiang Luo

Guangzhou Vocational University of Science and Technology 51000

* Correspondence address: C10-302, Huanan Royal Garden, Huaguan Road, Tianhe District, Guangzhou City, 510653, phone:18026219904, Mailbox:282051631@qq.com

Abstract. In order to understand the impact trend of big data technology on logistics supply chain, and find out the development idea of applying big data in logistics supply chain, the logistics supply chain based on big data technology presents the development trend of intelligentization, co-biochemistry, short chain and intellectualization. Taking agricultural products supply chain as an example, the main impacts of big data on the process refinement of agricultural products supply chain, green information exchange, short chain and the willingness improvement of all parties in the chain were analyzed by this paper. The results show that big data technology is still in the process of continuous superposition popularization and improvement in China, and each core stage of logistics supply chain should further realize higher data value. Based on the research results, this paper proposes to promote the innovative development of logistics supply chain from the perspectives of refining support policies, establishing a sustainable interconnection system of logistics big data, accelerating technological innovation and enhancing the willingness of enterprises to data.

Keywords: Big data analysis; Technological innovation; Logistics supply chain; Application strategy

1 Introduction

Due to the lack of flexibility in the information system of traditional logistics enterprises, problems such as low logistics efficiency and increased logistics risk occur frequently, which is difficult to meet the information needs of modern economic activities. Big data technology has the characteristics of large amount of data, fast speed and data diversity, which can provide real-time field information for all aspects of the supply chain, increase the flexibility and sustainability of logistics enterprises, and change the business model of logistics enterprises by promoting the integration of Internet, Internet of Things and logistics industry, and promote social and economic development. The use of big data technology in logistics supply chain operation management will not only improve the economic benefits of enterprises, but also improve the productivity, innovation and competitiveness of different departments and

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the economy as a whole, which is helpful to solve the matching of logistics supply and demand, optimize the allocation of resources, improve operational efficiency and obtain maximum benefits. Therefore, big data technology has attracted great attention from the global logistics sector ^[1]. According to a study by SCMWorld, a supply chain industry research organization in the United States, big data technology is reshaping the logistics supply chain industry by integrating and sharing resources and information between upstream and downstream enterprises in the supply chain ^[2].

2 Literature Review

The existing research on big data analysis of logistics supply chain has different emphases, which can be summarized from the level of meaning advantage, information understanding and application field. At the level of meaning advantage, big data analysis has great significance for logistics supply chain. Akter and others ^[3] believe that enterprises can innovate products by improving the ability of big data analysis, provide better services to customers, improve service level, increase sales and revenue, and open up new markets. Big data analysis enables consumers to clearly understand the production and distribution process, providing security and sustainability for the food supply chain ^[4]. Saunders ^[5] pointed out that the coordination of manufacturing, procurement, logistics, sales and other links in the supply chain system can be optimized and enhanced through big data analysis. At the level of information understanding, the connection and integration of information provide progress space for logistics supply chain. Waller et al. ^[6] believe that researchers in the field of logistics and supply chain management use data science to provide a large number of research opportunities for business forecasting and analysis. Zinn et al. ^[7] believe that in recent years, logistics and supply chain management are affected by the exponential growth of information and communication technology globalization, and more and more enterprises are willing to use big data business model for management. Wang Baiyi et al ^[8] summarized the differences between foreign advanced logistics technology information and China's existing logistics technology information, and put forward suggestions from the aspects of platform cooperation mechanism, platform security, lack of talents and so on. At the application level, many studies have tried to analyze, construct and promote the application of big data and supply chain management. Barreto et al ^[9] believe that relying on intelligent technology, the new logistics model will integrate supply chain, logistics platform, service scenarios, consumer demand and other dimensions in depth, and build a ubiquitous value network rooted in production, circulation and consumption. Wu Di ^[10] studied the advantages and opportunities of big data application, and the results showed that the logistics cloud model based on big data in western minority areas solved the problem of material resource allocation in western areas. Chen Yongping et al. ^[11] studied the logistics terminal distribution in the context of the big data era, and analyzed how to enhance consumer experience and value.

To sum up, the existing research summarizes the application status of big data technology in logistics supply chain from the meaning advantage level, information

understanding level and application field level, and has a preliminary understanding of the importance of big data, the connection of information and the application of technology, but there are few summaries and refinements from the perspective of development trend. Due to the late start of relevant research in China, the application research of big data technology is not comprehensive, and the analysis combined with domestic reality is relatively insufficient. What is the future development direction of logistics supply chain big data analysis? How to apply and popularize big data technology in the field of logistics supply chain in China? In this regard, this study summarizes the development trend of big data technology in logistics supply chain into four aspects: intelligentization, co-biochemistry, short chain and intellectualization. Taking agricultural products as an example, this paper analyzes the role and significance of agricultural products and the difficulties and problems encountered in practice, and puts forward corresponding countermeasures and suggestions, which provides reference for the further promotion and application of big data analysis technology in the field of logistics supply chain

3 Innovation and Development Trend of Logistics Supply Chain Applying Big Data Analysis Technology

3.1 Intelligentization

Traditional logistics supply chain process design usually only includes the master-slave relationship between human and machine, that is, human controls the machine through the operation interface and program. The application of general artificial intelligence (AGI) realizes the independent decision-making of system integration through the simulation of autonomous route design, human eye recognition and capture of logistics system equipment, which completely changes the traditional decision-making mode based on experience [12]. The application of intelligent and unmanned logistics operation planning, decision-making and feedback, the supply chain operation process of human participation factors gradually reduced until elimination, the logistics industry to achieve intelligent, will completely avoid errors in the operation, so that the entire supply chain intelligent, logistics operation orderly and efficient, to achieve traffic planning routes, terminal distribution, warehouse management. It has changed the way of commodity circulation and logistics coordination, and greatly improved the integration efficiency of supply chain. By including the point of sale and warehouse data calculation forecast, the supply chain planning process is more accurate and timely. Taking the United States as an example, the autonomous mobile robots (AMRs) developed by the United States for logistics supply chain and e-commerce automation can realize multi-mode sensing and decision-making of synchronous behavior between different output modes in a very short time, and the development is very rapid.

3.2 Co-biochemistry

Industrial symbiosis (is) is an ecosystem-based concept that emphasizes the provision of optimal raw materials and energy consumption and by-products as raw materials for other industries to reduce waste and loss of resources and achieve win-win benefits at different levels. Traditional supply chain mainly focuses on the relationship between products, suppliers and end customers, while the new generation of logistics adheres to the concept of sustainable and shared development, which pays more attention to the life cycle and social responsibility of enterprises, so as to make the industry more sustainable and achieve common interests. Zahra et al. [13] have shown that symbiotic systems can reduce costs, improve efficiency, improve visibility and understand consumer information by reducing industrial inventory and managing inventory efficiently, thus improving competitiveness. In pursuit of sustainable industrial symbiosis, information and communication technology can be used to transmit and integrate supply chain network information, and each node in the supply chain forms an interdependent relationship. From the perspective of operation and supply chain management, new suppliers are introduced to form a new supply chain cooperative symbiotic network.

3.3 Short Chain

Compared with the traditional long supply chain, the core of short supply chain is to reduce the number of transportation and shorten the transportation distance. Short chains can provide flexible, accurate and efficient logistics services, reduce management costs by creating a more direct link between local suppliers and consumers, and benefit producers, distributors and final consumers. The core goal of logistics processing and rapid delivery design is to reduce the average number of cargo handling, so through the integration of warehousing and distribution services, the intermediate chain can be continuously shortened to achieve the goal of short supply chain from the manufacturer's warehouse to the distribution center directly to the customer. By continuously optimizing the warehousing layout network and shortening the distance between goods and consumers, the faster the logistics delivery speed, the lower the cost. The main form of short supply chain is short food supply chain. For example, Wal-Mart, the largest retailer in the world, tracks the whole process of pork production and sales by using blockchain in China, which greatly shortens the tracking time and makes the whole supply chain gain consumers' trust.

3.4 Intellectualization

Different from the general virtual logistics dynamic information Internet management system, intelligent logistics has the characteristics of assessable, measurable, specific and so on, through big data, intelligent hardware, Internet of things and other intelligent technology and means, can improve the intelligent execution and decision-making ability of logistics system, and improve the level of intelligence, unmanned and automation of logistics system. Smart logistics is also indispensable in

the development of smart city, through the use of digital and information technology to optimize the logistics process, improve the innovation level of the city, can make the city reduce the negative impact of people flow and traffic flow, improve the quality of urban life level, support the development of smart city.

4 Logistics Supply Chain Innovation with Big Data Technology —— Taking Agricultural Products as an Example

The supply chain of agricultural products integrates the logistics, capital flow and information flow in the whole production and consumption process of agricultural products from farmland to dining table. The use of big data technology to reorganize the supply chain has greatly improved the efficiency and efficiency of agricultural products logistics.

4.1 Realizing the Process Refinement of Agricultural Products Supply Chain

In order to cope with the growing demand for food and the pressure of climate change, policymakers and industry leaders are committed to using the Internet of Things, big data and cloud computing. The Internet of Things mainly collects real-time data from vehicles, fields, soil and other ground through sensors, and carries out data analysis and integration on the basis of a large number of collected data (historical meteorological data, satellite and UAV images and soil types), so as to analyze the existing problems in land quality and operational efficiency. Consumers pursue hygienic and healthy food, through close monitoring of the whole logistics process of agricultural products, to promote farmers to comply with relevant laws and regulations, to avoid excessive use of pesticides and pesticides in food production. Big data technology provides information analysis and decision-making help for precision agriculture.

4.2 Realizing Green Information Exchange of Agricultural Products Supply Chain

For the supply chain of agricultural products, the main problems and challenges faced by the value enhancement of the entire agricultural industry chain are the poor quality of agricultural products and weak market competitiveness caused by unscientific fertilization and soil quality decline in agricultural production. The innovation and sustainable development of agricultural products supply chain driven by big data technology, through the quality evaluation of green sustainable high-quality agricultural products, focusing on the quality data needs of consumers, takes big data technology as the driving force of innovation to build the whole process quality control information data evaluation system, to help agricultural products achieve high-quality sales, high-quality and high-price. For example, Bayer Group uses machine learning and artificial intelligence to identify weed and insect infestation problem processing procedures, farmers apply the program to upload photos of weeds or insects, match

and identify with Bayer's comprehensive database, and the accurate results obtained through large data analysis help to improve the quality and efficiency of agricultural production, while improving the sustainability of product production ^[14].

4.3 Realizing Short-chain Value Innovation of Agricultural Products Supply Chain

In the traditional agricultural supply chain, there are often problems such as high loss of logistics and storage and transportation, which make the operating cost increase continuously. From the origin to the dining table, it needs to go through many links from farmers to wholesale manufacturers and markets, retailers, wholesale sales places, supermarkets/shopping malls/vegetable markets, and then to consumers/customers, so as to shorten the delivery cycle from producers to consumers. Through large data technology to effectively and accurately match the production of agricultural products and market demand upstream and downstream of a large number of information, can effectively solve the problem of information partition between producers and consumers, to achieve rapid distribution. The application of big data technology, through monitoring land conditions to implement accurate management, virtually subtracts the cumbersome steps, which is conducive to improving the productivity and profitability of agricultural products, as well as the production scale and value-added effect of agricultural products. The application of big data technology can also shorten the mileage and time of logistics transportation, reduce energy consumption and carbon emissions by tracking and optimizing the route of agricultural products transportation vehicles.

4.4 Realizing the Improvement of the Willingness of All Parties in the Agricultural Supply Chain

Traditional agricultural production depends largely on natural conditions, and production links are scattered, which makes it difficult to achieve standardization while achieving scale. The use of large data analysis technology can help farmers make correct decisions effectively in the interaction of machines and software with data, equipment and personnel, improve the efficiency of consumers' access to agricultural products information, and form a traceability management system of agricultural products with relevant information data such as food testing, logistics vehicle networking, so as to ensure the standardization of production. It can provide the information of agricultural products needed by the demanders accurately, quickly and efficiently.

5 Development Countermeasures of Logistics Supply Chain Applying Big Data Analysis Technology

At present, there are still many obstacles in the application of big data analysis technology in logistics supply chain. Firstly, it is difficult for a single enterprise to bear

the burden of technology platform, algorithm and computing capacity building in terms of capital and technology; Secondly, due to the problem of data sources leading to inaccurate data and lack of key data, even if the number of data is large enough, large data analysis system cannot accurately and timely processing, cannot provide refined, intelligent logistics operation; Thirdly, how to ensure effective collection of information and processing and analysis of different data, which are multiplying, to serve the field operation and decision-making guidance of logistics, is also a challenging problem faced by logistics supply chain enterprises^[15] Therefore, it is suggested to promote the development of big data technology in logistics supply chain from four aspects.

5.1 Further Refinement of Support Policies

Policy support can promote the application of big data technology in logistics industry. Give full play to the government's supervisory function, so that the development policy of logistics industry is inclined to promote the application of big data technology. Detailed construction of logistics big data platform, including information sharing platform, technical analysis platform, process operation platform, etc; From the perspective of financial support and reducing industrial restrictions, we should refine and promote information opening; From the aspects of data development, collection, mining, processing, analysis, exchange and management, detailed industrial standards are formulated for the logistics industry.

5.2 Establishing a Sustainable Interconnection System of Logistics Big Data

Data interconnection means the increase of information and the connection of data, and the key to big data-driven supply chain change is to effectively integrate and process decentralized and diverse enterprise information. Trust is the basis for enterprises to participate in the symbiotic network, the potential risk of unsafe data exchange will make enterprises not willing to share their product data, and the lack of awareness of cooperation and data sharing among logistics enterprises will greatly affect the operational efficiency of enterprises. Improving the availability of supply chain related data can improve the transparency of supply chain and promote the sustainable development of supply chain. Establish the big data interconnection system and sharing mode of logistics industry, establish the data collaboration and sharing mechanism of upstream and downstream industries, integrate the fragmented data of different logistics enterprises, and obtain the comprehensive data that can reflect a certain logistics direction or the whole logistics industry, reduce the cost of enterprises using data alone, and enhance green. Enhance industrial sustainability and enterprise competitiveness.

5.3 Accelerating Technological Innovation

From the comparison of big data technology innovation capability of major countries in the world, it can be seen that the United States, the United Kingdom, South Korea and other countries are in the leading position, but the innovation capability of China's

big data industry is still insufficient, and independent innovation needs to be strengthened. Therefore, in order to speed up the development of big data technology innovation, we should explore the potential of big data technology innovation and development on the premise of sharing supply chain information, and build a big data innovation platform from the new technology research and development, key technology research and development and other related innovation elements of big data; Optimize the operational management of the supply chain by rebalancing low-cost labor with inventory holdings and transportation costs.

5.4 Improving the Willingness of Enterprise Data Management

At present, many logistics enterprises in China still use the traditional logistics mode, the overall degree of symbiotic thinking, information exchange and process sharing is not high, and the ability of enterprises to apply big data is still weak, which brings about problems such as information mismatch, information lag and so on, leading to the failure to effectively reduce operating costs. Due to the financial pressure of applying big data technology, the ability to master new knowledge and the pressure to absorb new technology, the acceptance of big data technology in logistics industry is not very positive. We should strengthen the propaganda of big data technology applying in logistics enterprises, popularize relevant knowledge, and interpret relevant national policies in time; In addition, enterprises with better basic conditions are selected to carry out data sharing and intelligent logistics pilot projects, and experts and scholars in the field of big data are employed to carry out knowledge popularization and technical training for logistics enterprises, so that logistics enterprises can have a more intuitive understanding of the application value and prospects of big data technology, thus enhancing the willingness of logistics enterprises to actively carry out data.

6 Conclusion and Prospect

Big data technology is characterized by huge capacity, complex varieties, fast processing speed and low value density. With the development of data mining technology and data processing technology, the value of big data technology in logistics supply chain is becoming more and more obvious. The logistics supply chain based on big data technology presents the development trend of intelligentization, co-biochemistry, short chain and intellectualization. Big data technology has changed the traditional operation mode of logistics supply chain, established a logistics transaction system that can capture personnel, orders and inventory through digital, solved the problems of matching logistics supply and demand, optimizing and allocating logistics resources, reduced logistics costs, improved logistics efficiency, and consolidated the relationship with customers. By integrating the supply chain of agricultural products with big data in an all-round, fresh and broad perspective, we can break all kinds of constraints and obstacles existing in the traditional supply chain of agricultural products, promote the sharing of all kinds of information and resources in all

links and subjects of the supply chain, and construct a simple, fast, safe, ecological and sustainable development. It provides a reference for the development of supply chain application big data technology in other industries. At present, the application of big data technology in China is still in its early stage, and there are still many bottlenecks and constraints in how to flexibly process the collected data and realize the real value of big data in the core stages of logistics supply chain. This paper proposes to promote the application of big data technology in the field of logistics supply chain from the aspects of refining the supporting policies of big data technology in logistics industry, establishing logistics big data interconnection system, accelerating big data technology innovation and enhancing enterprise data willingness.

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