

The Advantages of The Blockchain Supply Chain Under the Influence of the Epidemic --Take the Retail Industry as an Example

Hai Xu*

President University, Jababeka Education Park, Jl. Ki Hajar Dewantara, RT.2/RW.4, Mekarmukti, Cikarang Utara, Bekasi Regency, West Java 17530 Indonesia

*Email: hai.xu@student.president.ac.id

Abstract. Under the development of globalization, the integration of value chain resources and information has become a prerequisite for optimizing the supply chain. Blockchain technology can effectively analyze and optimize the information of various departments in real-time. This paper studies the advantages of blockchain technology in the upgrading and management of the retail supply chain through the case study method. The research conclusion found that blockchain supply chain technology is still in the development stage. Through the analysis of the supply chains of the three companies, it can be concluded that the current blockchain supply chain network is not well established, lacks corresponding digital technology, and requires corresponding legal regulations on the dissemination of information chains.

Keywords: Blockchain Supply Chain, New Retail, Supply Chain Optimization.

1. Introduction

Since the outbreak of the new crown epidemic in 2019, it has been a test for the global enterprise economic and business model to respond to sudden crises, especially the fragility and shortcomings of the supply chain management of the retail industry under the epidemic have been exposed.

According to Forbes, more than 10,000 retail businesses in the U.S. have closed due to the outbreak, more than in the past few years combined. According to data from the United States Department of Commerce, retail sales in the United States fell 16.4 percent month on month in April, a record decline; in May, U.S. retail sales fell 6% year-on-year, the second-largest drop since the Great Depression. For the full year, 25,000 retail stores in the U.S. are expected to permanently close. Another reason is that due to the rise of new Internet retail, the decline of the traditional retail industry has come, and the oldest business behavior of mankind is facing the biggest challenge since its birth. Compared with the shrinking physical retail, the sales of e-commerce platforms in the United

States have developed rapidly during the epidemic. According to data from the United States Department of Commerce, e-commerce retail sales in the United States totaled US\$160.3 billion in the first quarter of 2020, representing a 2.4 percent month-on-month and 14.8 percent year-on-year increase. Total retail sales in the United States were 1.3635 trillion US dollars in the first quarter, a 1.3 percent decrease from the previous quarter. Amazon hired an additional 175,000 employees in the first quarter to handle a significant increase in online shopping demand, a rare bright spot in the bleak picture of unemployment in the United States as a result of the epidemic.

In fact, the decline of traditional retail enterprises has already begun, and the epidemic is just a "fuse". Therefore, The benefits of supply chain management based on blockchain technology in the new retail industry will be discussed in this article.

After the subprime mortgage crisis in the United States, the concept of blockchain first appeared in Satoshi Nakamoto's Bitcoin white paper. In recent years, the potential of blockchain has been gradually realized and applied to a variety of fields, including digital currency. Technology-based on blockchain It employs a database as the data storage carrier, a peer-to-peer network as the communication carrier, cryptography to determine ownership and protect privacy, and a distributed record system and consensus framework to ensure consistency. This article will use the current chain

structure of the alliance chain in the blockchain. Technology discusses the current application examples and experiences of the new retail blockchain supply chain.

2. Main Body

2.1 Overview of the traditional retail supply chain

The traditional retail industry is an independent business entity, and its supply chain is a one-dimensional process straight line, while the new retail industry is an interconnected network from upstream to downstream. With the help of digital platforms, the supply chain is multi-end and diverse.

The traditional supply chain is mostly a "one-dimensional process supply chain". The supply chain is made up of two ends of a simple linear chain that are not connected to one another.. Driven by the process-based model, the supply chain presents a one-dimensional, one-way, chain-like collaboration feature from department A to department B to department C.

The traditional one-dimensional process supply chain has the following disadvantages:

(1) The process is cumbersome and inefficient

Commodities have to go through various cumbersome processes from factories to consumers. Driven by the past process, the supply chain is often a one-dimensional chain-like collaboration, showing the characteristics of low efficiency and opaque information. Once a breakpoint or problem occurs in the process, it can be difficult to quickly find the cause and respond.

(2) Unable to meet diversified needs and poor user experience

Consumption that is personalized and diverse is becoming the norm for current consumption growth. Satisfying consumer demand with proper products and faster delivery is quickly becoming an important indicator of an enterprise's core competitiveness. Traditional supply chain enterprises continue to focus on suppliers/retailers rather than consumers, are unaware of market changes, and have certain flexibility flaws.

(3) Relying on human experience, the decision-making level is low

Many companies today still treat quantitative demand forecasting methods as a black box, judged entirely by experience and feeling. This approach relies heavily on the experience, level, energy of decision-makers, who were awarded the Turing Prize in 1975 and the Nobel Prize in Economics in 1978, said that what people look for in decision-making is not the "optimal" standard, but the "satisfaction" standard, which is bounded rationality. Such a decision-making method is often It is not the most accurate prediction and judgment.

(4) The system is complex and cost control is difficult

Most companies will face a problem: more and more product lines and more and more changing demands will inevitably form a more complex supply chain system, including a large number of participants (enterprise, suppliers, distributors, carriers end-user) Enterprises should not only establish a management method to reduce the cost of each individual item, but also how to balance it. Most of the time, lowering particular individual expenses not only raises the overall cost of the supply chain but also lowers product quality and service standards.

(5) Difficulty in information exchange and low ability to handle the crisis in the supply chain.

In the traditional supply chain, each department is an independent individual, and the information exchange with each other is limited to the transmission between adjacent departments, cross-level information exchange cannot be carried out, the information flow transmission time is long and the reliability is low. Therefore, the lag of information transmission when the supply chain encounters a crisis will lead to the weakening of the ability of various departments to change the supply chain to deal with the crisis.

2.2 Overview of the application of blockchain in the supply chain

The impact on the global supply chain is directly caused by the sudden external influence of the epidemic; in fact, hidden dangers have already existed, and to a large extent, the market players

in the supply chain are the result of over-biased efficiency in the "efficiency-safety" trade-off. To optimize profits in the global production-sales supply chain's division of labor mode, market players frequently consider labor costs and transportation costs when designing the spatial architecture of the supply chain and employ low inventory or even zero inventory to cut supply chain expenses. This approach generates substantial profits for the company in a regular operating environment. However, the new crown epidemic has impacted supply-side production capacity and limited transportation-side logistics capacity, exposing the shortcomings of this division of labor mode that seeks ultimate efficiency, causing the global supply chain to hit breakpoints in regional production and sales links, as well as international logistics links blockage occurs.

Blockchain is essentially a shared database, and the data or information recorded in it is unforgeable, traceable, traceable, open and transparent, and community maintenance. Based on these qualities, blockchain facilitates the establishment of a foundation of trust between organizations, enabling enterprises and producers to conduct peer-to-peer transactions without the use of a bank.

The characteristics of blockchain supply chain technology and the procurement system, logistics system, payment system, credit system, and electronic information security system under the framework of the model are improving the efficiency of the supply chain, improving information transmission, and creating a safe and reliable e-commerce network ecological environment. Has a technical advantage.

The advantages of blockchain supply chain in management:

Adjusted the collaborative relationship between various departments of the supply chain and expanded the traditional "one-dimensional process supply chain" into a supply chain network.

Increase the transparency of information flow between various departments

The improved cryptographic security of supply chain information

Since the rise of e-commerce platforms in 2018, the "war" between traditional offline retail and online companies has never stopped. Because online retail enterprises carry the express development of logistics and transportation, they have a prominent cost advantage over offline physical retail. However, with the evolution of traditional retail forms, the game strategies of both parties will tend to be integrated to create a win-win situation. Through Omni-channels, expanding from traditional entities to online, digitizing enterprises, carrying out digital platform management, reducing employee workload, and reducing labor costs, traditional retail enterprises are becoming more and more digitized. The integration of online + offline enterprises will create a new retail format in the future. Of course, the digital transformation of the supply chain, cloud computing, big data regulation, blockchain, and other technologies will empower the development of new retail enterprises.

2.3 Practical application

Empirical Analysis with JD.com as an Example

JD.com is a B2C Internet shopping platform.

Take the practice of JD's blockchain technology "Zhizhen Chain" since 2016 as an example.

Product traceability, blockchain traceability services:

By selecting 495 SKUs of 120 brands in 4 categories as the analysis objects, 97 SKUs of online blockchain traceability services, and 398 control SKUs of the same brand. The fixed-effect model and the interactive fixed-effect model were used to track the event occurrence time of SKU, and The consumption data of approximately 40 weeks was chosen to confirm that the blockchain anti-counterfeiting traceability service had a favorable impact on product sales and repurchase rate. The results are as follows: sales of nutritional health care and maternal and baby milk powder products have climbed by 29.4 percent and 10.0 percent, respectively; repurchase rates of seafood fresh, nutritional health care, maternal and infant milk powder beauty and skincare items have increased by 47.5 percent and 44.8 percent, respectively.

At present, the JingDong smart blockchain supply chain can already trace the whole process of commodities from raw materials to supply to consumers; in the intelligent supply chain, the whole process is informatized, combined with AI regulation, cloud computing big data and other

technologies, From commodity circulation data, logistics data, warehousing data, sales information, etc., information is quickly transmitted in the entire retail supply chain, and resources are allocated reasonably and goods are replenished. Combined with a market response, avoid unnecessary waste of resources; in product traceability, combined with blockchain information and cloud computing, quickly and accurately query the sourcing process of products, opening up a way to monitor product quality and enhance consumer confidence in the brand. new way.

2.4 Empirical analysis taking Wal-Mart as an example

Walmart's Mexican Mango Tracking Tour (with IBM Food Trust™)

Walmart, an American retail group, will be the object of this research.

Walmart is a multinational brick-and-mortar retailer headquartered in the United States. According to data collected at the end of January 2018, Walmart has 11,718 locations in 28 countries, operates under 59 distinct names, had \$500.3 billion in revenue in fiscal 2018, and employs approximately 2.3 million people worldwide.

Mr. Frank Yiannas described the IBM Food Trust™ supply chain system to track the growth of mango products at an IBM summit in 2017:

On the subject of blockchain and food safety, consider the delivery of mangoes: The first stage of the supply chain process for Walmart mango sliced products is seedling, in which mango seeds are planted in the farm's soil. Under the meticulous care of farmers, mango trees normally take 5 to 8 years to fully mature and bear fruit, along with other variables that help mango trees flourish, such as maintaining optimal soil and weather conditions, fertilization, irrigation, and more. Mangoes will be harvested before they are fully ripe at the appropriate time when the trees are ripe and ready for fruit picking. Following that, the fresh mangoes are transferred to a packing plant and processed, where they are washed first. Shipping can be done by sea, land, or air. Mangoes cross the U.S. customs border into the U.S. entry where the processing facility is located. During this processing stage, the mangoes are further washed, peeled, cut into small pieces, and placed in individual packaging. From these packages, the mangoes are shipped to Walmart distribution centers across the country, where they are refrigerated and displayed on Walmart store shelves as the final point of purchase for consumers.

For Walmart, the mango product line participating in the trial involved cross-border trade and sourcing from Mexico, followed by processing, distribution, and consumption in the U.S. market. These different countries involved in trade and logistics also take place beyond the US border. Therefore, from Walmart's point of view, business activities are international. And on the supply chain network, because all key stakeholders must give sufficient, numerous information such as precondition papers, import and export certificates, operation and product quality verification, and so on, at each stage of the product, in which the product is processed Update the entire chain network with real-time data.

Depending on how products are packaged and tracked in the supply chain, Walmart's tracking system is based on the identification of batch information, individual batches, pallets, serial numbers, or expiration dates. Walmart is currently tracking and managing the food supply chain with IBM Food Trust™. Because of the nature of blockchain technology, all data submitted into the system is encrypted, guaranteeing that it is permanent, securely kept, tamper-proof, and long-lasting. Furthermore, a copy of the data stored in the system is given to each permission network member in the chain, allowing users to have more flexible access and increasing the chain's transparency.

2.5 Empirical analysis using Lenovo as an example

Lenovo Group is a global technology company.

Take Lenovo's SCI (Supply Chain Intelligence) in 2017 as an example.

Supply chain optimization design.

Lenovo Smart Supply Chain is a functional platform integrating big data analysis, AI, intelligent decision-making, and other functions, and is the command center in the entire supply chain management. Integrating data on the same data platform, designing and optimizing the supply chain end-to-end supply chain process, making intelligent decisions, etc., it has brought significant benefits to Lenovo's global supply chain development.

Lenovo's supply chain process mainly starts from customer order information combined with the number of customer orders, forecasts on the demand side, controls the number of materials purchased, and provides data support for procurement and supply to help digest orders in the manufacturing process; at the same time, the product life from new product development to listing Cycle management, combined with manufacturing, analyzes past transaction orders in the platform database to control the release of new products. After the final delivery to the customer, the product quality information and customer satisfaction data are collected to optimize and adjust the SCI supply chain. Such closed-loop processing of supply chain data enables Lenovo's global business to continue to be upgraded on the industrial side and consumer service side. The transparent processing of information in the supply chain allows the supply chain to adjust, optimize and design in a timelier manner to improve its ability to resist risks.

3. Conclusion

New retail has put forward new requirements for the traditional supply chain operation mode of the retail industry, and transformation has become the only way for the development of the retail industry. The new retail industry should start from the consumer and then extend to the upstream of the supply chain, to meet the needs of consumers and be customer-centric. But for now, the development of the new retail supply chain is still a challenge for the retail industry.

However, blockchain supply chain solutions have begun to emerge in the new retail industry. With its unique advantages, blockchain technology makes supply chain data more interactive. The transparency of blockchain can assist reduce delays by preventing products from stalling in the supply chain or from being blocked from being transported owing to supply chain issues. The traceability of blockchain enables each product to be tracked in real-time digital nature reducing delays caused by paper documents, especially the convenience of entering and leaving customs.

Companies such as JD.com and Walmart that have adopted such supply chain adjustments have significantly improved the controllability and traceability of the value chain. The information in the supply chain network is encrypted and transmitted, open and transparent, to better manage the industrial chain, and continuously improve and upgrade the supply chain network to improve the ability to deal with risks. At present, blockchain supply chain technology is still in the exploration stage. It is hoped that soon, the upstream and downstream of the industrial chain can instantly understand, manage and predict supply chain problems, which also creates conditions for the blockchain development in the future industries

Reference

- [1] Cellini, S. R., & Kee, J. E. (2015). Cost-Effectiveness and Cost-Benefit Analysis. *Handbook of Practical Program Evaluation: Fourth Edition*, 636–672. <https://doi.org/10.1002/9781119171386.ch24>
- [2] Carvalho Fagundes, M. V., Teles, E. O., Vieira de Melo, S. A. B., & Mendonça Freires, F. G. (2020). Supply chain risk management modeling: A systematic literature network analysis review. *IMA Journal of Management Mathematics*, 31(4), 387–416. <https://doi.org/10.1093/imaman/dpaa019>
- [3] Bodkhe, U., Tanwar, S., Parekh, K., Khanpara, P., Tyagi, S., Kumar, N., & Alazab, M. (2020). Blockchain for Industry 4.0: A comprehensive review. *IEEE Access*, 8, 79764–79800. <https://doi.org/10.1109/ACCESS.2020.2988579>
- [4] Ali, O., Jaradat, A., Kulakli, A., & Abuhlimeh, A. (2021). A Comparative Study: Blockchain Technology Utilization Benefits, Challenges and Functionalities. *IEEE Access*, 9, 12730–12749. <https://doi.org/10.1109/ACCESS.2021.3050241>

- [5] Gervais, A., Karame, G. O., Wüst, K., Glykantzis, V., Ritzdorf, H., & Čapkun, S. (2016). On the security and performance of Proof of Work blockchains. *Proceedings of the ACM Conference on Computer and Communications Security*, 24-28-October-2016, 3–16. <https://doi.org/10.1145/2976749.2978341>
- [6] Karasman, I. S. (2009). Uloga astrologije u Teatru svijeta Giulia Camilla Delminija. *Filozofska Istrazivanja*, 29(2), 325–333.
- [7] Ko, T., Lee, J., & Ryu, D. (2018). Blockchain technology and manufacturing industry: Real-time transparency and cost savings. *Sustainability (Switzerland)*, 10(11), 1–20. <https://doi.org/10.3390/su10114274>
- [8] Pham, H. (2018). The impact of Blockchain technology on the improvement of International.
- [9] Queiroz, M. M., & Fosso Wamba, S. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. *International Journal of Information Management*, 46(September 2018), 70–82. <https://doi.org/10.1016/j.ijinfomgt.2018.11.021>
- [10] Tönnissen, S., & Teuteberg, F. (2020). Analysing the impact of blockchain-technology for operations and supply chain management: An explanatory model drawn from multiple case studies. *International Journal of Information Management*, 52(April), 0–1. <https://doi.org/10.1016/j.ijinfomgt.2019.05.009>
- [11] Xiong, F., Xiao, R., Ren, W., Zheng, R., & Jiang, J. (2019). A key protection scheme based on secret sharing for blockchain-based construction supply chain system. *IEEE Access*, 7, 126773–126786. <https://doi.org/10.1109/ACCESS.2019.2937917>
- [12] CAICT. (2021). BlockChain white paper2021. 202125. <http://www.caict.ac.cn/kxyj/qwfb/bps/201809/P020180905517892312190.pdf>
- [13] Jingji, S. (2019). Research on Cost Control of Enterprise Supply Chain based on Blockchain Technology. 0–2. <https://portal.issn.org/resource/ISSN/1009-6043>
- [14] JD Blockchain Technology Practice White Paper (2020). 0–223. <https://blockchain.jd.com/whitebook/>
- [15] Lohmer, J., Bugert, N., & Lasch, R. (2020). Analysis of resilience strategies and ripple effect in blockchain-coordinated supply chains: An agent-based simulation study. *International Journal of Production Economics*, 228, 107882. <https://doi.org/10.1016/j.ijpe.2020.107882>