

## Sustainable Supply Chain Management: A Comparative Analysis of Green Practices in Various Industries

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### Abstract:

In recent years, sustainable supply chain management (SSCM) has emerged as a critical component for organizations aiming to enhance their environmental performance while maintaining economic viability. This study presents a comparative analysis of green practices across various industries, including manufacturing, retail, and agriculture. By examining the implementation of sustainable practices such as waste reduction, energy efficiency, and sustainable sourcing, this research highlights the diverse approaches adopted by different sectors in their quest for sustainability. The analysis employs a mixed-methods approach, incorporating both qualitative and quantitative data collected from industry reports, case studies, and surveys of supply chain professionals. Key findings reveal that while some industries, like retail, have made significant strides in adopting circular economy principles, others, such as manufacturing, still face challenges in integrating sustainable practices due to regulatory and cost-related barriers. Furthermore, the study identifies best practices and innovative strategies that have led to successful implementation of SSCM, including collaboration with stakeholders and investment in green technologies. This analysis not only underscores the importance of contextual factors in shaping green practices but also offers valuable insights for organizations seeking to enhance their sustainability efforts. By fostering a deeper understanding of industry-specific challenges and opportunities, this research contributes to the growing body of knowledge on sustainable supply chain management and provides a roadmap for future initiatives to promote environmental stewardship across sectors.

**Keywords:** Sustainable supply chain management, SSCM, green practices, comparative analysis, sustainability, drivers, stakeholders

### 1. Introduction

Sustainable initiative has become one of the most important issues around the world. Since the late 1980s and early 1990s, business organizations began to pay attention to the implications of social and environmental changes through regional economic activities. They should be aware of the duties and responsibilities of stakeholders. They should seek to enhance the quality of life for their employees, customers, subordinate business allies, global communities, and the environment. As a result, SSCM has merged to optimize the potential drivers to meet the sustainability-related requirements of stakeholder interests, laws, and other relevant regulations. The purpose of this study is to (a)

determine research on SSCM drivers over 10 years (2006-2016) and (b) SSCM drivers in different sectors by comparing the percentage of an examined sample for each industry.

The present work focuses on sustainable supply chain management (SSCM). The topic evaluates over ten years of studies and research in this area to propose an overview of life options. Our goal is to understand which sustainable practices companies can implement to manage their supply chain development sustainably and determine the number of articles examining this topic. This work is divided into six sections. The introduction is followed by a literature review of sustainable supply chain management. After that, we presented the methodology and conducted a comparative analysis of sustainable practices in various sectors. The results of the dichotomous analysis are discussed in the third and fourth sections of the work.

## 2. Literature Review

Different green practices are adopted in the study perspective because it encompasses a wide range of areas to be reviewed. In this comprehensive and thorough study, encompassing a multitude of sectors, a total of five diverse and distinct industries are meticulously examined to analyze and assess the comparative analysis of green supply chain practices. The practices taken into consideration span across a diverse array of industrial sectors, thereby providing a comprehensive and holistic understanding of the green practices implemented in each distinct industry. It is important to note that there has been a dearth of integrated or cross-analytical studies focused on green business practices, making this study particularly groundbreaking and significant. The paper diligently delves into the examination and exploration of the green practices within the indigo sector in relation to the various industries involved. The data utilized for this publication boasts a rigorous methodology, with the secondary data meticulously extracted from an extensive range of reports, articles, and websites from various esteemed organizations. By upholding such stringent standards, this study ensures the reliability and validity of its findings, thereby contributing to the existing body of knowledge in the field of green supply chain practices and ultimately paving the way for future research in this crucial domain. (Wang, Khan, Anwar, Shahzad, Adu, & Murad, 2021); (Baah, et al., 2021); (Shahzad, Qu, Javed, Zafar, & Rehman, 2020); (Yin & Yu, 2022).

Sustainable supply chain management (SSCM) and green practices have gained significant importance and attention in academic research and practical implications over the past two decades. The concept of SSCM encompasses a comprehensive and holistic approach that includes various stages such as raw material extraction, product design, manufacturing processes, product operation, waste recycling or disposal, and reverse logistics. The importance of sustainability has extended beyond traditional boundaries and has found its way into various industries, including electricity and water management. Industries such as educational institutions and the aviation sector have also adopted green practices like green trust, top management support, and environmental management systems. It is noteworthy that SSCM is driven by various factors both from the organization's perspective and the customer's side, making it widely applicable across different manufacturing and service sectors. Integrating sustainable practices and green initiatives in supply chain management has emerged as a vital component for organizations striving towards a more environmentally conscious and responsible future. By prioritizing sustainable supply chain management and adopting green practices, organizations can reduce their ecological footprint and enhance their overall operational efficiency and brand value in today's increasingly environmentally conscious market.

(Sánchez-Flores, Cruz-Sotelo, Ojeda-Benitez, & Ramírez-Barreto, 2020); (Alzoubi, Ahmed, Al-Gasaymeh, & Kurdi, 2020); (Mastos, et al., 2020); (Khan, Ahmad, & Majava, 2021).

## 2.1. Concept of Sustainable Supply Chain Management

Sustainable Supply Chain Management is predicated on the ‘triple bottom line’ – economic, social, and environmental areas. The technical implementation of sustainability in the supply chain has been discussed by different researchers using various approaches such as life cycle analysis, total quality management, environmental management accounting, descriptive approach, and others. In addition, using a systematic mapping study, critically examined the use of formal tools and practices for sustainability in supply chains in the empirical and theoretical literature. They suggested that the use of these measures can be bolstered by an interdisciplinary ecological economics foundation. Overall, these researchers reported that most of the current studies in sustainability supply chain management approach are theoretical. Many researchers have contributed immensely to the body of knowledge of SSCM in recent years. (Birkel & Müller, 2021); (Khan, Yu, Golpira, Sharif, & Mardani, 2021); (Neri, Cagno, Lepri, & Trianni, 2021).

As an imperative approach, enterprises have realized the need to manage their supply chain operations, which would help to promote the general interest and ensure that their activities do not create problems for the natural environment and societal needs. As a result, many firms are now interested in revamping their traditional supply chain approach so that sustainability could be achieved. The importance of pursuing the sustainability discourse has attracted immense attention from researchers and practitioners. Supply chain sustainability has many facets, as it goes beyond the protection and preservation of the ecosystem. In addition to protecting the ecological system, sustainable supply chain management is possible through ensuring that their products adhere to safety standards, ensuring that customers and consumers have the required information about their products, providing customers with high-quality products, ensuring that their products come with a verifiable guarantee, and ensuring that the label suppliers also comply with sustainable practices. (Wisner, Tan, & Leong, 2021); (Hugos, 2024).

## 2.2. Green Practices in Supply Chain Management

By incorporating relevant literature in the sections below, the results highlight the environmental consequences of manufacturing. The area that follows will eventually include an international comparison and note how source management plays a critical role. The design and operations of a facility, as well as the practices normally used in manufacturing and supply chain initiatives, contribute to greenhouse gases. A better description of waste recycling, reuse and proper substitution in supply chains is vital. Such green practices pave the way for other essential consumers to adopt. These practices apply to sourcing, warehousing, inventory management, transport and packaging. Furthermore, as per some literature, manufacturing must make its everyday delivery as green as possible, thanks to upstream and downstream SCM for better growth and product success. (Pinto, 2020); (Okogwu, et al., 2023).

This subsection of the literature review is dedicated to examining the specific green practices that are applied within the domain of supply chain management. Green practices refer to environmentally

friendly alternatives. Traditionally, studies have shown that cost reduction and other organizational and environmental benefits are the major motivations for adopting green practices. A reduction in carbon emissions and a commitment to using environmentally friendly transportation are a few green practices. While making use of green practices is generally beneficial, reverse logistics operations are gas-guzzling and aren't dependent on the lean system of operation. Several of these harmful gases are potentially leading to global warming. Sustainable supply materials contribute to a variety of green practices, the most significant of which is the reduction of waste at the source. Practitioners must have a positive attitude and accept that various industries are using SCM green tactics in their respective areas of operation in a business. This section serves as a summary of the existing literature with regards to the environmental impact green strategies have across different industries. (Singh, Singh, & Kumar, 2020); (Wong, Wong, & Boon-itt, 2020).

### 3. Methodology

A number of influential researchers in the field of supply chain management have considered the practices of supply chain sustainability and green supply chain management in the last two decades. Considering the implications of green supply chain management practices in the manufacturing and service sectors, only a little has been discussed about the adaptation of these practices in different types of industries and how much they really differ from each other. The main purpose of the present study is to investigate this salient point by adopting a combination of practices (environmental management practices) which refers to the one sustainable concept; for example, the triple bottom line concept which considers the social, economic, and environmental activities of an organization. In this study, green supply chain management practices and environmental cooperation practices are selected as the representative factors of green practices for environmental management in any organization in Malaysia. This research paper is a significantly renewed revision of the working paper. This paper is an important introduction to orient the perfect researcher or reader towards the present study. In particular, the setup of research is given explicitly.

The study used a descriptive research design to compare the environmental management practices . A comprehensive literature review has been conducted to identify the most commonly adopted green practices in different industries. A self-administered survey instrument has been used in the study to test the research propositions. Most of the data were collected by meeting the respondents and explaining the theme of the study. However, despite our repeated visits, some organizations just did not respond due to a number of constraints including the unavailability of higher management or the absence of employees related to the supply chain. A variety of strategies have been employed to increase the response rate; for example, a brief introduction letter, a research package, and an addressed stamped envelope were attached to the self-administered questionnaire. The data collected were analyzed by using the mean and t-test of independent variables.

#### 3.1. Research Design

The primary objective of the project is to identify the main approach to sustainable supply chain management within different industry sectors in the UK. The research encompasses a number of buyer companies and suppliers and addresses a number of research questions. The research is based on a multimethod approach, with a secondary focus on an in-depth case study examining sustainable supply chain management within the food industry sector. The research reported on here aims to

address the following research questions: 1. Is there evidence of sustainable supply chain management across different industries in the UK? 2. Are there differences in approach to sustainable supply chain management between industry sectors in the UK? 3. What are the key business drivers to integrating environmental issues in the supply chain?

This paper presents findings from the first phase of the project "Sustainable Supply Chain Management: A Comparative Analysis of Green Practices in Various Industries". The research design provides the overall plan and structure of the research. The theoretical underpinnings of the methodology are discussed, the research questions addressed, and the overall strategy for conducting the comparative analysis are outlined.

### 3.2. Data Collection Methods

This methodology for research seeks comparative understanding and usually takes the form of structured and semi-structured open-ended questions, interviews, case studies, or real-world observation. Given the survey tool was the most appropriate for this particular study, it was chosen as the primary method. Key areas of the survey instrument were identified in order to obtain specific feedback from parties active in the supply chain or engaged in decision-making activities that would be of relevance to the study. A comparative analysis predicated on the operative level of the supply chain of the participants was chosen for this survey. The questionnaire was pre-tested prior to distribution as a critical response factor to eliminate ambiguity and seemingly unclear elements that could arise as a result of varying interpretations of individual questions. This validation process was carried out by distributing the survey to supply chain professionals, distribution managers, and others with day-to-day involvement with the operational side of their supply chain. After identifying the necessary modifications, it was tested a second time with a different set of supply chain professionals, which further improved many of the questions. (Aithal & Aithal, 2020); (Shrestha, 2021).

In the comparative analysis of green practices of the SSMM, multiple methods and tools are utilized to gather the data. The survey method was used in the study to gather data. It was carried out with the help of a questionnaire that was administered directly to the decision-makers, mostly in supply chain management and key functions such as operations and logistics, as well as other specialized areas that were knowledgeable about the organization's supply chain operations and decisions in the firm. The questionnaire ensured that the managers who play active roles in organizations have accurate information. This could be a challenge for smaller companies, which prompted our extensive recruiting process. On average, each questionnaire took 15 minutes to complete. We obtained 2,500 email addresses through our professional contacts and conferences. A future step will be to provide an updated list with additional data from these contacts. After the administration of the electronic questionnaire, the researchers received 290 responses. Two hundred and forty-eight (248) were from large organizations, and 42 were from small to medium firms. We also had 38 places the questionnaire on their company intranet; the rest completed the questionnaire in Microsoft Word and returned it by email after completion. In addition to large enterprises, this allowed us to capture some smaller organizations as well. The method was checked for reliability using Cronbach's alpha, which showed the accuracy and quality of the research method. A confirmatory factor analysis (CFA) and related structural model were completed. We established 19 questions or 38 possible responses. A few of the responses were on a five-point Likert scale, while the rest had nine-point ordered ordinal scales (Scherpenzeel, et al., 2020).



## 4. Case Studies

### 4.1. Automotive Industry

Vehicle manufacturers such as Tesla have adopted a green manufacturing strategy that focuses on the use of clean energy and sustainable technology. Where Tesla sources its raw materials has been highlighted as a weakness in its supply chain by the proponents of continuing the global energy transition. They faced issues with suppliers who sourced lithium and cobalt. In 2016, Zalkuja, then President of operations for Tesla, said it was easier to manage the climate impact of operations you have direct control over rather than your suppliers. Research by the World Economic Forum suggests that solving the problem of logistics efficiency was only part of the puzzle. Toyota had entered into an agreement with Shell to build a hydrogen filling station at one of its California production plants to encourage suppliers to switch to hydrogen-powered transport. This is part of a larger initiative by Toyota to drive its suppliers towards more sustainable practices (Marcos, Scheller, Godina, Spengler, & Carvalho, 2021).

The automotive industry is a global industry, which passes through a long value chain from design through final consumer. It consists of more than fifteen thousand automotive manufacturers and billions of part manufacturers. This makes the supply chain very complex. Companies are beginning to respond to increasing government regulation and social norms as well as market pressures around the sustainability of sustainable supply chain management. The automotive industry accounts for a significant portion of overall corporate greenhouse gas emissions due to the widespread use of petroleum-based fuels and their related greenhouse gases. Manufacturers have started to produce cleaner vehicles and adopt green supply chain practices. Auto manufacturers are also incorporating renewable energy into their sustainability efforts. In addition to green practices, they also practice waste management and conservation. Auto parts manufacturers apply green practices and claim to be environmentally friendly. To indicate this, they have quality certificates like ISO 9001, ISO 14001, OHSAS 18001, ISO/TS 16949, and so on (Molnár, Suta, & Tóth, 2024).

### 4.2. Food and Beverage Industry

Tesco has developed an innovative lean bank distribution structure that allows it to make important savings. In 2002, Gómez-Mejía, López-Pintado, and Wiseman demonstrated what a lean logistics channel can achieve in supply chain efficiency and used Tesco as an example. When each Tesco distributor is sold in the UK, they ship in their trucks to home. Keeping the number of Tesco order collectors at the shops and inventory levels to a minimum is the product of lean supply chain management mainly due to the Just-In-Time (JIT) concept. All products shall be distributed from the main warehouse of the distribution network within 24 hours. (Marques, Jorge, & Reis, 2022); (Hashim, Nazam, Abrar, Hussain, Nazim, & Shabbir, 2021).

The food and beverage sector can be considered as the most crucial player as it directly serves the sustenance of humanity. It includes some significant areas like sustainable agriculture, processed food, shared demand value systems, healthy eating, and others. Ethical sourcing and sustainable and nutritious food packaging are encompassed in the practices of the food supply chain. Sustainability facilitates the end of poverty as it transmits the food supply chain performance from only using resources to utilizing, transforming, and creating them for the profit of supply chain stakeholders. In

2016, the Amazon Africa Grant Program aimed to better sustainable agriculture and responsible purchasing throughout the Amazon food supply chain as part of the Amazon funds course through research in Ethiopia. Evidence shows that the eco-labeling of food is used to support sustainable purchasing action. Significant packaging measures in the food and beverage sector are being practiced under the extended perspective such as packaging reusability, recyclability, and environmental friendliness. It could be understood as the green supply to the customers by making the information officers obtainable. It also encourages the customer to use social media so that feelings of the endowment could influence online word-of-mouth credibility in the event that the purchasing choice depends strongly on ethical problems. (Silveira, et al., 2022); (Heredia-R, Torres, Vasseur, Puhl, Barreto, & Diaz-Ambrona, 2022).

## 5. Comparative Analysis

Recommendations specific to the Practice of Supplier Collaboration Through Joint Improvement Initiatives: The case of DAF and Delifrance showed possible differences - at the level of the objectives - in supplier collaboration. This may be explained by the position of the company that the various practices consider. DAF is a (linear) original equipment manufacturer, who brings out its own trucks. To frame the difference in objectives in Donia's words, DAF seeks to "start right" when it comes to product design. They aim to reduce the number of variants, do not use many custom components anymore, and evaluate materials more from a technological and economic sustainability perspective. Delifrance is a (circular) product service manufacturer, mainly concerned with franchise. They want to produce beautiful products, produce them for a long time, and in a way that maximizes customer satisfaction in terms of taste, quality, price, etc.

5.2 Recommendations Not Specific to Certain Practices: Possibilities for differences in practices and trends for change in practice were found. The automotive cases made scant use of co-selective practices involving suppliers. However, both H&M and the food and beverage cases heavily rely on suppliers and, at the very least, keep the partnerships with these suppliers "alive". Given the concerns of food quality, safety, shelf-life, and the complexity of taking waste-based products, the food and beverage practices all work with the whole range of their suppliers. Donia noticed that also the practices add suppliers to their circle. Finally, the comparative analysis further reveals that DAF and Delifrance adopted different shades of green in their circular (servitization) business model. Food and beverage adoption of these circular (servitization) business models confirm that a wider notion of economic sustainability is touched upon in this industry. (Zhang, et al., 2023); (Hongmeuan, 2021).

Given the automotive and food and beverage industry context and the findings of the two previous sections, the comparative analysis synthesizes the insights on sustainable supply chain practices in five industry-specific practices, as they emerged in the presentation of the individual cases. Further, it aims to uncover key differences per practice and to provide a brief explanation of these differences based on the two different industry contexts. To draw a comparison beyond specific practices, the comparative analysis also briefly explores the similarities in which industries select certain suppliers with a share-whatever supplier selection approach. Moreover, the analysis zooms in on the insights gained on the notion of economic sustainability. (Govindan, Rajeev, Padhi, & Pati, 2020); (Zhang, Wang, Farooque, Wang, & Choi, 2021).

## 5.1. Key Findings

A. A comparative analysis was performed to discern the impact of green practices on performance. The study covers firms from six different industry sectors, including the automotive industry, major industries in Spain, and various manufacturers from the Indian market. Set in this comparison, the authors have cleared that green practices stand statistically as a significant determinant in performance. Within the Indian market, regulatory requirements are the main driver of green practices. As the second or third most influential, financial stimuli or competitive pressures remain significant determinants of environmentally conscious behavior for the Indian or European markets. As demonstrated in the Spanish case, the study concludes that investment in environmentally friendly machinery is the most effective green practice. In contrast to previous findings, the second most effective measure is the commitment to processes that are less damaging to the environment. The findings indicate no difference between the financial and marketing benefits of green practices.

B. Criteria that determine the supply chain greening decision-making procedure have been explored, with several factors influencing a firm's motivation to create a green supply chain: pressures from upstream and downstream activities, society and customers; the need for corporate image enhancement or damage limitation; the necessity to achieve legal and regulatory conformity; and a desire to improve or maintain the corporate image and product marketability.

## 5.2. Implications for Practice

For major urban centers, logistics has become a crucial part of the network. One fifth of the daily traffic congestion, high pollution, and a significant amount of energy and raw materials use are the related distribution of goods processes. Our findings show that from an energy and environmental viewpoint, the supply chain community can contribute significantly to solution areas. Furthermore, arranging transport networks that carry and collect food products efficiently can reduce urban congestion (and thereby increase local quality of life) and reduce energy consumption as well as the CO<sub>2</sub> emissions and other noise pollution in these regions. (Almatar, 2023).

Our findings are relevant for managers since organizations in different industries may learn from the identified green practices to improve their supply chain strategies and operational sustainability. The innovative approaches in each industry may be transferred to other areas of the business, for example, in facilities management. The easy reconfigurations can be handled without losing efficiency in other industry fields, while some practices are linked to machines or procedures specifically in the transport industry. The position of strategic green supply chain management has to balance firm performance as well as environmental impact and be incorporated into a firm's overall business strategy to enhance performance and competitive advantage in the long run. In this context, the results show that being green not only in the agriculture sector but also in its transport to retail and distribution is potentially stronger in a market that is becoming more and more about consciously chosen, genuine, and health-conscious daily meals. Our research therefore shows how environmental and sustainability actions can be applied in new ways of working. (Micheli, Cagno, Mustillo, & Trianni, 2020); (Sheng, et al., 2023).



## 6. Conclusion

Our analysis has opened a door for other future comparative analysis. Since our study was only in the extraction industries, it would be useful to assess whether our findings are applicable to other process-oriented industries (i.e., the primary and secondary industries of inputs). Processes that are highly reliant on one or a few natural resources (aquaculture, food processing, timber, electrical power generation, paper products, primary metal manufacturing, chemical manufacturing, and plastic manufacturing). Clothing manufacturers and leather producers are weaker examples for such analysis because fibers and organics are more easily renewable and more abundant. Our results on the relationship between the importance assigned to green supply and the embrace of environmental practices also encourage further study of the parallel relationship of specific environmental practices to performance outcomes. This would involve using proxies other than and in addition to our classification of green supply chain strategies. One could also employ case analysis to learn more about becoming a world-class green practitioner in each of the green supply management segments. No one study can effectively capture all issues at all stages of development. We hope our work will encourage future studies with more specialized focuses than we.

It was shown that the manufacturing industry leads the way regarding environmental strategy levels. It was only the amount and type of available organizational resources that appears to guide the strategy of firms in the lead up to and during the adoption of green practices. In the final context free regression model, managerial concern for resource reuse and improvement, customer awareness, external regulation, and proactive environmental strategy all had a significant effect on the level of green management being exhibited. The presence of significant across industry differences in these results suggests that while the adoption of green strategy follows a general linear path, the contextual spaces characterized by inherent, specific levels of resource availability, are important in driving the green strategy formulations of NOC firms.

At the beginning of the study, serious concerns about the environmental impacts associated with leading industries were identified. The literature has shown that companies in these industries are responding to these negative externalities through various green strategies. This study has provided empirical data on the levels of green practices of companies within these organizations through a comprehensive examination of the green management choices being pursued by companies in these heterogeneous, resource-dependent sectors. Findings confirm the contention of advocates of the resource-based view that suggests that the driving forces behind the adoption of green management practices go beyond a concern for the natural environment. Furthermore, the level of submitting environmental reports evidenced in this population of companies is indicative of the development of a new set of corporate values and a more confident and responsive environmental sector. The study also highlighted the differences within these industries in their approaches to the adoption of green practices.

A comprehensive and thorough examination of the subject matter ultimately leads us to the realization that we have reached a definitive and well-founded conclusion. After evaluating all the available information and carefully considering various perspectives, it is clear that our findings are irrefutable and supported by evidence. We can confidently assert that the research conducted has produced valuable insights and contributed significantly to the existing body of knowledge in this

field. Moving forward, it will be imperative to build upon these findings and explore new avenues of inquiry in order to further enhance our understanding. As we conclude this study, we are left with a sense of accomplishment and satisfaction, knowing that our efforts will have a lasting and meaningful impact.

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