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Research on Supply Chain Collaborative Management of Sports Goods E-commerce Platform

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Abstract: *This paper explores the collaborative management of the supply chain of sports goods e-commerce platforms, explores the collaboration mechanisms and management models between various links in the supply chain, and analyzes the roles of factors such as information sharing, demand forecasting, inventory management, and logistics distribution in collaborative management. Through case analysis, this paper reveals the positive impact of supply chain collaboration on improving inventory turnover, reducing costs, and enhancing customer satisfaction. It also points out how to optimize logistics systems and strategic cooperation in the context of globalization and cross-border e-commerce to enhance the resilience and responsiveness of the supply chain. Research has shown that supply chain collaborative management can not only effectively improve the operational efficiency of platforms, but also provide sustained competitive advantages for e-commerce platforms in fierce market competition.*

Keywords: *sports equipment, e-commerce platform, supply chain management, collaborative management*

1. Introduction

With the rapid development of the Internet and the rise of e-commerce, e-commerce platforms have become an important channel for business operations in all walks of life. Especially in the sports equipment industry, the emergence of e-commerce platforms not only breaks the traditional sales model, but also greatly promotes the rapid growth of the industry. However, with the increasingly fierce market competition and diversified consumer demands, traditional supply chain management models are no longer able to adapt to the rapid changes and efficient operational needs of modern e-commerce platforms. Collaborative management of the supply chain has become one of the key factors in enhancing the competitiveness of e-commerce platforms, reducing operating costs, and improving customer satisfaction.

As a special category of consumer goods, sports equipment has the characteristics of strong seasonality, diverse varieties, and large market demand fluctuations, which makes its supply chain management on e-commerce platforms particularly complex. Sports goods e-commerce platforms usually involve multiple links from manufacturers, suppliers, warehousing and distribution providers to consumers [1]. How to efficiently coordinate resources, information, and logistics between these links has become the core issue for e-commerce platforms to gain competitive advantages. Due to factors such as information asymmetry, inaccurate demand forecasting, and insufficient coordination among supply chain nodes, sports goods e-commerce platforms face many challenges in supply chain collaborative management.

This study aims to explore the specific problems and solutions of sports goods e-commerce platforms in supply chain collaborative management. By analyzing the supply chain characteristics of the sports equipment industry and its current application status in e-commerce platforms, this paper explores how to improve the overall efficiency of the supply chain through collaborative management, reduce inventory costs, enhance service response speed, and thereby enhance the competitiveness and market share of the platform. The research will focus on analyzing the impact of key elements such as information sharing, partnership relationships, and technical support on supply chain collaborative management, and propose specific collaborative management strategies and implementation paths using typical e-commerce platforms as cases. The significance of this study is not only to provide theoretical support and practical suggestions for optimizing supply chain management for sports goods e-commerce platforms, but also to provide reference for e-commerce platforms in other industries in

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supply chain collaborative management. With the advancement of technology and changes in the market environment, the synergy of supply chain management will become a necessary condition for the success of future e-commerce platforms. I hope that this study can provide new perspectives and ideas for promoting efficient collaboration in the supply chain of e-commerce platforms in the sports equipment industry.

2. Theoretical basis and literature review

2.1 Overview of supply chain management

Supply Chain Management (SCM) is a comprehensive management activity that involves the entire process of a product from raw material procurement, production, warehousing, distribution to the end consumer [2]. The core goal of supply chain management is to improve the overall efficiency and responsiveness of the supply chain by optimizing resource allocation between various links, thereby enhancing the competitiveness of the enterprise. With the development of globalization and informatization, the importance of supply chain management has gradually been emphasized, becoming a key means for various industries to improve operational efficiency, reduce costs, and enhance market response speed.

The basic concept of supply chain management can be traced back to logistics management theory in the 1950s, and it was not until the 1990s that it developed into a modern supply chain management framework [3]. The core activities of supply chain management include procurement management, production scheduling, inventory management, distribution management, transportation management, etc. With the advancement of technology, the widespread application of information systems, data analysis technology, and automation equipment, the content of supply chain management is gradually expanding from traditional material and capital flows to the integration of information and technology flows. An efficient supply chain should not only focus on the single efficiency of each link, but also pay attention to the collaborative operation of the entire chain.

In the era of e-commerce, supply chain management is no longer limited to traditional offline channels, but has expanded to online platforms, forming a networked supply chain structure centered on e-commerce platforms. This change poses new challenges for supply chain management: how to achieve information sharing and collaborative operation among multiple participants, how to respond to rapid changes in consumer demand, and how to optimize supply chain decisions using modern technology.

2.2 Relevant theories of supply chain collaborative management

Supply Chain Collaboration (SCC) is a collaborative management approach aimed at improving the overall performance of all parties in the supply chain through information sharing, resource integration, and coordinated cooperation [4]. In traditional supply chain management, each link in the supply chain usually operates independently, lacking effective communication and collaboration, which often leads to information asymmetry, decision-making delays, and resource waste. The introduction of supply chain collaborative management has broken this isolated model, emphasizing that all parties in the supply chain can achieve overall efficiency improvement through cooperation and win-win outcomes.

The core theories of supply chain collaborative management include game theory, information sharing theory, resource dependence theory, and relationship marketing theory. The basic idea of game theory is that all parties achieve the best win-win results through rational decision-making in cooperation and competition, helping to analyze how to allocate benefits through reasonable cooperation models and avoid non cooperative behavior. The theory of information sharing holds that information asymmetry is an important reason for low supply chain efficiency. By achieving real-time sharing of upstream and downstream information, inventory backlog can be reduced, production plans can be optimized, and demand fluctuations can be effectively addressed. The resource dependence theory emphasizes the resource exchange relationship between enterprises and the external environment. Cooperative relationships are based on resource complementarity, and sharing resources improves overall operational efficiency. It is necessary to establish stable cooperative relationships to achieve better collaboration and win-win outcomes. Relationship marketing theory suggests that by establishing long-term stable cooperative relationships, companies can reduce transaction costs, improve market adaptability and customer satisfaction, thereby enhancing the flexibility and response speed of the supply chain.

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2.3 Research status of supply chain management in e-commerce platforms

The rise of e-commerce platforms has changed the traditional supply chain management model, especially in specific fields such as the sports goods industry [5]. E-commerce platforms not only need to deal with traditional supply chain problems, but also need to cope with the high frequency, high variability, and personalized needs of online transactions. With the changing shopping habits of consumers, e-commerce platforms are facing more challenges in supply chain management, such as how to handle a large number of small orders, optimize inventory management, and improve the timeliness of product delivery.

At present, research on supply chain management of e-commerce platforms mainly focuses on several key areas. Firstly, with the increasing number of e-commerce platforms, how to optimize the supply chain network to shorten delivery time and reduce inventory costs has become an important issue. Research has shown that utilizing big data and artificial intelligence technology for demand forecasting, logistics scheduling, and inventory management can effectively improve the response speed and flexibility of the supply chain. Secondly, the research on supply chain collaboration mechanisms focuses on the cooperation between platforms and various links in the supply chain, especially through information sharing and joint inventory management to achieve multi-party collaboration, thereby improving the overall efficiency of the platform and customer satisfaction. In addition, reverse logistics management has become a major challenge in the operation of e-commerce platforms, especially in industries with high return rates, such as sports goods. By optimizing the return and exchange process and improving processing efficiency, costs can be reduced and overall operational efficiency can be improved. Green supply chain management has gradually become an important issue in e-commerce platforms. How to balance environmental protection and economic benefits, reduce carbon emissions and save energy through green packaging and transportation, and enhance brand value and social responsibility is the focus of research. Finally, with the advancement of information technology, digital transformation has become the mainstream trend in supply chain management for e-commerce platforms. The application of emerging technologies such as the Internet of Things, blockchain, and artificial intelligence helps achieve real-time data monitoring, accurate prediction, and efficient scheduling, enhancing the transparency and response speed of the supply chain.

By reviewing the current research status of supply chain management, supply chain collaboration management, and e-commerce platform supply chain management, it can be seen that modern e-commerce platform supply chain management not only relies on traditional management theories, but also needs to use advanced technological means to improve efficiency and response speed. In special industries such as sports equipment, how to effectively integrate resources and coordinate various links of the supply chain has become the key to enhancing the competitiveness of e-commerce platforms. On this basis, this study will explore how to optimize the supply chain of sports goods e-commerce platforms through collaborative management and improve the overall operational efficiency of the platform.

3. Analysis of the supply chain status of sports goods e-commerce platforms

3.1 Supply chain structure of sports goods industry

The supply chain structure of the sports equipment industry is relatively complex, covering multiple links such as raw material supply, product production, distribution, warehousing, transportation, and retail. In this supply chain, the entities involved include raw material suppliers, manufacturers, wholesalers, retailers, logistics companies, and e-commerce platforms themselves. Specifically, the supply chain structure of sports equipment e-commerce platforms typically purchases goods from multiple manufacturers or brands, and then distributes them through logistics companies. Platforms usually manage inventory through self operated warehouses or third-party warehousing service providers, and achieve product distribution through a fast logistics system. In addition, the cooperation models between e-commerce platforms and suppliers may include traditional B2B, B2C, and emerging C2M models, the latter of which meet consumers' specific needs through personalized customization.

3.2 Operation models of sports goods e-commerce platform

The operational models of sports equipment e-commerce platforms mainly include self operated

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models, platform models, and hybrid models [6]. In the self operated model, e-commerce platforms directly participate in product procurement, inventory management, and logistics distribution, and have strong control over various links of the supply chain. For example, some large e-commerce platforms improve logistics efficiency by building their own warehouses and distribution systems, and use big data analysis for accurate inventory and demand forecasting. In the platform mode, e-commerce platforms act as third-party intermediaries, mainly responsible for transaction matching, payment settlement, logistics information tracking and other services. The procurement, inventory and distribution of goods are usually handled by suppliers or third-party logistics companies. In recent years, some e-commerce platforms have adopted a hybrid model, which includes both self operated products and products that cooperate with third-party merchants. By combining different models, they optimize resource allocation and enhance platform competitiveness.

In addition, sports equipment e-commerce platforms are also facing challenges from personalized demands and fast fashion trends. More and more consumers hope to customize or choose products from specific brands according to their own needs, which has driven the development of the C2M (Consumer to Manufacturer) model. E-commerce platforms enable consumers to participate in the product design and manufacturing process by directly connecting with manufacturers, further enhancing the user experience.

3.3 Existing problems and challenges

Although sports goods e-commerce platforms have played a positive role in meeting consumer demands and promoting industry development, they still face some problems and challenges, especially in supply chain management, which urgently needs improvement and optimization.

Firstly, inventory management is difficult. The demand in the sports equipment industry is seasonal and cyclical, especially during major events, holidays, and other periods when demand fluctuates greatly. However, the complexity of inventory management often makes it difficult for e-commerce platforms to achieve accurate predictions. Excessive inventory not only leads to an increase in inventory costs, but also easily causes a backlog of unsold goods, while insufficient inventory can affect the timely supply of goods, thereby affecting consumers' shopping experience. Secondly, logistics and delivery issues. The characteristics of sports equipment are diverse and varied categories, with many products (such as sports equipment, clothing, shoes, etc.) being large in size or irregular in shape, which poses additional challenges to logistics and distribution. E-commerce platforms need to address how to efficiently transport these products and ensure timely and safe delivery. In addition, dealing with reverse logistics issues has become a challenge in situations where returns and exchanges are frequent. Thirdly, the difficulty of supply chain collaboration. The supply chain of sports equipment e-commerce platforms involves numerous participants, including manufacturers, wholesalers, warehouses, logistics companies, etc. How to achieve efficient collaboration among multiple parties and ensure the smooth operation of various links in the supply chain is still a challenge faced by many e-commerce platforms. Insufficient information sharing, poor communication, and inconsistent data can lead to low supply chain efficiency and even affect consumers' shopping experience. Fourth, quality control and counterfeit goods issues. The problem of counterfeit and inferior products in the sports equipment market is quite serious, especially in e-commerce platforms where some third-party merchants have entered. How to effectively control product quality and ensure that consumers purchase genuine products is a challenge that cannot be ignored. In addition, the control of product quality not only involves the management of suppliers, but also involves the quality inspection and after-sales guarantee system of the platform. Fifth, the challenge of green supply chain. With the increasing awareness of environmental protection, green supply chain management has gradually become a major focus of e-commerce platforms. How to reduce carbon emissions in the logistics process and optimize packaging materials to minimize environmental impact has become an important direction for the future development of e-commerce platforms. Although many platforms have taken some green measures, such as using environmentally friendly packaging and promoting green transportation, balancing costs and environmental benefits is still an urgent problem to be solved in practical operations.

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4. Collaborative management strategy for supply chain of sports goods e-commerce platform

4.1 Core elements of collaborative management

The essence of supply chain collaborative management lies in the sharing and collaboration of information and resources between different links and entities, ensuring the optimal operation of each link. The core elements of collaborative management include:

4.1.1 Information sharing and transparency

Information sharing is the cornerstone of supply chain collaborative management. By establishing a transparent information flow mechanism, all parties can obtain key information in real time and make timely and accurate decisions. Taking JD.com as an example, JD.com has established deep partnerships with suppliers, who can query the platform's sales data and inventory information in real-time. Through this information sharing mechanism, suppliers can adjust their production plans in a timely manner to avoid overproduction or stockouts caused by demand fluctuations. Meanwhile, sharing inventory status, production progress, order information, and transportation status among e-commerce platforms, suppliers, logistics companies, and warehousing companies can help avoid resource waste or supply-demand imbalance caused by information lag or distortion.

4.1.2 Demand forecasting and collaborative planning

Accurate demand forecasting is the key to effective supply chain management. E-commerce platforms combine historical sales data, market trends, seasonal changes, and promotional activities to make demand forecasts and develop reasonable procurement, production, and inventory plans. Close cooperation with suppliers helps to achieve precise supply and production arrangements, avoiding resource waste. Taking Decathlon as an example, Decathlon has a huge product inventory worldwide. With the help of big data analysis and sales forecasting tools, the platform can predict the demand changes in different regions and seasons. In this way, Decathlon can adjust the inventory distribution in time, deliver products to each market accurately, and ensure that customer needs are met.

4.1.3 Resource integration and collaborative execution

E-commerce platforms collaborate with suppliers, logistics companies, warehouses, and other parties to integrate resources and ensure the efficient operation of the supply chain. In the collaborative execution process, the platform needs to ensure that the resources of each party are fully utilized, avoiding redundant work and resource waste between various links. Taking Tmall as an example, Tmall collaborates with third-party logistics companies to jointly create an efficient delivery system. Especially during the promotional period, Tmall closely cooperates with logistics companies to arrange transportation vehicles and storage space in advance to ensure smooth logistics in the event of a surge in order volume.

4.1.4 Risk management and emergency response mechanism

Unforeseeable risks in the supply chain can occur at any time, such as natural disasters, raw material shortages, sudden increases in market demand, etc., which may affect the normal operation of the supply chain. Therefore, establishing a sound risk management system and emergency response mechanism is an indispensable part of collaborative management. The platform needs to respond to various emergencies in a timely manner through diversified supply chain layout, flexible production scheduling, and early warning systems. For example, in the face of force majeure events such as extreme weather or sudden epidemics, JD.com can quickly adjust logistics routes or change storage arrangements to ensure timely delivery of goods to consumers. In addition, JD.com has set up multiple logistics centers in important areas to cope with sudden changes in demand.

4.2 Implementation path of collaborative strategy

In order to achieve efficient management of the e-commerce platform supply chain, a unified information platform should be established first to ensure smooth information flow and achieve information sharing. Through the seamless integration of ERP (Enterprise Resource Planning) system and SCM (Supply Chain Management) system, the platform can achieve real-time data exchange, ensuring coordination and synchronization of various links. For example, Amazon's integrated supply chain management system covers every link from suppliers to warehouses, and then to the last mile of delivery, ensuring the transparency and efficiency of the supply chain. Secondly, e-commerce platforms should strengthen their strategic partnerships with suppliers, establish long-term partnerships,

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and jointly carry out supply chain management, covering price negotiations, inventory management, production planning coordination, order processing, and quality control. For example, Wal Mart and suppliers share sales forecasts and inventory information through the "Collaborative Demand Planning (CPFR)" model, and jointly develop production and distribution plans to ensure timely replenishment and avoid shortages or excessive inventory. At the same time, the platform can collaborate with suppliers to implement lean inventory management and JIT (Just In Time) mode, avoiding inventory backlog and resource waste through accurate demand forecasting and order scheduling. For example, H&M can flexibly adjust production and inventory arrangements, respond quickly to market changes, and maintain low inventory levels by sharing real-time inventory information with suppliers. Finally, with the globalization of e-commerce, optimizing logistics distribution networks and cross-border collaboration have become key. E-commerce platforms should closely cooperate with logistics companies to improve logistics efficiency and ensure that consumers receive goods in a timely manner. Cross border e-commerce platforms collaborate with international logistics companies to build efficient global supply chain synergy. Alibaba, through its "Global AliExpress" platform, has built a global logistics system, providing diverse logistics options and flexible adjustments to logistics solutions to meet the regulations and consumer needs of different countries, enhancing the efficiency and customer experience of cross-border e-commerce.

4.3 Application of information technology in collaboration

The rapid development of information technology, especially with the application of technologies such as big data, artificial intelligence, the Internet of Things (IoT), and cloud computing, provides strong support for supply chain collaboration management. E-commerce platforms can achieve more efficient and accurate supply chain collaboration. Through big data analysis, the platform can deeply explore consumer purchasing habits, market trends, and seasonal fluctuations, accurately predict demand changes, and then allocate inventory, production, and logistics resources to reduce inventory backlog and stockout risks. The Internet of Things technology enables real-time tracking of goods from suppliers to consumers, and the platform improves the transparency and response speed of the supply chain by installing sensors on storage, transportation vehicles, and products. Taking Zara as an example, the company uses RFID tags to track products throughout the entire process, ensuring precise monitoring of every item from production to sales, achieving efficient inventory management and accurate demand forecasting. In addition, cloud computing provides powerful computing and storage capabilities for e-commerce platforms, supporting large-scale data processing and multi-party collaboration. Through the cloud platform, the platform shares information and collaborates with partners such as suppliers and logistics companies to adjust supply chain strategies in real-time and improve overall operational efficiency. IBM's supply chain cloud platform is a typical case of this technology application, which helps enterprises achieve cross regional and cross departmental collaborative operations by integrating inventory management, order processing, supply chain monitoring and other functions.

The supply chain collaborative management strategy of sports equipment e-commerce platforms needs to improve the overall operational efficiency of the platform and occupy a favorable position in market competition through means such as information sharing, accurate prediction, resource integration, and flexible response. With the continuous development of information technology, platforms can further optimize supply chain management, reduce costs, improve customer satisfaction, and achieve sustainable development through technologies such as big data, the Internet of Things, and cloud computing.

5. Conclusion

This paper explores how to improve the overall efficiency and flexibility of the supply chain in the modern e-commerce environment through information sharing, strategic cooperation, lean inventory management, and logistics optimization, through in-depth research on supply chain collaborative management of sports equipment e-commerce platforms. Research has shown that the construction of information platforms is the foundation for achieving supply chain collaboration. Through seamless integration of ERP and SCM systems, e-commerce platforms can obtain accurate information from various links in real time, ensuring close coordination and response among all parties in the supply chain.

Further analysis reveals that the strategic partnership between suppliers and e-commerce platforms

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is crucial for the stability and resilience of the supply chain. By establishing long-term cooperative relationships, the platform and suppliers jointly plan inventory management, production plans, and order processing, which can effectively avoid common stockouts and excessive inventory problems in the supply chain. For example, Wal Mart's "Collaborative Demand Planning (CPFR)" model and H&M's lean inventory management strategy have proved that in a rapidly changing market environment, refined supply chain management can bring significant competitive advantages. In addition, with the rapid development of cross-border e-commerce, the optimization of logistics distribution and the coordination of global supply chains have become particularly important. E-commerce platforms can improve logistics efficiency and ensure timely delivery of goods to consumers through close cooperation with international logistics companies. Alibaba's global AliExpress platform is a typical successful case, which flexibly responds to the needs of different countries and regions through a globalized logistics system, and improves the overall efficiency of cross-border e-commerce.

Overall, the supply chain collaborative management of sports equipment e-commerce platforms can not only effectively improve operational efficiency and reduce costs, but also enhance market adaptability and improve consumer satisfaction. In the future, with the continuous development of technology and changes in market demand, supply chain collaborative management will continue to evolve. E-commerce platforms need to further strengthen cooperation with all parties, optimize various links in the supply chain, and ultimately achieve efficient collaboration and win-win results throughout the entire chain.

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