

Implications of Green Supply Chain Management in Retail Enterprises under Low-Carbon Transformation Path

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Abstract: With the continuous deepening of economic globalization, market competition is becoming increasingly fierce, and the contradiction between economic development and environmental protection is intensifying. Issues such as environmental degradation, resource scarcity, and intense market competition urgently need to be addressed. As the terminal link in supply chain system, the operational efficiency of retail enterprises has a direct impact on supply chain performance. Therefore, it is imperative for retail enterprises to implement green supply chain management. This paper reviews relevant domestic and international theoretical and practical research, clarifies the research framework, and then provides a detailed introduction to the relevant theories of green supply chain management. Subsequently, it analyzes the current implementation status and existing problems of green supply chain management in retail enterprises. Finally, it proposes practical solutions to these problems, aiming to facilitate the effective implementation of green supply chain management in retail enterprises.

Keywords: Green Supply Chain Management, Retail Enterprises, Low-Carbon, Sustainable Development

1. Introduction

As a crucial component of commodity circulation and customer service, the stable development of retail enterprises can significantly drive GDP growth and improve the quality of life for the public. With the rapid expansion of Chinese retail enterprises and the continuous expansion of foreign retail giants, the competition in the domestic retail market is becoming increasingly fierce [1]. As the terminal link in the supply chain, retail enterprises directly face a vast consumer base

and are responsible for product delivery and consumer feedback [2]. Their operational efficiency has a decisive impact on the overall supply chain performance.

Compared to traditional supply chain management, green supply chain management places greater emphasis on environmental protection. Based on the supply chain management framework, green supply chain management integrates environmental protection and resource conservation principles, ensuring that products adhere to these principles throughout their entire lifecycle—from raw material acquisition to waste disposal—thereby promoting the coordinated and sustainable development of the economy and the environment [3-4]. As China's economy has surpassed Japan to become the world's second-largest economy, the national economic level and the quality of life of the people have continuously improved. Consumers' awareness of green consumption has significantly increased, and the green demand faced by retail enterprises continues to rise. Implementing green supply chain management has become an inevitable choice for the development of retail enterprises.

The implementation of green supply chain management in retail enterprises holds multiple significant implications. From an economic perspective, it not only helps retail enterprises reduce operational costs and improve internal efficiency but also has a profound impact on all levels of the supply chain. By implementing green supply chain management, retail enterprises can fully align with the current and future growing demand for green consumption, effectively reduce logistics and sales costs, enhance their market competitiveness, and achieve sustainable development goals in the fierce commercial competition. Firstly, building a green supply chain management system helps retail enterprises shape a positive corporate image.

Retail enterprises can demonstrate their social responsibility to society and consumers, establishing a highly socially responsible corporate image in the public perception, thereby enhancing their position in the market. Secondly, by implementing green supply chain management, retail enterprises can meet consumers' demand for green and environmentally friendly products, enhance consumers' environmental awareness and satisfaction with the company's products, and ultimately strengthen their competitive advantage. Thirdly, implementing green supply chain management is conducive to improving the collaborative relationship between retail enterprises and their upstream and downstream supply chain partners. As the terminal node of the green supply chain, retail enterprises can timely and accurately transmit supply and demand information from the consumer market to all levels of the supply chain. Other enterprises in the supply chain can respond to the needs of retail enterprises accordingly, thereby improving the overall operational efficiency and synergy of the supply chain.

2. Research Methods

The concept of green supply chain management can be traced back to the "Environmentally Responsible Manufacturing" project conducted by the Manufacturing Research Association of Michigan State University in 1996. This research innovatively incorporated environmental and other green elements into the supply chain management system, comprehensively assessing the impact of supply chain management activities on the ecological environment and exploring strategies for optimizing resource allocation. Its core objective is to minimize the negative environmental impact of supply chain management processes and maximize resource utilization efficiency.

2.1 Theoretical Research on Green Supply Chain Management

The essence of green supply chain management lies in deeply embedding key elements such as environmental protection into the entire supply chain system architecture. In this process, enterprises can leverage external resources with green competitive advantages and establish strategic partnerships with

enterprises that excel in green practices [5]. Enterprises in the supply chain should focus on their core businesses, striving to strengthen and consolidate their core competitiveness and industrial competitive advantages, thereby achieving the goal of reducing resource consumption and minimizing environmental impact across the entire supply chain.

Green supply chain management encompasses a rich content system that runs through all stages and processes of the supply chain [6]. Some scholars have summarized the main components of green supply chain management, including key modules such as green procurement, green design, green production, green marketing, and green recycling. Some scholars point out that green supply chain management is highly aligned with the functional positioning and goal orientation of environmental protection departments. It not only directly supplements and extends environmental protection practices but also serves as an important strategic path for promoting industrial structure upgrading and green transformation.

Some research scholars emphasize that the core essence of green supply chain management lies in introducing ecological design concepts throughout the entire lifecycle cycle of raw material procurement, product manufacturing, product end-use, and waste recycling, injecting new thinking modes into supply chain management. Through close collaboration and deep synergy among various departments and different enterprises in the supply chain, the entire supply chain can achieve coordinated and unified environmental management, leading to comprehensive optimization and improvement of the system environment [7]. Given the important role of green supply chain management in enterprise operations and industrial development, foreign research scholars have long believed that green supply chain management plays a crucial supporting role in enhancing enterprise performance, shaping corporate brand image, and saving resources and funds. It can effectively reduce resource and energy consumption in the production process and minimize adverse environmental impacts.

Based on the above theoretical research results, domestic research in the field of green supply chain management theory is relatively weak. Especially in the practical application of green

supply chain management in retail enterprises, there is a significant gap compared to advanced foreign enterprises. Although many domestic researchers have conducted basic research on green supply chain management, most of it remains at the preliminary stage of conceptual elaboration and theoretical discussion, and a deep and systematic research system has not yet been formed.

2.2 Practical Research on Green Supply Chain Management

By reviewing domestic and international theoretical research, it is evident that green supply chain management encompasses multiple dimensions such as green design management, green procurement management, green production management, green packaging management, and green marketing management [8]. Therefore, implementing green supply chain management requires starting from these diverse aspects. Scholars focusing on green procurement generally point out that green procurement is an effective path for retail enterprises to break through current competitive difficulties and achieve stable development. Implementing green procurement strategies in retail enterprises can not only reduce resource consumption and environmental pollution but also enhance their market competitiveness to a certain extent, promoting the coordinated development of the environment and the economy. Scholars unanimously emphasize that the implementation of green procurement is extremely necessary for retail enterprises, as it helps control the negative environmental impact from the source, thereby achieving the goals of green marketing and green consumption, and improving business performance in the enterprise operation process.

For manufacturing enterprises, the academic community advocates building a green manufacturing concept, comprehensively considering the impact of production activities on the environment and resources. Introducing advanced production lines, adopting scientific green manufacturing strategies, and formulating green management methods to ensure production safety. Some scholars regard green logistics as an integral part of green supply chain management, pointing out that green logistics includes green transportation,

green packaging, and green circulation processing. In the storage, handling, transportation, packaging, distribution, and circulation processing links, it is necessary to control the environmental hazards of logistics activities and effectively manage internal and external logistics, incorporating the environmental performance of logistics management into key performance indicator systems, reducing human and capital investment in logistics, and achieving the purification of the logistics environment and the optimal allocation of logistics resources [9].

In addition to focusing on specific operations in each link, enterprises also need to take a series of necessary measures. First, strengthen the environmental awareness of enterprise leaders and employees. Senior leaders need to change traditional concepts, organically integrate environmental protection with economic benefits, and help the enterprise develop rapidly. Second, enterprise managers should deeply learn from the successful experiences of advanced domestic and foreign enterprises, conduct advanced theoretical research, and master the methods and strategies for building green supply chain management. Third, enterprises should actively cooperate with third-party logistics enterprises to effectively promote the implementation of basic work in green supply chain management. Finally, enterprises need to vigorously introduce advanced information technology to provide strong support for the implementation of green supply chain management.

3. Current Status and Problems of Green Supply Chain Management Implementation in Retail Enterprises

3.1 Current Status of Green Supply Chain Management Implementation in Retail Enterprises

The concept of green supply chain management is derived from supply chain management. In the more than two decades since the concept of supply chain management was proposed, its practical application has matured. However, compared to supply chain management, the concept and theoretical system of green supply chain management are still relatively unfamiliar in Chinese

enterprises and are in the preliminary exploration stage. Compared with some developed countries, domestic enterprises in China have relatively weak environmental awareness, and the environmental pollution and resource consumption problems caused by various links in the supply chain are severe. Taking the key indicator of packaging recycling rate as an example, there is a significant gap between China's packaging recycling rate and that of developed countries such as the United States and Japan.

In China, as independent market entities, enterprises face practical difficulties such as high cost increase risks and weak awareness of corporate social responsibility, resulting in a lack of enthusiasm for participating in green supply chain construction. From a spatial layout perspective, enterprises in the entire supply chain system are geographically dispersed, and each enterprise faces different environmental challenges. When carrying out green supply chain operations, they generally face the problem of insufficient professional knowledge reserves and a lack of professional talent, and lack effective support and guidance. Most enterprises have a superficial understanding of green supply chain management, and their understanding of supply chain management is limited to the traditional supply chain scope, focusing only on the resource consumption status within their own enterprises. Although they have business connections with other links in the supply chain, they lack consideration of external environmental factors in the supply chain. Enterprises, guided by profit maximization, blindly pursue economic benefits but ignore the heavy burden this behavior places on the ecological environment and resource base, thus failing to successfully achieve the transformation and upgrading to the green supply chain management model. Although a few enterprises with advanced management concepts have gradually realized the urgency of environmental issues, they have not taken practical measures to promote the implementation of green supply chain management.

For retail enterprises, the implementation process of green supply chain management is almost starting from scratch. Currently, after the introduction of the green supply chain management concept in China, it has been

widely promoted and applied in manufacturing enterprises, and domestic academia has conducted a large amount of research on the practice of green supply chain management in manufacturing enterprises. In stark contrast, domestic scholars have conducted relatively little research on the implementation of green supply chain management in retail enterprises. Therefore, whether from the perspective of practical operation or theoretical research, the application of green supply chain management in China's retail enterprises is still in its infancy. Overall, green supply chain management is a highly effective management strategy for retail enterprises to build competitive advantages and is of great significance. However, given the current early stage of development, the level of green supply chain management in China's retail enterprises still lags behind that of large multinational retail enterprises represented by Wal-mart in terms of chain operation efficiency and supply chain integration capabilities, and they have not yet established a dominant position in the entire supply chain ecosystem. The green supply chain structure of most domestic retail enterprises is still not perfect, and there are many links that need to be optimized.

3.2 Implementation Problems of Green Supply Chain Management in Retail Enterprises

From the current status of green supply chain management implementation in China's retail enterprises, it is not difficult to see that there are many problems in the implementation of green supply chain management. Therefore, the green supply chain construction of most retail enterprises in China is not perfect, and th

3.2.1 Unless the Concept of Green Supply Chain Management

On the government side, most government departments focus only on environmental governance at the end of the supply chain, neglecting the environmental pollution and resource waste that occur during supply chain activities. This lack of attention provides little positive guidance for retail enterprises in building green supply chain management. On the enterprise side, due to inadequate laws, regulations, and oversight from management authorities, the economic cost of environmental pollution for enterprises is significantly lower than the management costs

associated with implementing green supply chain management. As a result, most companies tend to overlook the negative environmental impacts of supply chain activities, blindly pursuing profit maximization and prioritizing economic benefits above all other factors. The implementation of green supply chain management may not only fail to improve economic performance but could also increase related management costs, which is undoubtedly a waste of corporate resources. On the consumer side, consumers are primarily concerned with whether the products they purchase are green, safe, and healthy, paying little attention to whether the logistics processes of retail enterprises are environmentally friendly. Consequently, consumers do not exert sufficient pressure or motivation on enterprises to address environmental pollution and resource consumption issues in the supply chain. Green supply chain management requires collaboration across all functional links of the supply chain to achieve energy-saving and environmental protection goals.

3.2.2 Lack of Green Supply Chain Management Awareness

In China, many retail enterprises treat green supply chain management initiatives as mere ideological or political tasks, responding to national calls only superficially and promoting green supply chain management slogans without implementing substantive management measures effectively. In reality, building a green supply chain management system requires the participation of all employees, from management to frontline staff, as everyone bears the responsibility of advancing green supply chain management. This is not the sole responsibility of a single department nor should it be limited to superficial declarations by management. Currently, in many domestic retail enterprises, green supply chain management strategies are formulated solely by top-level leaders, with little involvement from grassroots employees. Frontline employees have limited understanding of the company's key decisions and strategic directions, making it difficult for them to contribute effectively to green supply chain management practices. Due to these constraints, enterprises struggle to achieve their green supply chain management goals and fail to foster a collaborative,

company-wide effort.

3.2.3 Inadequacy of Green Supply Chain Management Evaluation Systems

Although some retail enterprises have begun exploring the construction of green supply chain management systems, a comprehensive performance indicator system is essential to accurately assess the effectiveness of these efforts. However, in existing performance evaluation systems, the definition and presentation of green-related elements are not clear or precise, making it difficult to conduct scientific and accurate evaluations. Additionally, the lack of a robust performance evaluation system means that enterprises lack mechanisms to track and monitor the implementation process and outcomes of green supply chain management. As a result, management cannot obtain timely and accurate feedback, making it difficult to propose subsequent optimization and improvement measures. This hinders the continuous improvement and deepening of green supply chain management systems in retail enterprises. Over time, enterprise leaders may lose confidence and motivation to advance this work due to the inability to perceive tangible results from green supply chain management initiatives.

3.2.4 Shortage of Professionals in Green Supply Chain Management

The concept of green supply chain management is relatively new, and academic research in this area is still in its early stages, particularly in China, where scholars have only just begun to explore green supply chain management. This has led to a significant lag in the training of professionals in green supply chain management compared to market demand. Moreover, the lack of theoretical research is especially pronounced in the retail sector. Most studies focus on manufacturing enterprises, particularly those engaged in green manufacturing, leaving a gap in systematic and professional guidance on how retail enterprises can effectively implement and build green supply chain management. Currently, while there are a few individuals with some understanding and experience in green supply chain management, their theoretical knowledge and practical experience are not sufficiently comprehensive. There is a severe shortage of professionals with both solid theoretical foundations and rich practical

experience, making it difficult to meet the actual needs of retail enterprises in developing green supply chain management.

3.2.5 Lack of Strategic Partnerships with Suppliers

The main problems are as follows:

Enterprises relying solely on their internal resources find it challenging to establish a foothold in the fiercely competitive market and achieve long-term stable development. Green supply chain management cannot be effectively implemented by enterprises alone; fundamentally, it is closely tied to the supply chain, requiring the integration of green principles across all levels of the supply chain. Building a green supply chain management system demands deep collaboration among all enterprises in the supply chain to establish core competitiveness and gain market advantages. However, at present, retail enterprises and their suppliers have not yet formed long-term, stable strategic partnerships. The two sides often find themselves in opposition due to conflicting interests, leading to a lack of coordination and integration in supply chain management, which in turn results in inefficiencies in green supply chain management. With the rapid development of e-commerce platforms, competition in the retail market has intensified. Against the backdrop of declining profit margins, retailers continue to pressure suppliers to lower procurement prices, boosting their own profits at the expense of suppliers. In response, suppliers resort to various methods to raise product prices. This ongoing price competition makes it difficult to establish long-term, mutually trusting partnerships and achieve win-win outcomes. Furthermore, the lack of effective incentive and constraint mechanisms for suppliers in the green supply chain management process severely hampers the competitiveness of retail enterprises in the market.

4. Strategies to Promote Green Supply Chain Management in Retail Enterprises

To further strengthen the application of green supply chain management in retail enterprises, improve resource utilization efficiency, reduce environmental pollution, and help enterprises achieve the dual goals of economic benefits and sustainable development in harmony with the environment, this article will elaborate on strategies to promote green supply chain

management in retail enterprises from both internal and external dimensions.

4.1 Internal Strategies for Retail Enterprises to Promote Green Supply Chain Management

4.1.1 Shift in Management Philosophy at the Top Level

The effective implementation of green supply chain management heavily relies on the innovative thinking and decision-making capabilities of enterprise leaders. However, most retail enterprise leaders currently lack a deep understanding of the concepts and theories behind green supply chain management. Therefore, the primary task in promoting green supply chain management in retail enterprises is to encourage a shift in the mindset of top executives. This requires company leaders to enhance their learning abilities and overall competencies, proactively learn cutting-edge theories and concepts from professionals, and deeply understand the significance of building green supply chain management for breaking through traditional development models and achieving coordinated economic and environmental progress. At the same time, senior management should delve into relevant domestic and international theories and actively learn from the successful experiences of other enterprises. They should explore advanced cases across various industries, not limited to retail, as the universal strategies embedded in these cases can serve as valuable references for enterprises implementing green supply chain management. Enterprises can selectively apply these successful experiences to their green supply chain management practices based on their unique characteristics.

4.1.2 Introduce Professional Talent and Conduct Employee Training

Implementing green supply chain management requires not only a shift in mindset at the top level but also a transformation in the thinking of grassroots employees. Additionally, the implementation of green supply chain standards demands a large number of highly skilled professionals and standardized talent. With the continuous development of China's economy, the demand for green technologies and talent is increasing. Therefore, it is imperative to introduce professional green supply chain management talent, widely

disseminate green supply chain management concepts within the enterprise, and provide detailed introductions to the development status of green supply chain management abroad as well as successful domestic and international cases. This will help employees fully recognize the importance and necessity of implementing green supply chain management. Ultimately, professionals should conduct systematic training for all employees, including top management, to fundamentally change traditional mindsets and deeply integrate green supply chain management concepts into daily operations. This will enable employees to understand, at a conceptual level, that effective green supply chain management can enhance operational efficiency and promote harmonious economic and environmental development, thereby motivating them to actively drive the implementation of green supply chain management and achieve a top-down transformation in corporate thinking.

4.1.3 Improve the Performance Evaluation System for Green Supply Chain Management
Improving the performance evaluation system for green supply chain management requires not only deeper theoretical research by scholars but also a thorough understanding of the essence of green supply chain management and its application in retail enterprises, with the participation of industry professionals. Based on the integration of theory and practice, feasible improvement strategies should be proposed, and practical evaluation indicators should be summarized to achieve accurate assessments of the effectiveness of green supply chain management. Furthermore, the evaluation indicator system should evolve with the times, maintaining flexibility and adaptability, and timely removing or replacing outdated indicators to build a practical performance evaluation system that ensures comprehensive, reasonable, and actionable evaluation results. This will enable senior management to formulate targeted improvement measures based on evaluation results, driving more efficient implementation of green supply chain management within the enterprise.

4.1.4 Enhance the Application of Modern Information Technology

In the fiercely competitive market, retail enterprises must fully recognize that high-tech

support is the key to success and stable development. Retail enterprises should actively utilize electronic information technology, introduce modern IT systems, prioritize information system upgrades, and establish and continuously improve green supply chain management information platforms to provide solid technical support for green supply chain management. In summary, enterprises need to increase investment in advanced information technology, build green supply chain management information platforms, enable information sharing and communication among supply chain enterprises, and enhance collaborative capabilities across the supply chain. For example, the foreign retail giant Walmart is a model of successful application of modern information technology, widely emulated by domestic and international retail enterprises.

4.2 External Strategies for Retail Enterprises to Promote Green Supply Chain Management

4.2.1 Strengthen the Concept of Win-win Collaboration among Supply Chain Enterprises

Retail enterprises should not view suppliers as competitors but should strive to build long-term, stable, and mutually beneficial strategic partnerships with upstream suppliers. Through sustained collaboration, both parties can cultivate trust and work together to gain advantages in the competitive market, achieving synergistic development. In this process, all enterprises in the supply chain need to establish and strengthen a sense of collaboration, continuously improving and optimizing their green supply chain capabilities. At the same time, retailers should establish incentive and constraint mechanisms for upstream suppliers to enhance supplier performance and, in turn, boost their own sales performance. Retail enterprises should proactively engage in regular collaborative exchanges with upstream suppliers and other partners on environmental and resource issues, such as organizing professional forums, industry conferences, and thematic seminars. These activities will strengthen communication and collaboration among related enterprises in the green supply chain field. Enterprises must fully recognize that the concept of green supply chain management must permeate the

entire supply chain system, with all enterprises in the chain actively participating in collaboration. This places higher demands on enterprises' technical capabilities, information exchange levels, and collaborative abilities. Chinese enterprises need to abandon short-term profit-oriented thinking, take a long-term perspective, actively fulfill social responsibilities, build industrial synergy mechanisms with upstream and downstream enterprises, establish information-sharing platforms, and resolve issues of information opacity and asymmetry among enterprises. Through mutual supervision and collaboration, enterprises can enhance overall profitability and market competitiveness, flexibly responding to complex and changing market environments.

4.2.2 Promote the Improvement of Green Supply Chain Management Systems by Upstream Enterprises

Green supply chain management encompasses a wide range of areas, including green procurement, green design, green manufacturing, green logistics, green marketing, and green recycling. For retail enterprises, green procurement, green marketing, and green recycling are core focus areas, while green design, green manufacturing, and green logistics primarily rely on upstream enterprises to ensure the green and environmentally friendly attributes of the products sold by retailers. For example, retail enterprises can introduce third-party logistics services, prioritizing third-party logistics companies with green logistics capabilities; manufacturing enterprises should adopt energy-efficient and environmentally friendly production lines, use green design solutions, and produce green products that meet consumer demand. Retail enterprises should establish long-term strategic partnerships with these upstream enterprises to solidify the foundation for implementing green supply chain management.

4.2.3 Deepen the Ministry of Education's Efforts to Cultivate Relevant Professional Talent

The Ministry of Education should actively guide universities to establish green supply chain management-related programs and reasonably set up supporting courses, focusing on cultivating talent with deep professional knowledge. At the same time, through diverse

teaching methods such as practical courses, inviting experienced enterprise managers to share practical experiences, and establishing professional training bases, teachers should lead students in conducting research and practical activities within enterprises, encouraging students to apply theoretical knowledge to real-world work and emphasizing the deep integration of theory and practice. This will help address the current shortage of green supply chain management professionals, providing society and enterprises with a large number of high-quality, comprehensive green supply chain management professionals and building a high-caliber, high-level green supply chain management team.

4.2.4 Strengthen the Supply and Sharing of Green Information

Relevant departments need to establish information-sharing platforms for suppliers, retailers, and consumers, continuously updating information on products that meet green procurement standards both domestically and internationally, as well as green supply chain management technologies. Regularly publishing lists of brands and organizations that meet green procurement requirements will further strengthen green procurement information management. This will enable retail enterprises to comprehensively grasp product information from suppliers and accurately select long-term cooperative suppliers. Additionally, regularly publicizing enterprises that have achieved significant results in green supply chain management and providing corresponding incentives and recognition will further stimulate enterprises' enthusiasm for implementing green supply chain management.

5. Conclusion

This article focuses on exploring strategies to promote the implementation of green supply chain management in retail enterprises. By analyzing the current status of green supply chain management implementation in retail enterprises and identifying existing problems, it proposes a series of targeted strategies. The aim is to assist retail enterprises that have not yet fully implemented green supply chain management to deeply understand its significance, clarify the current state of green supply chain management in retail enterprises,

and accurately grasp specific methods to address various issues in promoting green supply chain management. By drawing insights from these strategies, retail enterprises can improve the level of green supply chain management, which will not only bring economic benefits to the enterprises themselves but also generate broad social benefits. In today's era, the development model of blindly pursuing economic benefits is no longer appropriate. Whether from the perspective of the long-term development of enterprises or the consideration of human health, both enterprises and consumers need to strengthen their awareness of environmental protection and resource conservation and actively participate in the wave of green development.

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