

Walmart Supply Chain Research

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Abstract. In the increasingly competitive global retail industry, supply chain management has become a critical factor for companies to gain a competitive edge. As a global retail leader, Walmart's supply chain management system has long been regarded as an industry benchmark. However, with the rise of e-commerce, evolving consumer demands and growing uncertainties in global supply chains, its supply chain management faces new challenges. Based on existing literature and relevant data, this paper focuses on the core advantages of Walmart's supply chain management, including advanced information technology applications, efficient logistics networks, and supplier collaboration mechanisms. The paper then explores the main challenges Wal-Mart currently faces, such as inventory management optimization, omnichannel integration, and enhancing supply chain resilience. Building on this analysis, the paper proposes optimization strategies, including strengthening digital supply chain construction, refining inventory management strategies, improving supply chain sustainability, and enhancing supply chain resilience.

Keywords: Walmart, Supply Chain Management, Supplier Management

1. Introduction

Against the backdrop of global economic integration, competition in the retail industry has intensified. Retail enterprises are vying for market share through fierce competition in pricing, services, product variety, and other dimensions. According to Statista, the global retail market reached \$25 trillion in 2024 and is expected to maintain steady growth in the coming years. In this competitive landscape, supply chain management has emerged as a core element for companies to secure a competitive advantage [1]. Walmart, as a global retail giant, has achieved remarkable success in supply chain management. Its global procurement network spans over 200 countries and regions and directly collaborates with more than 100,000 suppliers. In terms of supplier classification, Simchi-Levi et al. highlight that Walmart employs a supplier performance evaluation system to ensure suppliers meet its high standards in quality, delivery time, and cost [2]. This rigorous supplier management mechanism is considered a key factor in Walmart's ability to maintain its low-price strategy. However, some scholars argue that this dominant approach may compress suppliers' profit margins, leading to strained supply chain relationships [3]. In inventory management, Stank et al. demonstrate that cross-docking technology enables Walmart to transfer goods directly from suppliers' trucks to distribution vehicles, minimizing storage needs and significantly reducing inventory holding costs [4]. The utilization of information technology in

Walmart's supply chain management is an additional area of academic interest. In the 1980s, Walmart invested in its Retail Link system, enabling suppliers to access real-time sales and inventory data [5]. Walmart has increasingly incorporated emerging technologies, like RFID, big data analytics, and artificial intelligence, into its supply chain system due to technological improvements. A review of existing literature reveals that research on Walmart's supply chain management is multidimensional and interdisciplinary. While scholars hold differing views on specific issues, there is a consensus that Walmart's supply chain management system plays a decisive role in its market leadership. Building on this foundation, this paper aims to conduct an in-depth study of Walmart's supply chain management. By employing a literature analysis method, it synthesizes existing research findings to evaluate the strengths, weaknesses, opportunities, and threats of Walmart's supply chain management. This study possesses considerable practical significance for Walmart in enhancing its supply chain to save costs and augment efficiency. It also offers significant insights for other international retail companies, facilitating innovations and progress in supply chain management throughout the retail sector.

2. Related concepts

Supply Chain Management: It refers to the planning, coordination, control and optimization of management activities for the whole process from raw material procurement, production and manufacturing, product distribution and sales to end consumers. The core elements of supply chain management include procurement, production, distribution, inventory, etc. Supply chain management is of great significance to enterprise operational efficiency and cost control. Effective supply chain management can shorten the product delivery cycle, improve the inventory turnover rate, and reduce procurement and transportation costs. Studies have shown that enterprises that adopt digital supply chain management can reduce operating costs by an average of 18-25%, and the inventory turnover rate can be increased to 10-12 times/year (industry average 5-7 times) [6]. For instance, the Retail Link system enhanced Walmart's supply chain oversight and decision-making, resulting in a 35% increase in suppliers' inventory turnover rate and a 96.5% order satisfaction rate, significantly improving market demand forecasting accuracy while minimizing inventory backlogs and costs [7].

Supplier Evaluation and Supplier Management: The criteria for supplier selection mainly include cost, quality, delivery time, service level, corporate credibility, etc. Commonly used supplier selection methods include hierarchical analysis, fuzzy comprehensive evaluation, etc. Supplier performance evaluation is mainly carried out in terms of cost, quality, delivery time, service, etc., and the performance of suppliers is measured through quantitative indicators. For example, in terms of cost, evaluate whether the supplier's quotation is competitive; in terms of quality, check whether the products provided by the supplier meet the quality standards; in terms of delivery time, check whether the supplier can deliver on time; and in terms of service, evaluate the supplier's after-sales service level and response speed.

Supplier Classification Management: Based on the classification management method of demand importance and supplier capability, suppliers are divided into strategic suppliers, leveraged suppliers, bottleneck suppliers and general suppliers. For different types of suppliers, adopt different management strategies, such as establishing long-term cooperative relationships with strategic suppliers, negotiating prices with leveraged suppliers, etc. [8]. For example, for strategic suppliers, enterprises should work with them to carry out product research and development and cost control to achieve mutual benefit and win-win results; for leveraged suppliers, enterprises can obtain more favorable procurement prices through bidding and other means.

Transaction Cost Theory: Transaction costs encompass the diverse expenses associated with market transactions, including search costs, negotiation costs, signing costs, monitoring costs, and default costs. In supply chain management, the implementation of transaction cost theory mostly manifests in the reduction of procurement and transportation expenses. For instance, cultivating enduring and reliable supplier connections can diminish search and negotiating expenses; streamlining logistics and distribution routes can lower transportation costs. Furthermore, the utilization of information technology to facilitate information sharing can diminish the transaction costs associated with information asymmetry.

3. The current situation of Wal-Mart supply chain management

3.1. Overview of Wal-Mart global suppliers

Walmart has set up more than 20 procurement centers around the world, such as a global procurement headquarters in Bentonville, the United States, and procurement centers in Shenzhen, Shanghai and other places in China. Its main suppliers are located in China, India, the United States, Mexico and other countries and regions. These suppliers cover fields including clothing, food, daily necessities, and electronic products, characterized by large scale, strong production capacity, and stable product quality. For example, some large clothing suppliers in China have provided Walmart with a large number of novel and reliable clothing products; Indian suppliers have advantages in textiles and handicrafts.

According to factors such as product characteristics, supplier size and strategic importance, Walmart divides suppliers into four categories: strategic suppliers, leverage suppliers, bottleneck suppliers and general suppliers [9]. This classification method is not static, but based on the dynamic adjustment of continuous performance evaluation. In terms of performance evaluation, Walmart has established a multi-dimensional quantitative index system, including on-time delivery rate, product quality qualification rate, price competitiveness, innovation contribution and sustainable development performance, etc [10]. Among them, the supplier's order satisfaction rate is regarded as a core indicator. Research shows that Walmart will monitor this data in real time through the retail chain system. Any performance below 95% will trigger an early warning mechanism. If there is still no improvement, cooperation may be reduced [11]. Walmart will augment buy volume and provide specific price reductions for suppliers demonstrating exceptional performance. This strict evaluation system enables Walmart to accurately identify high-performance suppliers. For example, P&G has long been listed as a strategic supplier and has received priority order allocation for its excellent collaborative forecasting and replenishment (CPFR) capabilities [12].

3.2. Overview of Wal-Mart distribution center

Walmart has more than 1,000 distribution centers around the world. These distribution centers are distributed on all continents and are responsible for the centralized distribution of purchased goods to each store. Walmart utilizes advanced logistics systems, including large trucks and rail transport, to reduce costs. Simultaneously, optimizing distribution routes enhances efficiency and ensures timely store deliveries. For example, Walmart uses big data analysis technology to optimize distribution routes and reduce transportation time and costs based on store sales data and traffic conditions. The efficient distribution system of Walmart's distribution center is regarded as the core element of the success of its supply chain management. Its operation deeply integrates the Just-in-Time (JIT) principle to minimize inventory and maximize response speed. Research shows that

Walmart compresses the flow time of goods from suppliers to stores to within the industry-leading 48 hours through the Regional Distribution Centers (RDCs) network [13]. The core of this JIT distribution model lies in the demand-driven continuous replenishment system. Walmart's Retail Link system updates sales data every 20 minutes to generate distribution instructions, so that the inventory turnover rate of each distribution center is maintained at an amazing 10.5 times/year, far higher than the industry average of 5.3 times [5].

3.3. Walmart distribution

Walmart's distribution mode includes direct delivery and distribution mode. The direct delivery mode is suitable for stores with close distance and large demand, which can reduce intermediate links and reduce transportation costs; the distribution mode suits stores at long distances with low demand, requiring redistribution through distribution centers. By introducing advanced information systems, Walmart has optimized and intelligentized the distribution network and improved the distribution efficiency. For example, its innovative "closed-loop logistics" design has made the utilization rate of return vehicles reach 92%, greatly reducing the empty load rate [14]. This refined transportation management enables Walmart to control logistics costs at 1.7% of sales, while competitors usually need 3-4%, which provides key support for its "daily low price" strategy [2].

4. Risk assessment and suggestions

4.1. Risk assessment of Walmart supply chain

Supplier risk assessment: Although Walmart's classification management of suppliers is conducive to its layered screening and adjustment cooperation to achieve the purpose of controlling costs, some studies point out that Walmart's evaluation standards overly focus on short-term operational indicators, which may inhibit suppliers' long-term innovation investment [15]. The extreme pursuit of cost control has forced some suppliers to outsource production to low-cost areas, increasing the vulnerability of the supply chain, such as the disconnection of some Asian suppliers during the epidemic in 2020 [16]. In addition, Walmart requires suppliers to bear more sustainable development costs (such as environmentally friendly packaging transformation), but does not adjust the procurement price accordingly, which is criticized for passing on the cost of corporate social responsibility [17]. These controversies reflect the deep contradictions brought about by the asymmetry of power in global supply chain governance, and also point out the direction for future supplier management research — how to establish a new balance between efficiency, resilience and fairness.

Logistics and distribution risks: Walmart's JIT inventory management model also exposes the vulnerability of difficulty in dealing with emergencies in practice. The research of Chopra and Meindl pointed out that in the early days of the COVID-19 pandemic in 2020, Walmart relied too much on lean inventory (on average, only maintaining 3.5 days of store inventory buffer), resulting in a large-scale shortage of urgently needed goods such as toilet paper and disinfectant, forcing temporary opening at a higher cost [14]. Air freight replenishment. Similar problems are more prominent when natural disasters occur frequently. For example, after Hurricane Harvey hit Texas in 2017, Walmart's local distribution center was paralyzed by the flood, causing the supply chain of 50 surrounding stores to be interrupted for a week [16]. This systemic vulnerability arises from JIT's rigid stability requirements—compounded by 85% reliance on third-party logistics providers for domestic distribution. When these carriers fluctuate due to driver shortages or rising fuel prices, the

entire distribution system will have a chain reaction. What's more noteworthy is that Walmart's on-time delivery pressure on suppliers in order to maintain JIT efficiency (98% on-time rate requirement) actually transfers inventory risks to upstream [18].

Big data and information security risks: Logistics systems that rely heavily on big data gradually show three types of typical risks in practice: data quality risk, system vulnerability risk and algorithmic ethics risk. The research of Kshetri revealed that the "data drift" incident that occurred at Walmart in 2021 caused the distortion of frozen food temperature data due to sensor failure, resulting in the wrong scrapping of goods worth \$4.3 million, which reflects the quality control defects in the data collection link of the Internet of Things [19]. More seriously, in 2020, hackers' ransomware attacks on Walmart's distribution routing algorithm paralyzed 23 distribution centers in the southeastern United States for 36 hours, with a direct loss of \$120 million, exposing the centralized data architecture.

4.2. Risk management suggestions

Optimize the supplier selection process: In order to establish a balance between efficiency and resilience, Walmart can introduce the supply chain resilience index, relax short-term cost requirements for strategic material suppliers, and allow them to maintain safe inventory for 10-15 days [16]. Implement a revenue-sharing framework and allocate advantages via a price premium when suppliers' sustainable innovations yield tangible benefits [19]. The future trajectory of supplier management must focus on establishing a "symbiotic" supply chain ecosystem that balances market competitiveness with risk resilience. This necessitates Walmart's transition from a transactional leader to a value co-creator through digital collaboration, such as shared forecasting algorithms, and risk-sharing mechanisms, including the creation of a supply chain interruption insurance pool where Walmart and suppliers proportionately share premiums based on purchase volume, alongside other profound institutional innovations [15].

Logistics optimization: Walmart adopts the strategy of "resilience optimization" while maintaining the advantages of JIT. Kshetri proposed that Walmart can draw on the "JIT+buffer" model improved by Toyota after the earthquake in 2011 to establish strategic inventory reserves for key categories (such as drugs and infant formula). Research shows that this hybrid model can improve the resilience of the supply chain by 28% and only increase 1.2% of the inventory cost [19]. In terms of transportation network optimization, Wamba and Queiroz suggested that Walmart expand cooperation with digital freight platforms such as Uber Freight to alleviate carrier dependence through dynamic capacity pools. Pilot data shows that this plan can respond to sudden capacity gaps [20]. For supplier risk sharing, Sodhi and Tang advocate the establishment of a blockchain-based supply chain collaboration platform to share inventory visualization and demand forecasting data in real time upstream and downstream. This model tested by P&G and Walmart has reduced the cost of joint inventory by 19% [12].

Big data application suggestions: a "resilient data governance" system can be built. At the security level, a "digital twin" stress test system should be established to regularly simulate data interruptions in extreme scenarios. Toyota shortens the system recovery time to 15 minutes through this method [21]. In the future, Walmart must transition from a "data-driven" approach to a "data-enabled" model, integrating big data technology with human expertise and insight, exemplified by allowing regional distribution managers in Kentucky to retain a 20% manual adjustment authority over algorithmic recommendations. This "human-computer collaboration" model improves distribution efficiency by 13% and reduces system risk events by 41% [13]. This suggests that the

digital transformation of retail enterprises should not fall into the trap of technological omnipotence, but should find a dynamic balance between technological advancedness and operational robustness.

5. Conclusion

Walmart's supply chain management system has shown a leading level in the industry in terms of supplier classification and performance evaluation, efficient distribution in distribution centers, and big data-driven logistics optimization, but it also faces deep contradictions between efficiency and resilience, technology dependence and risk control. In terms of supplier management, Walmart ensures the efficient operation of the supply chain through dynamic classification and a strict performance evaluation system, but overemphasis on cost control and short-term indicators may inhibit suppliers' innovative ability and long-term cooperation. Although the JIT (punctual system) distribution mode of the distribution center has greatly improved the inventory turnover rate and logistics efficiency, it has exposed vulnerabilities in emergencies (such as epidemics and natural disasters), highlighting the trade-off problem between lean inventory and supply chain resilience. The application of big data technology enables Walmart to achieve accurate demand forecasting and transportation optimization, but data quality risks, system security vulnerabilities and algorithmic ethics also pose challenges to the stability of the supply chain. This analysis primarily confirms the sophistication of Walmart's supply chain management. The transparency and interpretability of big data algorithms remain constrained, and the persistence of the algorithmic black box issue continues to undermine trust among supply chain partners. Future research should enhance the study of digital ethics within the supply chain, provide a framework for algorithm governance, and guarantee that the utilization of big data is both effective and equitable.

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