Accounting and Corporate Management (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/acccm.2024.060318
ISSN 2523-5788 Vol. 6 Num. 3

Literature Review on Green Supply Chain Performance Evaluation

Jianwei Ma[1,a,*], Min Gao[1,b]

[1]*School of Economics and Management, Lanzhou University of Technology, Lanzhou, Gansu, China*
[a]*majianwei0931@163.com*, [b]*958525958@qq.com*
[*]*Corresponding author*

Keywords: Green Supply Chain, Performance Evaluation

Abstract: In the current global context of high emphasis on sustainable development, enterprises face both challenges and opportunities. In order to stand out in the fierce market competition, actively respond to the requirements of environmental protection, and achieve excellent economic and environmental benefits, many core enterprises actively introduce the concept of green supply chain in their supply chain systems. This measure is of great significance. To achieve superior economic and environmental benefits, many core enterprises have actively introduced the concept of green supply chain in their supply chain system. Evaluating the performance of green supply chains not only constitutes a key yardstick for assessing the management effectiveness of enterprises but also becomes a core tool for guiding the continuous optimization strategy of enterprises. This paper systematically discusses domestic and international studies on green supply chain performance evaluation, covering four dimensions: basic concepts of green supply chain, driving factors, management practices, and performance evaluation mechanisms.

1. Introduction

The concept of a sustainable supply chain, initially conceived at Michigan State University in 1990, underwent a seminal elaboration by Srivastava (2007). This author offers a distinctive and comprehensive interpretation, portraying a green supply chain as a cutting-edge managerial paradigm that seamlessly incorporates environmental stewardship into every stage of a product's lifecycle—from the conception of its design, through the selection of eco-friendly raw materials, to the production and manufacturing processes, the strategic layout of distribution networks, and ultimately, its responsible disposal. This integration goes beyond the conventional boundaries of traditional supply chain management, fostering a holistic approach that prioritizes environmental concerns [1].

The theoretical exploration of green supply chain in China began in the early 21st century. Relying on the universal principle of supply chain and the definition of green manufacturing, Dan Bin and Liu Fei (2000) constructed a broader interpretation of green supply chain, i.e., on top of the traditional supply chain structure, the model integrates the elements of resource efficiency improvement and environmental protection to form a modern management system. This system is

rooted in supply chain management and green manufacturing theories. It runs through the complete life cycle of products from procurement, manufacturing, packaging, and sales to recycling, aiming to achieve the dual goals of minimizing environmental impacts and maximizing the efficiency of resource utilization. Its management scope involves a wide range of collaborative operations among suppliers, customers, distributors, and end consumers [2]. Subsequently, Wang Nengmin et al. (2002) introduced a supply chain framework for green manufacturing on top of the traditional manufacturing paradigm, which integrates the relevant knowledge flows (covering green design and green manufacturing) based on the logistics, information and capital flows of the existing supply chain, and optimizes the unidirectional flow of the traditional supply chain into a bi-directional interaction, which promotes a more efficient and comprehensive exchange of information [3]. Although no consensus has been reached on the authoritative definition of a green supply chain at home and abroad, the academic community generally agrees that its core concept lies in the deep integration of the principles of environmental protection, emission reduction, and waste reduction into the production, consumption, and recycling cycles, to optimize the allocation of resources and maintain ecological balance.

Drawing upon the lens of low-carbon logistics, Wang Guowen (2010) recast the notion of a green supply chain into a comprehensive framework that permeates crucial facets of logistics and supply chain operations, deeply embedding low-carbon and environmental preservation principles. This holistic system spans the entire lifecycle of a product, initiating from the inception of product design, progressing through raw material sourcing, manufacturing processes, distribution network optimization, and culminating in the delivery of the product to consumers. Furthermore, it strives to establish a comprehensive, end-to-end green operational paradigm, ensuring that every node within the supply chain adheres to environmental friendliness and fosters efficient resource utilization [4]. Although a unified definition of a green supply chain has not yet been formed globally, academics generally agree that the core of the concept lies in the deep integration of the concepts of environmental protection, pollution reduction, and resource conservation into the whole process of product production, consumption and even recycling, aiming at optimizing the allocation of resources to achieve sound and sustainable development of the ecological environment. Xiao Liang (2016) analyzed the circulation mode of the green supply chain for agricultural products and further clarified its core concept. Based on China's current national conditions, he innovatively constructed a green supply chain circulation framework for agricultural products in line with national conditions. He elaborated in detail the specific operation process of the model in the five key aspects of green design, procurement, production, marketing, and logistics. Through this comprehensive perspective, he not only emphasizes the close connection between the links but also highlights the implementation and execution of the green concept in the whole chain of agricultural supply chain. He emphasized that it was imperative to ensure the seamless functioning of the green supply chain distribution model for agricultural products and that it was, therefore, necessary to focus strategies on five key areas. First, enhancing the robustness of information systems for agricultural commodity flows was critical to maintaining transparency and facilitating the timely dissemination of information. Second, improving agricultural logistics frameworks is essential for improving logistics efficiency and environmental sustainability. Third, promoting the process of standardization of agricultural products is a catalyst for strengthening quality control measures and facilitates market access through universally accepted standards; fourth, increasing the support of policies, through the policy guidance and incentives, and the policy guidance and incentives, and through the policy guidance and incentives. The fourth is to increase policy support, through policy guidance and incentive. The fifth is to deepen the innovation and optimization of supply chain organization mode, to enhance the synergy and flexibility of supply chain links.Through the comprehensive measures in these five aspects, the operational efficiency of the green supply chain

circulation model of agricultural products can be effectively enhanced, and the goal of sustainable development of agriculture can be realized. This green supply chain architecture system is more suitable for China's national conditions and aims to achieve the goal of sustainable development of agricultural product circulation through in-depth exploration in procurement, production, and marketing [5]. Cui Fang (2018) pointed out that Chinese enterprises are still deficient in the field of green marketing and face multiple challenges. To stand out in the competitive market environment, enterprises urgently need to identify and improve their shortcomings, and actively adopt green marketing strategies as a key driving force for sustainable growth. Through this shift, companies can not only enhance their brand image but also find a better balance between environmental protection and economic benefits [6]. Mao Tao (2021) Greening ecological supplier management is an innovative environmental management approach that can effectively enhance the greening of the corporate supply chain [7]. With the accession of China, the first manufacturing power in time, the practice of greening and ecological supplier governance has also been actively promoted by China, which has taken measures such as construction and experimental innovation, and has made significant dedication to the development of greening and ecological suppliers in the world. The lack of awareness of greening and ecological supplier governance, the lack of internal power, and the insufficient openness of information systems by Chinese private enterprises have made the current participation in greening and ecological supplier governance by Chinese private enterprises extremely scarce. To this end, positive measures should be taken, such as setting up an effective incentive management mechanism and strengthening the openness of the information system, to stimulate the enthusiasm of enterprises to participate in greening and ecological supplier governance. Ki-Hoon Lee (2017), taking Hyundai Motor in South Korea as a case study, traced and analyzed in depth the trajectory of the carbon footprint of the entire supply chain, and then, from the different dimensions of the supplier and the core enterprise, elaborated the specific paths and strategies for the construction of a green supply chain [8]. Sengupta Dipanjana and other scholars (2021) further refined the theoretical framework of green supply chain and divided its essence into five key areas, such as green design, green procurement strategy, environmentally friendly production methods, sustainable transportation system, and reverse logistics and recycling mechanism, which provides a more detailed guide for the comprehensive development of green supply chain [9].

Factors influencing companies to engage in green supply chain practices. Factors affecting the management practices of enterprises are multifaceted, and a study on the green supply chain practices of German automobile enterprises pointed out that market factors are the key factors driving their green supply chain practices. Han Bing et al. classified the factors affecting the green supply chain practices of enterprises into internal and external factors and used structural equation modeling to point out that the green supply chain practices of port service enterprises are mainly influenced by stakeholders in external factors. Based on the triple bottom line theory and stakeholder theory, Zhang Xuan and other scholars innovatively deconstructed the factors driving enterprises' green supply chain practices into four major systems: the social system (centered on government regulations, industry competition, and the public's ethical expectations), the production system (covering the production process of the entire product lifecycle), the consumption system (focusing on the consumers' environmental protection awareness and green demand), and the environmental system (comprehensively considering the environmental elements and their interrelationships). They use meta-analysis to explore the environmental factors and their interconnections in depth.) Using meta-analysis methods, they explored how these systems specifically contribute to the various aspects of a company's green supply chain [10]. In contrast, Chen Qiujun and other scholars make a more detailed distinction between institutional pressures, dividing them into two dimensions: business environmental pressure and social environmental

pressure. Through the rigorous verification of empirical research, they not only confirmed that both pressures have a positive driving effect on the green supply chain practice of enterprises but also further revealed that social environmental protection pressure has a more significant facilitating effect compared with commercial environmental protection pressure. In addition, they also emphasized the moderating effect of corporate innovation capacity in this process, i.e., the level of corporate innovation capacity affects the efficiency and effectiveness of institutional pressure into green supply chain practices [11].

2. Motivations for Implementing Green Supply Chains

There are various research perspectives on the motivation of green supply chain implementation. From the perspective of stakeholders, the implementation of a green supply chain by enterprises is regarded as a model of practicing social responsibility, which not only benefits internal employees, but also positively affects suppliers, customers, and the communities in which they are located, and builds a win-win situation of harmonious coexistence. The institutional framework elucidates the coercive power of statutory acts and industrial agreements to incentivize firms to pursue green supply chain trajectories. The system dynamics perspective reveals a dual-pressure dynamic where internal motivations are intertwined with changes in the external environment, which together drive the adoption of green supply chain management practices. In addition, the supply chain risk management perspective emphasizes the proactive stance taken by firms in embracing green supply chain strategies, thereby enhancing the resilience and sustainability of their supply networks to cope with uncertainties associated with environmental pollution risks and changing consumer preferences. Based on a detailed literature review, Helen Walker (2008) has extracted a framework of the dual drivers of green supply chain management adoption by firms. Internal drivers include cost reduction expectations, owner value orientation, corporate value expansion, investor pressure, and product quality enhancement; while external drivers come from regulatory compliance requirements, consumer power (including demand, willingness to cooperate, and market pressure), competitive dynamics (pursuit of competitive advantage and performance improvement), social pressure (public opinion, pressure from environmental organizations, and the risk of consumer criticism) and supply chain partners (deepening supplier cooperation and supply integration). However, there are challenges associated with this process, with internal barriers focusing on high implementation costs, insufficient training, and lack of understanding, and external barriers including environmental constraints on innovation, poor supplier cooperation, information asymmetry, and industry-specific barriers [12]. Cao Jingshan and Cao Guozhi (2007) explored the multidimensional drivers of corporate adoption of green supply chain management and distilled their essence into four pillars: legal compliance, market demand, stakeholder coexistence, and corporate social responsibility (CSR). Based on this, they constructed a clear hierarchical green supply chain management conceptual model, which starts from the cornerstone of legal compliance, gradually extends upward to responding to market demand, strengthening stakeholder collaboration, and finally reaches the highest level of total greening. The model is divided into four phases, each of which marks the progression of the depth and breadth of green supply chain management: from the basic legal compliance guarantee to the flexible response to market demand strategy adjustment to the management optimization focusing on the harmonious coexistence among stakeholders, and finally to realize the all-around, deep-level greening practice [13]. Through this model, enterprises can recognize the different development stages of green supply chain management and their corresponding implementation priorities.

Zhu Qinghua and Tian Yihui (2010) analyzed the multiple influencing factors of green supply chain practice with the help of a system dynamics perspective and concluded that the driving force

and hindering force coexist in enterprises' promotion of green supply chain management system, and both of them are originated from the comprehensive effect of the internal and external environment. Specifically, the external drivers include national macro-policy orientation, competitive situation in the industry, supplier cooperation pressure, and broad social expectations and pressures; while the internal factors focus on the operational challenges of the enterprise, the decision-making preference of the management, and the expectation of economic benefits. However, it is worth noting that some scholars disagree, arguing that full-scale implementation of green supply chains may not be the preferred strategy for SMEs at this stage given the specific challenges they face, such as limited resources and the need for flexibility [14]. For example, Hwa (2001) argues that firms will impose environmental requirements on their suppliers due to survival pressure or to maintain market share. However, for some firms, especially SMEs, environmental protection is an “extra cost” and they do not have sufficient resources to support improved environmental performance.

3. Research on Green Supply Chain Performance Evaluation

The current academic research on the evaluation of green supply chain performance can be broadly categorized into two major areas: one is the construction of a green supply chain performance evaluation system, and the other is the exploration of methods for evaluating green supply chain performance.

The construction of a green supply chain performance evaluation system is a prerequisite for evaluating the green supply chain management practices of enterprises, which needs to be designed according to the specific industries and enterprises. Further, Petljak (2018) and other researchers focused on the food retail industry, integrated the green supply chain management concept with the characteristics of this industry, and designed a performance evaluation system tailored for food retail stores. The system innovatively evaluates the performance and effectiveness of food retailers in green supply chain practices from the dimensions of internal green operation processes of stores and overall green management processes of the supply chain comprehensively and systematically. Digalwar (2018) et al. summarized the previous studies and proposed a set of performance evaluation criteria for customer perception, brand image, economic benefits, suppliers' participation in environmental protection, and the enterprise's support to 18 supply chain sustainable performance evaluation indicators, such as customer perception, brand image, economic efficiency, suppliers' environmental participation, and enterprises' policy support for green supply chain management, and used structural explanatory modeling and network hierarchical analysis to determine the hierarchical structure and indicator weights to assess the green sustainability of supply chains of agile manufacturing enterprises in India. Ji Juhai (2013) and others constructed a green supply chain performance evaluation system for China's iron and steel industry, considering the economic performance dimension of economic development and technological progress, the environmental performance dimension of resource consumption, environmental protection, and energy-saving and emission reduction, and the social performance dimension of social impact, to evaluate the green supply chain performance of Baosteel, Anshan Iron & Steel and other iron and steel enterprises [15]. Cheng Qiongwen (2017) and others constructed a system dynamics model of the green supply chain for aluminum industry enterprises with financial status, internal processes, customer service, innovation and development, and green environmental protection as subsystems, and used simulation to derive that enterprises should pay attention to environmental protection as well as the overall pull of innovation drive on the green supply chain performance of electrolytic aluminum enterprises [16].

In the process of exploring the green supply chain performance evaluation index system, the

pioneer Scott (1998) took the lead in proposing the integration of the balanced scorecard concept into the index screening process, and through the improved balanced scorecard strategy, which is more in line with the reality of the enterprise and focuses on the selection of the indexes of the environmental performance dimension, and then constructed a comprehensive evaluation index system from five core perspectives [17]. Yang (2009) further expanded on this basis and concluded that enterprises should pay attention to environmental protection and the overall pull of innovation drive on the green supply chain performance of electrolytic aluminum enterprises [18].) further expanded on this basis, not only incorporating learning and growth dimensions but also adding five new key aspects, such as the level of greening, which together constructed a more diversified evaluation index system. Zhao Lijuan (2003), on the other hand, focuses her research on the environmental characteristics of green supply chains, concentrates on the in-depth analysis of environmental dimensions, and designs a set of systems focusing on the assessment of greenness of supply chains, which provides quantitative analysis tools for the greening process of the industry. Han Xiaohua (2006), when constructing a green supply chain performance evaluation system, skillfully integrated the green supply chain concept with the balanced scorecard method and innovatively introduced environmental performance indicators, thus constructing a comprehensive and targeted performance evaluation system.

In exploring the methodological level of green supply chain performance evaluation, scholars at home and abroad have shown diversified research perspectives and strategies. Specifically, in the use of data envelopment analysis (DEA), Fang Wei (2017) took an alternative approach, focusing on the interrelationships and linkage mechanisms among supply chain node enterprises, and constructed a comprehensive index system aimed at evaluating the operational efficiency of green supply chain performance, and then utilized the DEA model to carry out in-depth performance profiling of Company M [19]. Juan Zhang (2016) improved the network DEA method and established an evaluation system to select 10 food companies for green supply chain performance evaluation [20]. Krishnendu Shawa (2016) used a combination of fuzzy hierarchical analysis and linear programming in selecting suppliers to evaluate green supply chain performance [21]. In exploring the practice of applying the gray correlation evaluation method, Ji Juhai's (2013) study demonstrated a novel and multidimensional analysis framework. Through meticulous analysis, he carefully constructed a comprehensive evaluation system for the green supply chain management performance of steel enterprises from six differentiated dimensions and four core levels. To verify the scientificity and practicality of the system, he skillfully selected four to five groups of steel enterprises as sample cases and deeply analyzed the actual performance of these enterprises in the field of green supply chain management with the help of the gray correlation evaluation method [22]. Li Yanbo (2019), on the other hand, comprehensively considered the three core elements of environment, economy, and operation when constructing the green supply chain management performance evaluation index system for manufacturing enterprises. Using this as a cornerstone, he constructed a comprehensive and systematic evaluation framework and innovatively introduced a fuzzy comprehensive evaluation method [23]. In exploring other evaluation paths of green supply chain management, Zheng Jiliang (2017) innovatively constructed a green supply chain management framework covering the whole industry chain and designed a quantitative evaluation model of synergistic effect in a supporting way. He selected Baosteel as a typical case, and through the implementation of the synergy analysis model, he not only deeply analyzed the synergistic management effectiveness of the enterprise's green supply chain, but also comprehensively assessed the synergistic interaction effect between the enterprise's internal and external green performance growth, which provided strong theoretical support and empirical references for the practice of green supply chain management [24]. From Ozer Uygun's (2016) research perspective, the process of green supply chain decision-making is endowed with multi-dimensional consideration requirements.

He constructed an evaluation model that is rooted in a comprehensive fuzzy multi-objective decision-making framework that aims to comprehensively assess various factors related to decision-making. To accurately quantify the relative importance of these factors, he adopted the fuzzy network analysis (ANP) method to effectively calculate the weight distribution of each evaluation index to realize the comprehensive evaluation and ranking of enterprises' green supply chain operation [25]. Gabriela Scur (2017) studied the green supply chain of the home appliance industry in Brazil, choosing five manufacturers and two professional associations as the research subjects for evaluation and analysis [26]. Zeng Youxin (2017) based on the idea of a green supply chain, selected the performance evaluation indexes of end-of-life automobile enterprises from four aspects, screened the indexes and tested the correctness and stability of the index system through ridge regression, and finally established the evaluation index system, and selected enterprise A to simulate the simulation using the BP neural network method [27].

4. Conclusions

The article analyzes and summarizes the domestic and international studies related to green supply chain performance from three aspects: the definition of green supply chain, motivation, and evaluation methods of green supply chain performance. In summary, we can find that the definition of a green supply chain has not yet been given an authoritative definition in academic circles, but its essence lies in the philosophy of environmental protection, pollution reduction, and resource loss deeply rooted in the whole process of production, consumption, and recycling. This process aims to optimize the efficiency of resource allocation and promote the balance and stability of the ecosystem, thereby achieving sustainable protection of the natural environment.

References

[1] Srivastava, S. K. Green supply-chain management: A state-of-the-art literature review. International Journal of Management Reviews. 2007, 9 (1): 53-80.

[2] Dan Bin, Liu Fei. Research on green supply chain and its system structure. China Mechanical Engineering, 2000 (11): 40-42+4.

[3] Wang Nengmin, Sun Linyan, Wang Yingluo. Supply chain management based on green manufacturing. China Mechanical Engineering, 2002 (23): 42-44+4.

[4] Wang Guowen. Low-carbon logistics and green supply chain: concept, process and policy. Open Herald, 2010 (02): 37-40+53.

[5] Xiao Liang. Research on the circulation mode and operation process of green supply chain of agricultural products. Technical Economy and Management Research, 2011 (11): 109-112.

[6] Cui Fang, Jia Minrong. Research on Green Marketing Mode in Enterprise Marketing. Enterprise Research, 2013 (16): 39-41.

[7] Mao Tao. Progress, Dilemma and Countermeasures of Green Supply Chain Management. Environmental Protection, 2021, 49 (02): 61-65.

[8] Ki-Hoon Lee. Integrating carbon footprint into supply chain management: the case of Hyundai Motor Company (HMC) in the automobile industry. Journal of Cleaner Production, 2011, 19 (11): 1216-1223.

[9] Sengupta Dipanjana, Das Amrit, Bera Kumar Uttam et al. A Green Supply Chain Management Considering Minimum Cost and Time. International Journal of Business Analytics, 2021, 8 (2): 63-82.

[10] Han Bing, Kang Juanjuan, Kuang Haibo. Research on green operation driving factors and correlation effects in port service supply chain. Industrial Engineering and Management, 2020, 25 (02): 59-66.

[11] Zhang Xuan, MA Zhijun, TIAN Donghong, Xue Gang. A study on the influencing factors of green supply chain management practices in enterprises--an exploration based on meta-analysis method. China Population-Resources and Environment, 2017, 27 (12): 183-195.

[12] Chen Qiu-Jun, Jia Tao, Wang Neng-Min, Wang Yu. A study on the impact of institutional pressure on green supply chain management practices-the moderating role of innovation capability. Industrial Engineering and Management, 2021, 26 (03): 40-47.

[13] Walker, H., L. D. Sisto and D. Mcbain. Drivers and barriers to environmental supply chain management practices:

Lessons from the public and private sectors. Journal of Purchasing & Supply Management. 2008, 14 (1): 69-85.
[14] Jingshan Cao, Guozhi Cao. A theoretical discussion on the driving factors for enterprises to implement green supply chain management. Value Engineering, 2007 (10): 56-60.
[15] Zhu Qinghua and Tian Yihui. Research on the driving force model of green supply chain management in enterprises. Journal of Management, 2010 (05): 723-727.
[16] Cheng Qiongwen, ZHOU Lu, Yu Shengran. Research on Green Supply Chain Management and Practical Performance--Taking Electrolytic Aluminum Enterprises as an Example. China Soft Science, 2017 (10): 163-172.
[17] Johnson S D. Identification and selection of environmental performance indicators: Application of the balanced scorecard approach. Corporate environmental strategy, 1998, 5 (4): 34-41.
[18] Yang J. Integrative performance evaluation for supply chain system based on logarithm triangular fuzzy number-AHP method. Kybernetes, 2009, 38 (10): 1760-1770.
[19] Zhao Lijuan, Luo Bing. Fuzzy comprehensive evaluation of environmental management performance in green supply chain. Journal of Chongqing University (Natural Science Edition), 2003 (11): 155-158.
[20] Han Xiaohua, Xue Shengjia. A green supply chain performance evaluation method based on benchmarking. Industrial Technology and Economics, 2006 (11): 89-92.
[21] Fang Wei, Yang Bu. Research on the evaluation of enterprise green supply chain operation efficiency based on DEA method. Industrial Technology and Economics, 2017, 36 (12): 19-26.
[22] Zhang Juan. Green supply chain evaluation method based on fuzzy mathematics and network DEA model. Statistics and Decision Making, 2016 (14): 41-44.
[23] Li Yanbo, Yuan Wenbin, Zhu Jianxin. Evaluation of green supply chain management performance in manufacturing enterprises. Electromechanical Products Development and Innovation, 2019, 32 (03): 40-41+54.
[24] Zheng Jiliang, Zhou Xuan. Research on the evaluation of synergistic effect of green supply chain management in iron and steel enterprises. Research Management, 2017, 38 (S1): 563-568.
[25] Uygun Ö, Dede A. Performance evaluation of green supply chain management using integrated fuzzy multi-criteria decision making techniques. Computers and industrial engineering, 2016, 102: 502-511.
[26] Scur G, Barbosa M E. Green supply chain management practices: Multiple case studies in the Brazilian home appliance industry. Journal of cleaner production, 2017, 141: 1293-1302.
[27] Zeng Youxin, Wang Bin. Research on performance evaluation of end-of-life automobile enterprises based on green supply chain. Industrial Technology Economy, 2017, 36 (04): 98-106.