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Using SWOT Analysis to Assist Chinese Enterprises in Establishing Green Supply Chain Management

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Abstract: Green Supply Chain Management (GSCM) is an innovative management approach that integrates environmental protection and resource efficiency into supply chain management, playing a significant role in enhancing the greening level of supply chains and achieving sustainable development. By reviewing the origins, development, and current state of GSCM, this paper highlights that, compared to developed countries such as those in Europe, the United States, and Japan, Chinese enterprises still have a substantial gap in establishing green supply chain management. SWOT analysis is a widely used tool in strategic planning and decision-making processes. By systematically assessing the strengths, weaknesses, opportunities, and threats of a project, enterprise, or industry, it helps decision-makers comprehensively understand both internal and external environments, enabling them to formulate more scientifically sound strategies. This paper aims to use the SWOT analysis framework and specific case studies to help enterprises thoroughly assess internal and external environmental factors in the process of implementing GSCM. It also provides strategic recommendations, offering theoretical support and practical references to aid Chinese enterprises in making informed decisions on establishing green supply chain management.

Keywords: Green Supply Chain, Green Supply Chain Management, SWOT Analysis

1. Introduction

With the continuous development of the global economy and the accelerated pace of industrialization, environmental issues have become increasingly severe, drawing significant global attention. Against this backdrop, Green Supply Chain Management (GSCM) has emerged as an innovative management model that is gradually becoming a critical means for enterprises to achieve sustainable development and enhance competitiveness. In recent years, as the Chinese government has heightened awareness of environmental protection and introduced supportive policies, a growing number of Chinese enterprises have begun to value and implement GSCM. Numerous enterprises, universities, research institutions, and consulting agencies have conducted extensive research in the field of GSCM. These studies provide theoretical support for enterprises and offer valuable insights for policymakers. In recent years, research has primarily focused on the following areas:

Policy Support and Enterprise Response: Zhou Guomei, Shi Feng, and Fan Wenjia [1] discussed a series of policy measures introduced by the government to support enterprises in establishing green supply chains, noting that many Chinese companies are gradually making green transformations.

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Driving Factors and Enterprise Performance: Zhang et al. [2] conducted empirical research to deepen our understanding of the driving factors of GSCM practices and the environmental and economic performance outcomes of GSCM implementation among Chinese enterprises. Ye Fei and Zhang Jie [3], based on stakeholder theory, constructed a theoretical model examining the relationship between the driving factors of GSCM, green design, and performance.

Practical Level of Green Supply Chain Management: Mao Tao [4] analyzed the progress of green supply chain practices in China, evaluating achievements and identifying shortcomings in China's green supply chain efforts, and proposed key focus areas for GSCM practices during the "14th Five-Year Plan" period. Liu Junjun [5] focused on proactive GSCM practices in manufacturing enterprises, defining behavior-based and technology-based GSCM practices and revealing that behavioral practices effectively facilitate the implementation of technological practices, both of which jointly contribute to performance improvements.

Green Supply Chain Management and Technological Innovation: Research by Chen Yapin, Zhang Zhenyu, and Jin Tian [6] demonstrated that green technological innovation positively impacts enterprise performance, with supply chain management playing a partial mediating role in the influence of green technological innovation on enterprise performance. Dong et al. [7] analyzed data from 501 major multinational companies in China from 2014 to 2016, concluding that clean technology innovation (CTI) benefits from GSCM. These studies provide valuable insights into how companies can effectively implement GSCM to promote clean technology innovation.

GSCM in the New Era: Liao Lingjia and Liao Chunyan [8] provided recommendations on how companies should implement GSCM in the context of a low-carbon economy. Using Apple as a case study, Liu Guancheng [9] discussed how, in the digital economy, companies should center on data, build industrial internet and digital production lines, and focus on cultivating a green supply chain to achieve sustainable development.

In summary, although the implementation of GSCM among Chinese enterprises is still in a developmental stage, it has achieved notable results and has garnered substantial support from the government. At the same time, it is important to note that many enterprises, especially small and medium-sized enterprises, face challenges in establishing GSCM due to a lack of information, understanding, funding, management, and talent, which results in insufficient motivation.

In this context, this paper adopts a SWOT analysis perspective to assist enterprises in evaluating their internal and external strengths and weaknesses when deciding on implementing GSCM, aiming to develop business strategies conducive to sustainable development.

2. Overview of Green Supply Chain Management

2.1. Definition and Core Concepts

A green supply chain refers to integrating producer responsibility and the principles of energy conservation, environmental protection, and sustainable development into traditional supply chain management. It entails a comprehensive consideration of environmental impact throughout a product's entire lifecycle—from raw material procurement, production, and logistics to product recycling and reuse. The goal is to optimize these processes to achieve a harmonious balance between economic, social, and environmental benefits.

Green Supply Chain Management (GSCM) uses various management tools and methods to promote the establishment and effective operation of green supply chains. It ensures that each stage of the supply chain is environmentally sustainable, enhancing the overall sustainable development capabilities of the supply chain. GSCM is an innovative model that integrates environmental protection and resource efficiency into the entire supply chain process. It not only oversees the lifecycle of a product from raw material procurement to final consumption but also emphasizes the

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need to consider environmental protection and resource efficiency throughout this process. The aim is to reduce environmental impact and achieve sustainable development in economic, social, and environmental aspects. The core concept of GSCM is to address climate change, promote energy conservation and emission reduction, and tackle environmental governance issues through market-driven approaches. Unlike carbon market mechanisms, which are more suitable for high-energy industries or large enterprises, green supply chains leverage the purchasing power of leading companies and the investment power of financial institutions to influence supplier companies. The goal is to encourage emission reduction and improve environmental performance among small and medium-sized enterprises.

2.2. Differences Between Green Supply Chains and Traditional Supply Chains

There are significant differences between green supply chain management and traditional supply chain management in terms of principles, practices, and objectives. Traditional supply chain management focuses on minimizing costs and maximizing efficiency, while GSCM incorporates environmental impact and sustainable development considerations. In practice, GSCM emphasizes optimizing resource efficiency and minimizing environmental impact at every stage, from raw material procurement to the final disposal of products. Furthermore, GSCM involves evaluating and monitoring the environmental performance of upstream and downstream suppliers and logistics providers to ensure environmental accountability throughout the supply chain.

2.3. Development History of Green Supply Chains and Current Situation in China

In 1990, Schot analyzed the motivations behind green procurement by studying the environmental performance of chemical companies [10]. In 1994, Webb, after examining the environmental impact of various products, recommended choosing raw materials based on environmental standards and enhancing resource recycling, emphasizing the importance of green procurement [11]. In 1996, during the "Environmentally Responsible Manufacturing" project led by the Manufacturing Research Association at Michigan State University, the concept of the green supply chain was introduced for the first time [12]. Following the introduction of the concept, U.S. companies like General Motors, Hewlett-Packard, Apple, and Walmart pioneered practical explorations in green supply chains. Developed regions, including Japan and Europe, also actively implemented green supply chain management practices.

Compared to developed countries in Europe and the United States, China's research on green supply chains started relatively late. Initially, most efforts were exploratory studies conducted by scholars, alongside passive environmental compliance measures aimed at countering green trade barriers and aligning with the eco-friendly procurement requirements of international corporations.

Since the start of the 21st century, especially after joining the WTO, China's rapid economic growth has resulted in increasing resource consumption and frequent environmental pollution incidents. To achieve sustainable development, China has established a range of policies and regulations tailored to local needs to enhance environmental protection and management. Green supply chain management, as a sustainable development model that considers environmental impact at every stage, has attracted growing attention from the government, enterprises, and the academic community [13].

Since the release of the Beijing Declaration at the 2014 APEC Summit, which officially proposed the establishment of a green supply chain cooperation network, China's focus on green supply chains has intensified, and policy development has accelerated. This is evident through the release of a series of policies and standards, including the Industrial Green Development Plan (2016-2020), Guidelines for Implementing Green Manufacturing Projects (2016-2020), Guiding Opinions on Actively

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Promoting Supply Chain Innovation and Application by the State Council, and Guidelines for Green Supply Chain Management in Green Manufacturing Enterprises (GB/T33635-2017), all aimed at guiding and assisting enterprises in establishing and promoting green supply chain management. Currently, although green supply chain management in China began later than in other regions, it has progressed rapidly.Since 2017, the Ministry of Industry and Information Technology has released eight batches of national-level demonstration units for green manufacturing, green design, and green supply chain, serving as a significant role model within the industry [14].

Table Columns / Date	Green Factory	Green Design Product	Green Park	Green Supply Chain
2017	201	193	24	15
2018. 2	208	53	22	4
2018. 11	391	480	34	21
2019	602	371	39	50
2020	719	1073	53	99
2021	662	989	52	107
2022	874	643	47	112
2023	1488	0	104	205
TOTAL	5145	3802	375	613

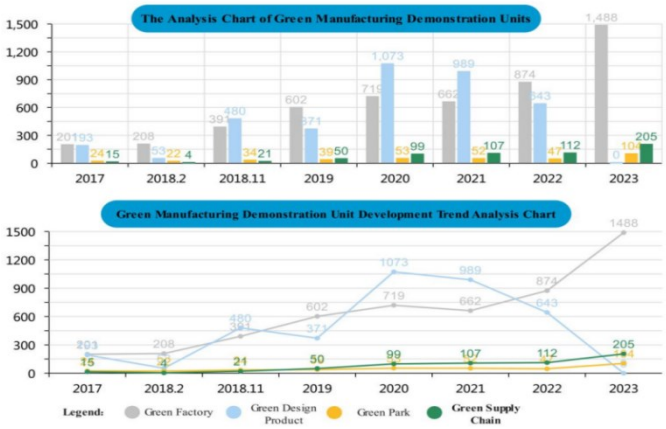

Figure 1: Statistics Table of "Green Manufacturing" Demonstration Units from the Ministry of Industry and Information Technology (2017-2023)[15]

However, we should also be clear that, given China's comprehensive and vast industrial system (as of 2023, there are 482,000 industrial enterprises above designated size in China, including 27,065 state-owned holding companies, 349,269 private companies, 43,260 joint/sole proprietorship ventures, and 45,061 large and medium-sized enterprises[16]), the number of green enterprises and green supply chain initiatives remains insufficient. Only 613 green supply chain enterprises are currently registered, accounting for just 1.27‰ of industrial enterprises above designated size and only 1.36% of large and medium-sized enterprises.

In terms of the quality of Green Supply Chain Management (GSCM), the 2023 CITI Index Annual Evaluation Report on Green Supply Chains by the Institute of Public & Environmental Affairs (IPE) evaluated 740 enterprises across 22 industries under the CITI Index, with 350 of them being mainland Chinese companies, representing 47% of the total. Among the top 100 companies in the CITI Index rankings, most are renowned firms from developed countries and regions such as Europe, the United States, and Japan.

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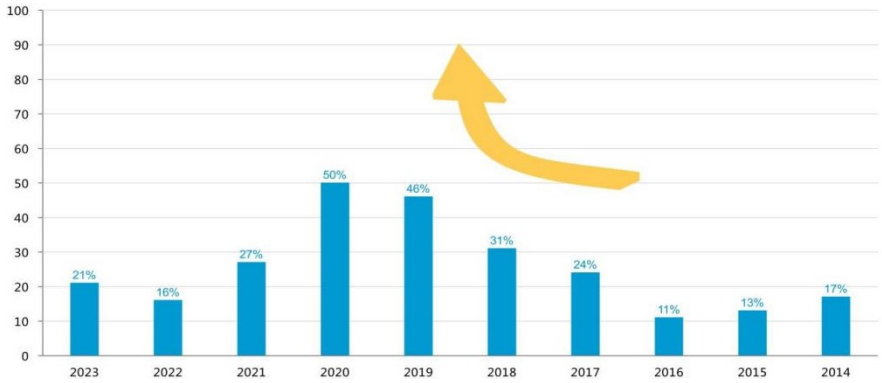

Figure 2: Proportion of Chinese Enterprises in the TOP 100 of the CITI Index (2014–2023)[17]

As shown in the figure, from 2014 to 2023, the proportion of Chinese enterprises among the top 100 enterprises in the CITI Index Annual Evaluation Report of Green Supply Chain released by IPE showed an overall rising trend. However, compared with developed countries in Europe and America, China has significant room for growth in both the quantity of green supply chain enterprises and the quality of green supply chain management.

With the global rise in environmental awareness and the deepening of sustainable development strategies, establishing green supply chains has become an irreversible trend. Nevertheless, in the practical implementation of green supply chain management, China faces real challenges. Many Chinese companies remain cautious about adopting green supply chains, often viewing government-driven policies and regulations as administrative directives to passively comply with. This hesitation arises from multiple factors, including a lack of confidence due to the business environment and, more significantly, insufficient understanding within companies of green supply chain management, leading to a lack of intrinsic motivation. For instance, some companies simply equate green supply chain management with environmental compliance, assuming that meeting compliance standards requires additional staffing and funding, thus increasing costs. However, while environmental compliance is a legal obligation for companies, it is not the sole measure of green supply chain performance [14]. A key aspect of green supply chain management is resource efficiency—efficient resource utilization, comprehensive energy-saving and emissions-reducing measures, sound ecological maintenance, and a transparent green supply chain are all powerful tools for reducing costs, enhancing competitiveness, and boosting brand image.

To help companies develop an accurate understanding of green supply chains, the following will provide a comprehensive analysis of the internal strengths, weaknesses, opportunities, and threats (SWOT) associated with establishing green supply chains, thereby offering a scientific basis for strategic decision-making.

3. Applying SWOT Analysis to Green Supply Chain Management

3.1. Steps of SWOT Analysis

SWOT analysis is a systematic evaluation method to choose the best business strategy by considering various factors of internal conditions and external environment. The steps usually include the analysis of environmental factors, the construction of analysis matrix, and the formulation of coping strategies.

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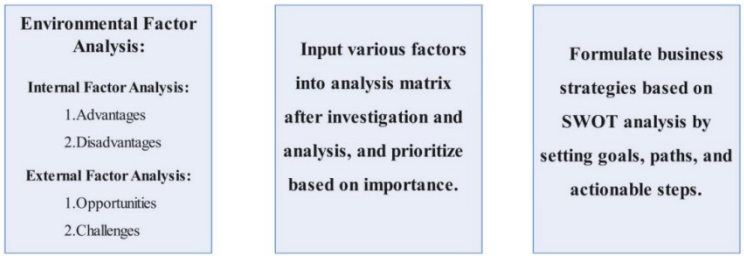

Figure 3: SWOT Strategic Decision-Making Analysis Flow.

Through the above steps, enterprises can comprehensively and systematically understand their own strengths and weaknesses, as well as opportunities and threats in the external environment, so as to formulate a more realistic and operable development strategy.

3.2. Analysis of Environmental Factors

3.2.1. Strengths

Enhanced Corporate Brand Image: Implementing a green supply chain helps companies establish an environmentally responsible corporate image, fostering consumer recognition and loyalty and boosting market competitiveness.

Cost Savings and Efficiency Improvements: Through resource recycling, energy-saving, and emission reduction measures, companies can lower production costs, improve resource utilization efficiency, and reduce waste disposal and emission expenses, achieving both economic and environmental benefits.

Improved Risk Resilience: Green supply chains enable companies to better adapt to changes in environmental regulations and meet the increasing environmental demands of future consumers, reducing the risks associated with fines, litigation, and public relations crises due to environmental non-compliance.

Enhanced Innovation Capacity: Green supply chains necessitate innovation in product design, manufacturing processes, and logistics management to meet environmental and resource efficiency standards. This drives companies to continuously update their knowledge and adopt technological advancements, which in turn fosters innovation and industrial technological upgrades.

3.2.2. Weaknesses

High Initial Investment: Establishing a green supply chain requires substantial financial investment for technology upgrades, equipment modifications, and employee training, posing a financial burden on companies.

Increased Complexity in Supply Chain Management: Green supply chains demand stricter environmental audits and management across suppliers, manufacturers, and logistics providers, adding to the complexity and difficulty of supply chain management and increasing management costs.

Uncertainty in Market Acceptance: Although environmental awareness is growing, there remains significant variability and uncertainty in consumer acceptance of and willingness to pay for green products, which could impact the direct economic benefits of green supply chains.

Technological and Standards Barriers: Currently, green supply chain technologies are not yet fully mature, and relevant standard systems remain underdeveloped. As a result, companies may face both technical and regulatory challenges, in addition to financial pressures, during implementation.

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3.2.3. Opportunities

Policy Support and Incentives: As national environmental policies are increasingly strengthened and improved, the government is likely to offer preferential policies to green supply chain enterprises, such as tax reductions, financial subsidies, and financing support, helping companies reduce the operational costs of implementing a green supply chain.

Growing Market Demand: With the rising consumer demand for environmentally friendly products, green supply chain enterprises will encounter significant market space and development opportunities.

International Collaboration and Exchange: Green supply chains are a global concern, allowing companies to leverage international cooperation and exchange to bring in advanced technologies and management experience, thus enhancing their green supply chain management standards. Green supply chain management can further help companies comply with the environmental standards and regulations of international markets, providing them with a gateway to environmentally stringent regions such as Europe and North America.

Opportunity for Industry Transformation and Upgrading: Implementing a green supply chain will strengthen collaborative relationships among enterprises within the supply chain, driving industrial transformation and upgrading within each company, optimizing industry structures, and increasing industrial added value, thereby enhancing the overall competitiveness of enterprises.

3.2.4. Threats

Regulatory Constraints and Compliance Risks: One of the threats faced by green supply chains is regulatory restrictions and compliance risks. With the ongoing improvement of environmental regulations, companies must adhere to increasingly strict environmental standards in their production and operations, or they may risk fines, shutdowns, or suspensions. Furthermore, differences in environmental standards between countries and regions could expose companies to trade and green barriers in the international market.

Competitor Strategy Adjustments: As the concept of green supply chains becomes more prevalent, competitors may adopt more aggressive environmental strategies, intensifying market competition. This will require companies to continuously invest and innovate to maintain competitiveness in green supply chain practices.

Increased Supply Chain Risk: Green supply chains demand that companies select suppliers and manufacturers that meet environmental standards, potentially leading to increased dependency on specific eco-friendly suppliers or materials in the short term. This could reduce supply chain stability and increase supply chain risk.

Economic Fluctuations and Consumer Behavior: During economic downturns, when income inequality widens, unemployment rises, and worker income declines, both ordinary consumers and companies may prioritize cost savings over environmental concerns, potentially reducing demand for green products and impacting green supply chain management strategies.

3.3. Building the SWOT Analysis Matrix

Based on the analysis of internal strengths and weaknesses and external opportunities and threats in establishing and implementing green supply chain management, these factors can be incorporated into the SWOT analysis framework, which then guides the formulation of the strategies companies should adopt. There are numerous factors influencing whether companies choose to establish a green supply chain, and constructing the SWOT analysis matrix typically involves prioritizing the importance of these analytical factors.

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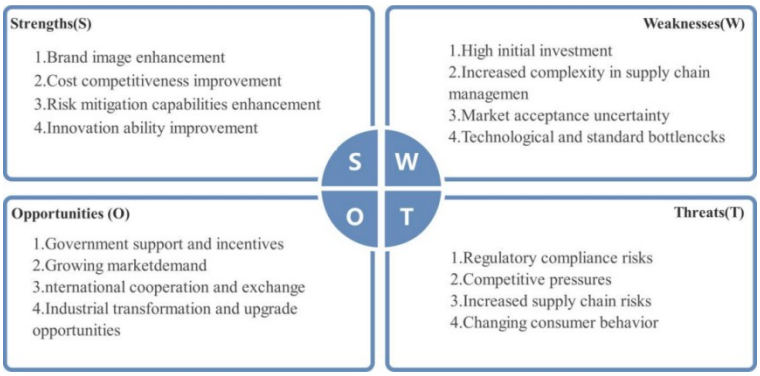

Figure 4: SWOT Analysis Table for Establishing a Green Supply Chain.

According to the SWOT analysis matrix, there are two "opportunity response strategies" for enterprises to establish green supply chain management: SO (advantage opportunity) strategy and WO(disadvantage opportunity) strategy, and two "challenge response strategies" : ST (advantage challenge) strategy and WT (disadvantage challenge) strategy. Under normal circumstances, enterprises should choose the opportunity response strategy as the main strategy, while the two challenge response strategies are generally not the main strategy. The basic strategies are shown in the table below.

Table 1: Four response strategies for establishing GSCM based on SWOT analysis.

SO (Growth Strategy)	1. Establish a comprehensive green supply chain. 2. Utilize policy support to promote green upgrades for enterprises. 3. Increase investment in technological innovation. 4. Core enterprises should promote green development throughout the entire supply chain.
WO (Transformation Strategy)	1. Establish a green brand image to consolidate market position 2. Optimize product lines and adopt different market segmentation strategies. 3. Assist supply chain enterprises in enhancing their green standards to address compliance risks. 4. Diversify industrial layout to spread business risks.
ST (Diversified Operations Strategy)	1. Firmly establish a business strategy of building a green supply chain. 2. Finance through "green finance" to alleviate financial pressure. 3. Focus on technological upgrades with energy conservation and emission reduction as the core. 4. Gradually transition to green design, green production, and a green supply chain.
WT (Defensive Strategy)	1. Treat green supply chain as a social responsibility goal. 2. Choose adaptive management strategies based on actual conditions to gain competitive advantage. 3. Ensure core business operations, reduce or eliminate unnecessary investments and expansions. 4. Enhance technological and management capabilities to cope with market competition.

As shown in the SWOT analysis matrix, the decision to establish green supply chain management presents two “opportunity response strategies”: the SO (Strengths-Opportunities) strategy and the

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WO (Weaknesses-Opportunities) strategy, as well as two “challenge response strategies”: the ST (Strengths-Threats) strategy and the WT (Weaknesses-Threats) strategy. Generally, companies should select opportunity response strategies as their main strategies, while challenge response strategies are typically not the primary strategies for most companies.

3.4. Case Study: Huawei’s Green Supply Chain Management

Huawei is not only a global leader in ICT (Information and Communication Technology) infrastructure and smart devices but also a practitioner of green supply chain management. Below are some key milestones in Huawei’s development and implementation of green supply chain management (Sources: Huawei’s official website and sustainable development reports from 2008 to 2023[18]):

Figure 5: Huawei 20-Year Green Supply Chain Management (GSCM) Development Path.

Let us briefly review Huawei’s strategic responses using SWOT analysis. Prior to 2016, Huawei’s internal strengths (S) included its industry leadership in brand, financial resources, technological development, and market share, which were all at a growing stage. The internal weakness (W) was that, alongside rapid growth, Huawei was attracting increasing global attention, requiring a more professional, standardized, compliant, and internationalized management model, including GSCM (Green Supply Chain Management). The external opportunities (O) included active government support for the company’s international development and its low-carbon, environmentally sustainable development strategy; advancements in information technology leading the world into the mobile-connected 5G era; growing demand for green consumption; and the arrival of the smart era, bringing new opportunities for the company. External threats (T) included market competition from outstanding companies like Apple and Samsung; the normal regulatory and compliance requirements in the international market concerning standards, business rules, environmental protection, and intellectual property; and non-standard business suppression from Europe and the U.S., such as: the Cisco lawsuit in 2003, the U.S. blocking Huawei’s acquisition of 3Com in 2007. During this stage, Huawei adopted the SO strategy and the WO strategy, leveraging its strengths and external opportunities to improve brand competitiveness and market share, increasing innovation efforts and technology reserves, developing GSCM. As a result, it grew into a global leader in ICT infrastructure and smart terminals.

After 2016, the U.S. government began to intensify its pressure on Huawei. Between 2019 and 2020 alone, the U.S. launched four rounds of sanctions against Huawei. During this period, Huawei

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clearly adopted the ST strategy and some aspects of the WT strategy. The ST strategy is reflected in Huawei's full utilization of national policy support and its deep technological accumulation. While consolidating its core business, Huawei focused on software development and self-research of chips, while continuing its emphasis on research and innovation. In GSCM, as a core enterprise in the supply chain, Huawei integrated green, low-carbon, and sustainable development requirements into its procurement processes, driving continuous improvement across the industry chain. The WT strategy is reflected in Huawei's decisive withdrawal from certain markets and its reduction in non-essential investments.

Over the past decade, Huawei has consistently ranked among the top 30 companies in the annual "Green Supply Chain CITI Index Report" published by the Institute of Public and Environmental Affairs (IPE), frequently achieving the top ranking in China.

Table 2: 2014 to 2023 Huawei Company CITI Index Score and Ranking.

Date	Index Ranking	Index Score
2014	18	45
2015	17	43.5
2016	12	54.5
2017	17	47
2018	21	46
2019	13	54.09
2020	22	45.98
2021	24	50.63
2022	22	55.36
2023	22	57.82

From Huawei's development in GSCM, we can see that since establishing CSR supply chain management in 2003, Huawei has adhered to innovation, continuously improving its green supply chain, and enhancing GSCM capabilities, whether during rapid growth or facing challenges.

4. Conclusion

This paper reviews the development process of GSCM, analyzing the achievements and shortcomings of Chinese enterprises in establishing and implementing GSCM. Using the SWOT framework to study GSCM, it also analyzes Huawei's process of establishing and improving its GSCM from a SWOT perspective. The conclusions are as follows:

The SO strategy aims to leverage the company's internal strengths to fully exploit external opportunities. By utilizing external opportunities to accelerate the enhancement of internal strengths, the company can accelerate its development, further consolidate and expand its advantages, and thus gain initiative when opportunities or challenges arise. The implementation of the WO strategy requires favorable market conditions, and internal weaknesses hinder the ability to take advantage of external opportunities. Therefore, the key is to eliminate weaknesses and seize opportunities.

The choice between ST and WT strategies lies in how the company responds to external challenges. When facing external challenges, decision-makers should fully consider the impact of the company's internal strengths and external challenges, weighing the balance of internal and external forces and the development trends of external challenges. When internal strengths can offset risks, the ST strategy should be adopted, strengthening the company's advantages and addressing the external impacts. If external challenges cannot be addressed, the WT strategy, which involves defensive,

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contraction, and other conservative strategies, should be adopted. At the same time, gradual reforms should be made to the company's production, operations, and management.

Decision-makers should take a dynamic, developmental view of the company's internal and external environmental factors. Since a company's resources and power are always limited, it is crucial not to pursue comprehensive advantages when facing challenges but to establish relative advantages.

In summary, Chinese enterprises should be confident in implementing GSCM. Whether responding to opportunities or challenges, external factors such as government policy support and incentives, as well as the growing market for green consumption, should be considered as long-term favorable conditions. In the long run, establishing a sound and effective green supply chain will not only help companies comply with increasingly strict environmental regulations, practice corporate social responsibility (CSR), and enhance their social image and brand influence, but it will also reduce costs by improving resource efficiency, thereby gaining a competitive advantage in the market.

Improving the basic ecological civilization system, strengthening the ecological environment governance system, and perfecting the green low-carbon development mechanism are national policies. Green and environmentally friendly products are the true needs of the people. Enterprises should seize the opportunity, make scientific decisions, and seek long-term development.

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