

Article

Navigating Sustainable Supply Chain Management in the Perfume Industry: Challenges and Solutions

Reham Alhindawi ^{1,*} , Yousef Abu Nahleh ²  and Arun Kumar ³

¹ Mechanical and Industrial Engineering Department, College of Engineering, Abu Dhabi University, Abu Dhabi 59911, United Arab Emirates

² Industrial Engineering Technology, Higher Colleges of Technology, University City, Sharjah 7947, United Arab Emirates; yabunahleh@hct.ac.ae

³ School of Engineering, RMIT University, Melbourne, VIC 3000, Australia; arun.kumar2@rmit.edu.au

* Correspondence: reham.alhindawi@adu.ac.ae

Abstract: The perfume industry faces significant challenges in integrating sustainable supply chain management (SSCM) practices due to its fragmentation and the need for coordination among diverse stakeholders. This study explores these challenges and identifies potential solutions through a comprehensive literature review, a case study, and interviews with industry professionals. Findings highlight the complexity of SSCM, emphasizing the integration of environmental, social, and economic considerations. Key challenges include high implementation costs, lack of stakeholder awareness, and inadequate regulatory frameworks. Economically, the primary issue is balancing SSCM investments with short-term benefits. Socially, effective communication between stakeholders is critical, while environmentally, reducing carbon footprints and waste, particularly in transportation, is essential. The research underscores the need for a long-term vision and collaboration to successfully implement SSCM practices in the perfume industry.

Keywords: sustainable supply chain management; perfume industry; stakeholder collaboration; environmental impact; economic challenges



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1. Introduction

The perfume industry, with its intricate global operations and extensive network of stakeholders, faces increasing pressure to implement sustainable supply chain management (SSCM) techniques. The industry's reliance on natural resources, such as rare botanicals, essential oils, and other organic compounds, makes it particularly sensitive to issues of resource depletion and biodiversity loss. Additionally, many perfume companies operate across diverse regions with varying regulatory standards, adding complexity to maintaining sustainable practices [1]. Characterized by extreme fragmentation, this industry consists of numerous small and medium-sized enterprises spread across the world. This fragmentation presents significant challenges to the smooth integration of SSCM, making the path to sustainability both complex and multifaceted [2]. Implementing SSCM in the perfume industry is significant due to several reasons.

SSCM promotes responsible sourcing of natural ingredients, helping to preserve biodiversity and reduce ecological degradation. By adopting sustainable procurement practices and ensuring traceability of ingredients, perfume companies can minimize their environmental footprint and contribute to global conservation efforts [3]. The shift toward environmentally friendly practices, such as eco-design, waste reduction, and efficient

resource utilization, aligns the industry with broader goals of reducing greenhouse gas emissions and mitigating climate change impacts [4].

In addition, with consumers increasingly prioritizing sustainability, SSCM offers a pathway for companies to build trust and enhance their brand image. Customers are becoming more conscious of the ethical and environmental practices behind the products they purchase, and a sustainable supply chain can differentiate brands in a competitive market. Companies that emphasize SSCM can attract eco-conscious consumers and improve loyalty by aligning with their values, thus strengthening their market position. Moreover, sustainable practices in supply chain management can lead to long-term cost savings through waste reduction, energy efficiency, and optimized logistics. By reducing reliance on non-renewable resources and increasing supply chain resilience, perfume companies can also mitigate risks associated with supply shortages, price volatility, and regulatory changes. Additionally, SSCM enhances operational resilience by diversifying supply sources, improving supplier relationships, and adopting circular economy principles, which collectively reduce vulnerability to disruptions.

Furthermore, SSCM also helps perfume companies navigate increasingly stringent environmental regulations, such as those related to chemical use, waste management, and carbon emissions. By proactively adopting sustainable practices, companies not only ensure compliance with current laws but also position themselves to adapt to future regulatory developments. This compliance minimizes the risk of legal penalties and enhances the company's reputation among stakeholders, including investors and regulatory bodies.

Additionally, SSCM allows the perfume industry to address social issues in the supply chain, such as fair labor practices, community engagement, and the well-being of smallholder farmers and suppliers. Ethical sourcing initiatives ensure that local communities benefit from perfume-related agricultural activities, fostering social development and supporting sustainable livelihoods. Thus, SSCM is not only essential for minimizing environmental and social impacts but also represents a strategic advantage for perfume companies in a rapidly evolving market [5].

Recognizing the complexity of SSCM is essential to fully understanding the challenges that the perfume industry faces in its pursuit of sustainable supply chain practices. SSCM involves integrating social, economic, and environmental factors into the supply chain management process. This paper conducts a comprehensive literature review to explore how SSCM is applied within the perfume industry and other sectors. Additionally, case studies of businesses that have successfully navigated the challenges of SSCM integration provide valuable insights into effective strategies and practices.

The motivation for this study is the growing importance of sustainable business practices in our global environment. Acknowledging the difficulties inherent in implementing SSCM within the perfume industry is crucial for identifying solutions and opportunities that promote a more sustainable future. This research seeks to uncover the challenges of adopting SSCM and to gain practical and significant insights that will influence the industry's journey toward sustainability.

This study aims to explore and document the challenges and opportunities in implementing SSCM in the perfume industry. The objectives are as follows:

1. Analyze the economic, social, and environmental complexities of SSCM within the perfume supply chain;
2. Identify industry-specific barriers and enabling factors for SSCM adoption;
3. Offer insights into effective SSCM practices that can enhance industry-wide sustainability.

The existing literature provides a foundational understanding of SSCM principles across industries; however, there is limited insight into the practical application of SSCM within the perfume industry. Despite the rising global demand for sustainable practices,

the specific regulatory, economic, and operational barriers faced by perfume companies remain underexplored. Moreover, the lack of a tailored approach to SSCM for the perfume sector limits the ability of businesses to effectively address and adapt to unique challenges, such as regulatory shifts and consumer demands for sustainability.

To address this gap, this study investigates the following research questions:

1. What are the primary social challenges encountered by perfume companies in their supply chains?
2. How do these companies balance economic viability with sustainable practices?
3. What environmental obstacles and innovations shape the perfume industry's approach to SSCM?
4. What practices and strategies enable effective SSCM implementation in perfume businesses?

By addressing these questions, this study aims to provide a holistic understanding of SSCM challenges and solutions within the perfume industry, contributing valuable insights to both academic and industry professionals.

This study employs a multimodal approach, combining an in-depth literature review with a case study based on interviews with industry professionals. By integrating theoretical knowledge with real-world examples, this research aims to develop a thorough understanding of the opportunities and challenges associated with applying SSCM principles in the perfume industry.

The research primarily focuses on the European and North American regions, where sustainability concerns are particularly pronounced. This focus allows for a detailed investigation of specific issues and potential solutions within these contexts. However, the study also acknowledges the global nature of the perfume industry and the variability in sustainable practices due to consumer behavior, regulatory frameworks, and cultural differences. By examining different regions and the varying sustainability challenges and practices in these areas, the research can offer a broader understanding of how SSCM is applied across the world. Here are some suggestions for incorporating a global geographic approach: examining regional variations in sustainability practices, cross-cultural differences in consumer expectations, global supply chain networks and sustainability, and case studies from multiple regions. Moreover, this research aims to make significant contributions to both industry practices and academic knowledge. By analyzing the complexities of SSCM implementation in the perfume industry, it seeks to enhance the theoretical understanding of sustainable supply chain practices. Industry managers can benefit from the practical implications of insights gained from real-world interviews, which provide valuable tools to help address the challenges of SSCM implementation.

The following sections of this manuscript will first present a comprehensive literature review. Next, the research methodology employed will be outlined. Subsequently, an in-depth description of the results and findings from the data collection will be provided. Finally, the study will explore the implications for industry managers, policymakers, and regulators, concluding with a summary of the key findings and their implications.

2. Literature Review

2.1. Sustainable Supply Chain Management (SSCM)

SSCM represents a critical paradigm shift in supply chain practices, acknowledging the imperative of addressing present needs without compromising the ability of future generations to meet their requirements [6]. This approach integrates sustainability principles into core business functions within the supply chain management domain, encompassing procurement, logistics, and knowledge management, leading to the creation of a multidisciplinary field: SSCM [7].

Ref. [8] provide a representative definition of corporate sustainability, emphasizing the capacity to meet the needs of a firm's direct and indirect stakeholders without jeopardizing the ability to meet the needs of future stakeholders. Furthermore, SSCM emphasizes integrating environmental considerations into supply chain management, extending from initial conception to responsible disposal. This holistic approach is indispensable for achieving a harmonious balance among social, environmental, and economic operations, effectively aligning the interests of society, the economy, and the environment [9].

The importance of SSCM is underscored by its capacity to enable organizations to achieve sustainable development by incorporating environmental, social, and economic factors into their supply chain management practices. By adopting SSCM practices, companies can reduce their environmental impact, improve social conditions, and enhance financial performance. SSCM creates value for stakeholders, including customers, suppliers, employees, and the community, while improving the company's competitiveness and long-term viability [10].

Ref. [9] conducted research confirming the positive effect SSCM has on environmental efficiency. This is evidenced by SSCM practices that reduce carbon emissions, energy consumption, and waste generation while positively affecting social performance by improving employee welfare, community development, and stakeholder engagement [11].

The increasing complexity and dynamicity of global supply chains and the rapid pace of technological change present severe threats to contemporary SCM. This requires organizations to focus on developing competitive advantage (CA) and customer relationship management (CRM) to improve their organizational performance (OP) [10]. SSCM can improve them.

The adoption of SSCM is driven by a confluence of factors, with a strong emphasis on economic and environmental imperatives. The adoption of SSCM, in conjunction with green innovation methods, is said to augment productivity and profitability in everyday activities. These practices, characterized by their environmental friendliness, can enhance a company's energy and material consumption, foster stakeholder engagement, influence pricing strategies, and elevate product quality, with far-reaching implications for overall business viability [9].

Economic benefits arising from SSCM practices manifest in two pivotal categories. Firstly, they result in significant cost savings, encompassing reduced health and safety costs, mitigation-related cost reductions, and enhanced operational efficiencies. Secondly, they contribute to revenue increases by cultivating an improved brand image and attaining competitive advantages by virtue of a responsible corporate identity [7]. This economic enhancement is further affirmed by the positive relationship between SSCM and competitive advantage, as elucidated in a study by [10].

However, the motivations for companies to adopt SSCM are not confined to internal factors. Stakeholder pressures, both internal and external, exert a substantial influence on companies. Stakeholders, from customers and shareholders to government entities, employees, non-governmental organizations (NGOs), and the broader community play a pivotal role in driving companies toward SSCM adoption. Institutional pressures, as recognized in the study by [7], hold the most extraordinary influence value, emphasizing the significant role of external pressures in shaping SSCM practices.

In the realm of perfumery, the creation of natural fragrances involves sourcing a diverse array of resources from various parts of the world, including forests, plants, animals, and resins, leading to a global network of suppliers. This intricate web, each linked to its own industry, adds to the inherent complexity of the perfume supply chain [12]. The availability of these natural ingredients is often limited by factors such as finite resources

and environmental conditions, demonstrated by the scarcity of whale-derived Amber and the impact of weather on rose plants in India [13,14].

To address these challenges, many companies and perfume brands turn to synthetic compounds produced by specialized scent manufacturers like Givaudan and Firmenich, though some natural ingredients are still utilized. The quality of raw materials remains crucial in the fragrance market, necessitating strict adherence to safety regulations and standards. Certain ingredients lack viable substitutes, increasing the influence of suppliers, especially regarding essential fragrance components. Moreover, suppliers of raw materials generally operate on a smaller scale compared to large manufacturers, resulting in asymmetric bargaining power. However, this imbalance is mitigated by the diverse revenue streams of chemical producers, reducing their dependence on fragrance product manufacturers [14,15]. Furthermore, manufacturing approaches differ among brands. Some, such as Coty Inc., manage the entire production process internally with laboratories and skilled perfumers. Others, such as Estée Lauder, collaborate with external companies for manufacturing to ensure that the scent aligns with the brand's guidelines.

Global brands like L'Oréal and Puig utilize extensive logistics networks during distribution. Mainstream perfumes are often distributed through brands such as Sephora and Marionnaud, whereas luxury and artisanal perfumes are selectively distributed through dedicated brand stores, as seen with Hermès and Le Labo. This multifaceted approach to production and distribution reflects the diverse nature of the perfume supply chain [14].

Thus, SSCM emerges as an imperative response to multifaceted pressures, including economic, environmental, and stakeholder considerations, and is poised to drive sustainable and responsible supply chain management practices in the modern business landscape.

2.2. Sustainable Techniques and Practices

2.2.1. Triple Bottom Line Approach

In pursuing long-term success, businesses are confronted with the challenge of finding a sustainable equilibrium among their social, environmental, and economic operations. The intricate interplay of these factors makes achieving such a balance a complex challenge. Researchers have recognized that one approach with the potential to harmonize societal, economic, and environmental advantages is SSCM [9].

However, in response to this pressing need for a holistic and integrated framework, researchers have introduced the Triple Bottom Line (TBL) concept. Ref. [16] define TBL as a framework that assesses the performance of any practice or concept related to the supply chain by considering economic, environmental, and social factors. The TBL framework is a valuable tool across industries, ensuring that financial considerations are intricately balanced with environmental and social considerations [17].

The TBL approach is instrumental in promoting sustainability by fostering a harmonious coexistence of economic, environmental, and social dimensions. Doing so underlines the interconnectedness of these dimensions and the necessity of considering them collectively for a more comprehensive evaluation of supply chain practices. In this light, TBL contributes to building sustainable resilience, denoting a supply chain's ability to withstand and recover from disruptions. By incorporating social, environmental, and economic factors into supply chain decision-making processes, companies can effectively identify and mitigate risks associated with various supply chain activities [18].

For instance, by assessing the environmental impact of supply chain activities, organizations can proactively identify and mitigate risks linked to climate change, including challenges posed by extreme weather events and resource scarcity. This proactive approach aligns with the broader objectives of SSCM, emphasizing the importance of integrating sustainability principles into supply chain practices.

It is essential to acknowledge that while the TBL framework is a robust tool for assessing sustainability, it may not comprehensively cover the entirety of the sustainability concept. Consequently, it can be complemented by other tools and approaches, such as Circular Economy, Life Cycle Analysis, Reverse Supply Chain, and Green Logistics [17]. These complementary approaches further enhance the comprehensive sustainability efforts in supply chain management, ensuring that economic, environmental, and social dimensions are considered in their entirety to drive sustainable and responsible practices.

2.2.2. Circular Economy Approach and Eco-Design

The circular economy (CE) stands as an economic paradigm with the explicit goal of minimizing waste and optimizing resource utilization, guided by principles that advocate for waste and pollution elimination, product and material longevity, and the regeneration of natural systems [19]. This innovative approach directly addresses the environmental consequences of disposable items, playing a crucial role in mitigating methane emissions and contributing significantly to reducing global warming [9].

In human activities, particularly those associated with the environmental impact of waste, the circular economy emerges as a comprehensive solution, effectively combating issues such as greenhouse gas emissions, deforestation, and water pollution [9]. Ref. [19] highlight the pivotal role of CE in reducing the overall environmental impact of these activities.

A fundamental aspect of the circular economy is the strategic design of products to prioritize reusability, repairability, and recyclability, coupled with meticulous waste minimization strategies. Recognizing the environmental implications of disposable waste, CE strongly emphasizes eco-design, as defined by [20]. According to their definition, eco-design is an intentional process that considers environmental factors throughout a product's life cycle, from raw material extraction to disposal. This approach ensures the creation of durable products that are easily repairable, crafted from sustainable materials, and designed with an overarching commitment to reducing environmental impact [19].

2.2.3. Life Cycle Analysis

Life Cycle Analysis (LCA) emerges as a pivotal tool within the realm of SSCM, offering a comprehensive method for evaluating the environmental impacts of products, processes, or services throughout their entire life cycle [17]. This tool considers all stages, from production to use and disposal, and encompasses a broad spectrum of environmental factors, including greenhouse gas emissions, water use, and resource depletion. LCA, therefore, provides a holistic perspective that is instrumental in identifying opportunities to mitigate negative impacts and enhance sustainability [21].

One of the critical strengths of LCA lies in its recognition and adherence to internationally established standards and protocols. Notably, ISO 14040 [22] outlines the principles and framework for conducting LCA, ensuring a consistent and robust methodology accepted worldwide. PAS2050 [23], a British Standard, explicitly addresses the assessment of the carbon footprint of goods and services, offering guidelines for conducting LCA and measuring and reporting greenhouse gas emissions [24]. This standardization enhances the reliability and comparability of LCA results, making it an integral tool for both industry and academic research.

The significance of LCA is further underscored by its ability to inform decision-making and strategy development within businesses. By scrutinizing the life cycle stages, organizations can pinpoint areas where improvements are feasible and sustainable. LCA is, therefore, not merely a tool for environmental impact assessment but also a powerful instrument for shaping product design, material selection, waste management, and communication of environmental performance to stakeholders [21].

To sum up, LCA is an indispensable asset in SSCM, offering a rigorous, standardized, and holistic approach to assess and enhance the environmental sustainability of products, processes, and services. Its capacity to identify areas for improvement and inform strategic decision-making aligns with the broader objective of creating more sustainable and responsible supply chain practices.

2.2.4. Reverse Supply Chain

Reverse Supply Chain (RSC) represents a critical component of SSCM, encompassing a process wherein products flow from end-users back to sellers or manufacturers [25]. This process is instrumental in managing returned goods, repurposing obsolete items, and facilitating the recycling or disposal of products, thereby significantly contributing to sustainability objectives. RSC's significance lies in its ability to minimize environmental impact and waste, aligning closely with the principles of the circular economy.

RSC offers substantial opportunities for organizations to reduce costs, enhance customer satisfaction, and gain a competitive advantage by embracing environmentally conscious practices [25]. These practices can range from efficient handling of returned goods to innovative methods for repurposing obsolete items. Furthermore, implementing RSC ensures compliance with regulations related to waste management and environmental sustainability, positioning companies as responsible entities committed to sustainable practices.

2.2.5. Green Logistics

Green logistics (GL) focuses on optimizing the transportation and storage aspects of supply chains to reduce environmental impact [26]. Green logistics practices involve efficient transportation planning, route optimization, energy-efficient warehousing, and adopting eco-friendly technologies. By reducing carbon emissions, minimizing energy consumption, and promoting sustainable practices, GL contributes to SSCM.

2.3. SSCM Implementation in the Real World

2.3.1. Best Practices and Case Studies from Various Industries

Best practices in SSCM across different industries demonstrate the adaptability and effectiveness of sustainable techniques. For instance, the automotive industry has embraced eco-design and LCA to develop environmentally friendly vehicles [27]. The electronics industry, on the other hand, has focused on reverse supply chain practices to manage electronic waste and promote recycling [28]. Furthermore, SSCM involves the selection of reliable third-party logistics (3PL) providers, particularly in industries like perfumery, where supply chains often span multiple regions and involve complex logistics. Existing research highlights the significance of selecting 3PL providers who align with both the sustainability goals and risk tolerance of the supply chain network. However, conventional 3PL selection models may inadequately address the inherent risks and uncertainties in global supply chains [29]. The study by [29] introduces a two-stage auction mechanism for 3PL supplier selection that accounts for risk aversion among supply chain partners.

2.3.2. Challenges Faced by Companies and How They Overcome Them

Implementing SSCM can be challenging for companies due to factors such as high initial costs, lack of expertise, and resistance to change [30]. Companies often overcome these challenges by investing in employee training, collaborating with stakeholders, and leveraging technological advancements [31]. Additionally, regulatory support and incentives play a crucial role in encouraging SSCM adoption.

The regulatory framework governing the perfume industry is complex and multi-faceted, addressing various aspects such as product safety, environmental impact, fair trade, and ethical considerations. Regulations vary across regions and are influenced

by international standards. Below is an overview of the key elements of the regulatory framework in the perfume industry:

Product Safety Regulations: Perfumes are categorized as cosmetic products in most regions, and their safety is a top priority to protect consumers. Cosmetics Regulation (EC) No. 1223/2009 sets safety requirements for cosmetic products, including perfumes. It mandates ingredient listing, safety assessments, and prohibits harmful substances. Moreover, the Scientific Committee on Consumer Safety (SCCS) evaluates the safety of certain fragrance ingredients and provides recommendations. Regulated by the Food and Drug Administration (FDA) under the Federal Food, Drug, and Cosmetic Act (FD & C Act of USA), perfumes do not require pre-market approval; ingredients must be safe for intended use. The Fair Packaging and Labeling Act (FPLA) requires accurate labelling of ingredients. In Japan, perfumes are regulated under the Pharmaceutical and Medical Device Act (PMD Act), ensuring safety and efficacy. In China, perfumes fall under the regulation of the National Medical Products Administration (NMPA) and must comply with stringent safety and labelling requirements.

Environmental Regulations: The perfume industry is subject to regulations aimed at reducing environmental impact through sustainable sourcing, production, and waste management. Many perfumes contain VOCs that contribute to air pollution. In the EU and the US, limits are placed on VOC content in products. Regulations like the EU's Waste Framework Directive promote recycling and the reduction of packaging waste. Companies are encouraged to use recyclable or biodegradable materials. Increasing focus on reducing carbon emissions and sourcing sustainable ingredients, driven by frameworks like the Paris Agreement and the EU Green Deal.

Ethical and Social Compliance: Sustainability and ethical considerations are becoming key components of the regulatory framework. Companies sourcing raw materials (e.g., essential oils, flowers) must ensure compliance with fair trade and labor standards. Many companies align their practices with the United Nations SDGs, particularly goals related to responsible consumption and production (Goal 12).

International Standards and Guidelines: International organizations play a significant role in setting standards for the perfume industry. The International Fragrance Association (IFRA) sets global standards for the safe use of fragrance ingredients. The IFRA Code of Practice is widely adopted by companies to ensure compliance with safety and environmental standards. Moreover, the World Trade Organization (WTO) regulates international trade, including perfumes, ensuring fair practices under agreements like the Technical Barriers to Trade (TBT) Agreement.

Regional Regulations and Specific Initiatives: The European Union (EU) emphasizes green chemistry, eco-labelling, and sustainable sourcing. The EU's Ecolabel Regulation encourages environmentally friendly products. In the USA, individual states, such as California, have stricter environmental and safety laws. The California Air Resources Board (CARB) sets limits on VOC emissions from consumer products, including perfumes. In India, The Bureau of Indian Standards (BIS) regulates cosmetics, including perfumes, focusing on quality and safety.

Emerging Trends in Regulation: Increasingly, companies are required or encouraged to report on their environmental and social impact. This is particularly relevant in the EU with the Corporate Sustainability Reporting Directive (CSRD). The use of certain synthetic ingredients and animal-derived materials (e.g., musk) is being restricted or banned in some regions due to environmental and ethical concerns. Furthermore, companies are being encouraged to achieve carbon neutrality, in line with global climate agreements.

The regulatory framework in the perfume industry is evolving rapidly to address safety, sustainability, and ethical challenges. Adhering to these regulations not only en-

sure compliance but also helps companies build trust with consumers and stakeholders. By aligning with international standards and proactively addressing regulatory trends, perfume companies can remain competitive while contributing to environmental and social well-being.

2.3.3. Revenue Distribution and Fairness in Sustainable Supply Chains

An emerging area of research in SSCM highlights the importance of fairness in revenue distribution within supply chain partnerships. Traditional models in supply chain revenue distribution often overlook the preferences for fairness among stakeholders, which can lead to imbalances and inefficiencies that ultimately weaken the supply chain's resilience and sustainability [32]. The study by [32] introduces an improved revenue distribution model for logistics service supply chains that considers fairness preferences among partners. This model is relevant for industries like perfumery, where supply chains are fragmented and often involve partnerships with small- and medium-sized enterprises that may lack bargaining power. By applying a fairness preference model, companies can foster more equitable partnerships, improve trust among stakeholders, and support long-term sustainability.

Integrating fairness into revenue distribution aligns with SSCM's broader goals of economic and social sustainability by ensuring all supply chain participants, including suppliers of raw materials and logistics providers, receive a fair share of profits. This approach may reduce conflicts and turnover among supply chain partners, contributing to a more stable and resilient supply chain structure, which is particularly important for the perfume industry's complex and multi-tiered supply chains.

2.4. Comparative Examination of SSCM: Perfume vs. Fashion and Cosmetics Industries

Sustainable Supply Chain Management (SSCM) in the perfume industry shares similarities with other sectors like fashion and cosmetics but also faces distinct challenges and opportunities. Drawing lessons from these industries can help adapt best practices for perfumes. There are shared challenges across sectors such as perfume, fashion and cosmetics.

Fashion and cosmetics industries have embraced certification schemes (e.g., Fair Trade, RSPO for palm oil), which could be replicated in perfume ingredient sourcing to ensure sustainability. Moreover, fashion's circular economy models (e.g., recycling programs by brands like Patagonia) and cosmetics' refillable packaging systems could inspire perfume companies to innovate in waste reduction and sustainable packaging.

Distinct Approaches to SSCM: Many brands, such as Lush, provide complete ingredient transparency and certifications. Fashion products require QR codes for product traceability (e.g., Everlane). Perfume often relies on proprietary blends and trade secrets. Additionally, the perfume industry can adopt digital transparency tools (blockchain for ingredient traceability) without disclosing proprietary formulations. The perfume industry engages with smallholder farmers in developing regions for sourcing. Fashion requires collaborations with artisans to preserve traditional crafts. Cosmetics require CSR initiatives targeting women's empowerment and local education. Perfume brands can replicate cosmetics' CSR-focused empowerment programs to enhance their social impact.

Sustainable Innovation: Cosmetics uses biotech innovations (e.g., lab-grown hyaluronic acid). In the case of perfume, there is a potential for bioengineered fragrance molecules to replace rare or environmentally harmful ingredients like ambergris. Cosmetics' adoption of biotech offers a roadmap for the perfume industry to explore sustainable synthetic alternatives.

Thrift stores and rental models reduce waste in fashion, whereas cosmetics require compact, biodegradable packaging (e.g., brands like Fenty Skin). Emerging refillable systems are popular in perfume, such as refill stations in stores. Perfume brands can scale the refillable packaging model, drawing inspiration from cosmetics' minimalistic designs.

The fashion and cosmetics industries offer a rich source of best practices for SSCM. By integrating these insights—such as leveraging biotechnology, adopting circular economy principles, and enhancing transparency—the perfume industry can address its unique challenges while achieving significant sustainability advancements.

2.5. *Emerging Trends in SSCM*

2.5.1. Technological Advancements and Their Impact on SSCM

Technological innovations are revolutionizing sustainability in the perfume supply chain, particularly through green chemistry and advanced practices. Green chemistry focuses on designing formulations that reduce environmental impact by using renewable raw materials, biodegradable ingredients, and eliminating hazardous chemicals. For example, biotechnology enables the creation of sustainable synthetic ingredients like lab-grown musk, reducing reliance on animal-derived or environmentally damaging sources.

Technological advancements, such as blockchain, the Internet of Things (IoT), and artificial intelligence (AI), are revolutionizing SSCM. These technologies enable better supply chain transparency, enhance traceability, and improve decision-making [33]. Blockchain, for instance, can ensure the authenticity and sustainability of products by providing a secure and transparent record of transactions [34]. IoT and AI facilitate real-time monitoring and optimization of supply chain operations, leading to increased efficiency and reduced environmental impact [35].

These technologies not only mitigate environmental impact but also align with consumer demand for sustainability, strengthening brand loyalty and regulatory compliance. By leveraging these advancements, the perfume industry is progressing toward a greener, more ethical future.

2.5.2. Future Directions for SSCM Research

Future research in SSCM should focus on exploring the potential of emerging technologies, developing new sustainable business models, and addressing the social dimensions of sustainability [36]. Additionally, research should investigate the role of collaboration and stakeholder engagement in achieving SSCM goals [31]. By addressing these areas, SSCM research can contribute to developing more sustainable and resilient supply chains.

In summary, SSCM is crucial in addressing the environmental, social, and economic challenges of modern supply chains. By adopting sustainable techniques such as the Triple Bottom Line approach, circular economy principles, Life Cycle Analysis, reverse supply chain practices, and green logistics, companies can achieve long-term sustainability and create value for stakeholders. The real-world implementation of SSCM showcases best practices and highlights the challenges companies face and the strategies they employ to overcome them. Technological advancements are poised to transform SSCM, and future research should focus on exploring these innovations and developing sustainable business models.

2.6. *Limitations of Existing Studies*

Based on common themes in SSCM research and this study, here is an analysis of the limitations of existing studies and how they highlight the relevance and innovation of this paper:

Lack of Industry-Specific Research: Many SSCM studies focus on broader industries such as manufacturing, retail, or food but lack detailed insights into niche sectors such as perfumery. This generalization limits understanding of how unique supply chain structures and materials (e.g., essential oils, rare botanicals) impact SSCM. By focusing specifically on the perfume industry, this paper addresses a significant gap, offering tailored solutions and practices that consider the industry's unique environmental and ethical challenges.

Insufficient Focus on Practical Implementation: Existing research often emphasizes theoretical frameworks or high-level strategies for SSCM without exploring the real-world challenges companies face in implementing these practices. For instance, factors such as supplier variability, cost implications, and regulatory constraints are frequently underexplored. This paper provides a practical perspective on SSCM by using case studies and interviews with industry professionals, capturing the operational and logistical challenges, and supporting the development of actionable strategies.

Limited Attention to Supply Chain Fragmentation: Perfume industry supply chains are highly fragmented, with multiple small and medium-sized suppliers across regions, often creating coordination and compliance challenges. Traditional SSCM models may not fully address this complexity, which can hinder efforts to integrate sustainability. The innovation of this paper lies in addressing this fragmentation directly, offering insights and frameworks designed to improve collaboration, traceability, and resource management in a dispersed supply network.

Focus on Single Sustainability Dimensions: Numerous studies on SSCM emphasize environmental factors (e.g., carbon footprint reduction) but give less attention to the social and economic dimensions, such as fair-trade practices or financial feasibility for smaller suppliers. By adopting a triple-bottom-line approach, this paper contributes to a more comprehensive SSCM framework that balances environmental, economic, and social objectives, aligning with the perfume industry's ethical considerations and consumer demands.

Lack of Region-Specific Solutions: SSCM research often provides global recommendations without accounting for region-specific regulations, market demands, or resources, limiting the applicability of these solutions in specific contexts. Given the perfume industry's strong presence in regions like Europe and North America, this study innovates by focusing on these areas, incorporating region-specific insights into SSCM practices, and enhancing the practical relevance for companies operating in these markets.

In summary, this paper innovates by addressing the limitations in the existing SSCM literature, offering industry-specific, practical, and multi-dimensional solutions tailored for the perfume industry. This contribution fills critical gaps, providing insights and frameworks that can lead to more effective and sustainable supply chain practices within this unique industry.

3. Research Methods

This section outlines the research methods employed to examine the integration of sustainability in supply chain management, including the techniques used, challenges faced, and future directions. The research approach was designed to ensure comprehensive data collection, analysis, and interpretation.

3.1. Research Questions

The research questions are designed to explore the challenges of implementing sustainable supply chain management (SSCM) in the perfume industry, focusing on social, economic, and environmental dimensions.

1. Social Dimension

RQ1: What are the social challenges encountered by companies in sustainable supply chain management within the perfume industry?

Hypothesis 1. *Perfume companies encounter significant social challenges in sustainable supply chain management, primarily due to the lack of transparency in supplier operations and difficulties in ensuring fair labor practices across the supply chain.*

RQ2: How do companies address social challenges, and what initiatives have they undertaken to engage with stakeholders along the supply chain?

Hypothesis 2. *Companies address social challenges in sustainable supply chain management by implementing ethical sourcing initiatives and stakeholder engagement programs, which enhance transparency, promote fair labor practices, and support the well-being of local communities along the supply chain.*

2. Economic Dimension

RQ3: What economic viability challenges do companies face in maintaining profitability while adopting sustainable supply chain practices in the perfume industry?

Hypothesis 3. *Perfume companies face economic viability challenges in maintaining profitability while adopting sustainable supply chain practices due to high implementation costs, limited access to sustainable raw materials, and price sensitivity in consumer markets.*

RQ4: What strategies have companies employed to sustain economic performance while implementing sustainable principles in their supply chains?

Hypothesis 4. *Companies sustain economic performance while implementing sustainable principles in their supply chains by adopting cost-efficient technologies, optimizing resource utilization, and leveraging green marketing strategies.*

3. Environmental Dimension

RQ5: What specific environmental sustainability challenges do companies face in their supply chains within the perfume industry?

Hypothesis 5. *Companies in the perfume industry face significant environmental sustainability challenges in their supply chains, including the depletion of natural resources for raw materials, high carbon emissions, and the generation of chemical waste in production processes.*

RQ6: What sustainable practices and innovations have companies implemented to mitigate environmental impacts in their supply chains?

Hypothesis 6. *Companies in the perfume industry mitigate environmental impacts in their supply chains by implementing sustainable practices and innovations.*

3.2. Research Methodology and Design

This thesis adopts a qualitative research methodology to explore the challenges and opportunities in implementing SSCM within the perfume industry. Given the complexity and nuance of SSCM, a qualitative approach allows for in-depth insights into the experiences, perspectives, and practices of industry professionals, providing a comprehensive understanding of the social, economic, and environmental dimensions of SSCM.

The study follows an exploratory and descriptive design to map the intricate dynamics of SSCM in the perfume industry. This approach facilitates an in-depth investigation of current SSCM practices, challenges, and drivers within the industry. By focusing on descriptive insights from real-world examples, the study aims to bridge the gap between theory and practice, especially relevant in industries with limited SSCM research like perfumery. Research methodology overview is represented in a flowchart format with three main stages and relevant subprocesses as displayed in Figure 1. Each main stage is connected by arrows, with subprocesses shown as branching out from the relevant stages.

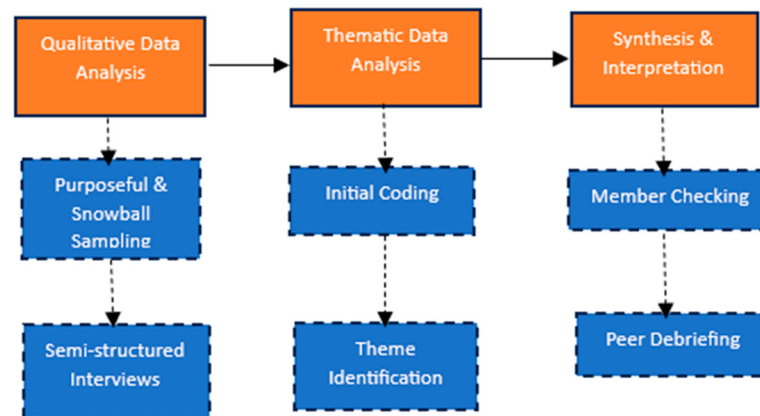


Figure 1. Research methodology overview.

Through interviews with professionals in the industry, this study aims to gain valuable insights into the current challenges and potential solutions. This study employs an inductive research design, drawing conclusions from the qualitative data collected from interviews. While it begins with hypotheses based on the existing literature, the study aims to develop broader generalizations based on the insights gathered from industry professionals.

3.2.1. Data Collection Method

Primary data was collected through structured interviews with professionals working in supply chain management, sustainability, and related roles in the perfume industry. These interviews were designed to capture diverse perspectives on sustainable practices, implementation barriers, and strategies for SSCM. The open-ended nature of qualitative interviews enables the researcher to gather nuanced insights, allowing participants to elaborate on their experiences and perceptions in their own words.

Collected interview data were systematically analyzed using qualitative methods to identify key themes, trends, and challenges related to SSCM. Coding and categorization techniques, assisted by software like NVivo 14, helped in organizing data into major themes, allowing the researcher to draw connections between theoretical concepts and practical industry insights. This analysis framework provides a structured interpretation of the complex SSCM dynamics specific to the perfume industry.

3.2.2. Sampling

The study used purposeful sampling to select participants with specific expertise in the perfume industry's supply chain and sustainability practices. The sampling aimed to ensure representation from various segments of the industry, including large corporations and smaller niche brands. Additionally, snowball sampling was incorporated, where initial participants recommended other industry experts, thus expanding the network of interviewees, and enhancing the diversity of perspectives.

4. Data Collection

4.1. Interview Guide

4.1.1. Participant Consent and Introduction

- "May I have your permission to record this interview?"
- "All information discussed will remain confidential."

4.1.2. Introduction Questions

- "What is your current position, and how long have you held it?"
- "How long have you been in this industry?"

4.1.3. In-Depth Questions

Supply Chain Sustainability and its Challenges:

1. How do you define sustainable supply chain management?
2. Can you describe sustainable initiatives your company has implemented?
3. What are your company's critical environmental, economic, or social challenges in sustainability?
4. How do these challenges influence your company's operations?
5. How does your company adapt to these challenges?
6. Can you provide an example of successful sustainable practice?

Challenges and Indicators in Sustainable Supply Chain Management:

7. What are the main barriers hindering the integration of sustainable techniques?
8. Do stakeholders in your company play a role in sustainable practices?
9. How does a sustainable supply chain impact your company's performance?
10. How do you measure or evaluate sustainability in your supply chain?
11. What are the most important sustainability indicators?
12. Do you have any additional comments on this topic?
13. Are there other experts you could recommend for this study?

This structured approach ensured that the study addressed the complexities of sustainable supply chain management in the perfume industry comprehensively, providing valuable insights for industry professionals and researchers alike.

4.2. Surveys

A structured survey was designed and distributed to supply chain professionals across various industries. The survey aimed to collect quantitative data on the adoption of sustainable practices, the challenges encountered, and the perceived benefits. Likert scales, multiple-choice questions, and open-ended questions were included to capture diverse insights.

4.3. Interviews

In-depth interviews were conducted with selected supply chain managers, sustainability officers, and industry experts. These semi-structured interviews provided qualitative insights into the practical aspects of implementing sustainable practices, the challenges faced, and the strategies employed to overcome these challenges. The interviews also explored future trends and innovations in sustainable supply chain management.

4.4. Case Studies

Several case studies of companies that have successfully integrated sustainability into their supply chains were examined. These case studies provided real-world examples of best practices, innovative solutions, and lessons learned. Data for the case studies were obtained from company reports, interviews with company representatives, and secondary sources.

4.5. Data Analysis

The data analysis in this study followed a structured qualitative approach to identify key themes and patterns related to SSCM in the perfume industry. Interviews were conducted with experts from various segments of the perfume supply chain, including supply chain managers, sustainability officers, logistics specialists, and procurement heads. The participants were carefully selected for their experience and deep industry knowledge, ranging from 5 to over 20 years in the field, ensuring a comprehensive understanding of both strategic and operational aspects of SSCM. Experts interviewed included Supply

Chain Managers, Sustainability Officers, Procurement and Purchasing Heads, and Logistics and Operations Specialists.

Supply Chain Managers: With over 10 years of experience, these managers from major fragrance brands offered insights into logistical complexities, supplier coordination, and inventory management challenges within SSCM. Their perspective was invaluable in understanding day-to-day supply chain operations and sustainability constraints.

Sustainability Officers: These professionals, with 8 to 15 years of experience in sustainability and CSR roles, provided expertise on integrating sustainable practices within the supply chain, particularly focusing on ethical sourcing and environmental impact reduction. Their insights shed light on the internal policies and regulatory requirements that drive SSCM in the perfume industry.

Procurement and Purchasing Heads: Typically, with over 15 years of experience, these experts shared perspectives on supplier selection, risk management, and cost considerations, which are critical in balancing sustainability with economic goals. Their insights were particularly relevant in discussing fair revenue distribution and sourcing strategies for rare natural ingredients.

Logistics and Operations Specialists: With backgrounds in both regional and global logistics, these professionals, possessing 5 to 10 years of experience, provided practical knowledge on green logistics, reverse logistics, and packaging innovations. Their input highlighted logistical challenges in managing environmental footprints while ensuring efficient supply chain flow.

Each participant's in-depth understanding of SSCM nuances within their roles contributed to a well-rounded dataset for analysis, facilitating a robust exploration of sustainable practices in the perfume industry.

4.5.1. Qualitative Analysis

Qualitative data from the interviews and open-ended survey responses were analyzed using thematic analysis. This involved coding the data to identify recurring themes, patterns, and insights related to the challenges and strategies in sustainable supply chain management. NVivo 14 software was used to assist in the organization and analysis of qualitative data.

Furthermore, the case studies were analyzed using a comparative approach to identify commonalities and differences in the strategies and outcomes of sustainable supply chain practices. Key success factors, challenges, and innovations were highlighted to provide practical insights and recommendations.

4.5.2. Validity and Reliability

To ensure the validity and reliability of the research, the following measures were taken:

- **Triangulation:** Multiple data sources (surveys, interviews, case studies) were used to cross-verify findings and ensure a comprehensive understanding.
- **Pilot Testing:** The survey instrument was pilot tested with a small group of supply chain professionals to ensure clarity and relevance of the questions.
- **Peer Review:** The research methodology and findings were reviewed by academic peers and industry experts to ensure accuracy and credibility.

Ethical guidelines were strictly adhered to throughout the research process. Informed consent was obtained from all survey and interview participants. Confidentiality and anonymity were maintained to protect the privacy of the participants and the organizations involved.

5. Findings

This section presents the findings from interviews conducted with seasoned supply chain professionals, aimed at understanding the challenges of implementing sustainable supply chain management (SSCM) within the perfume industry. The study explored various dimensions through structured interviews, revealing the complex dynamics that influence sustainable practices in this specialized sector.

5.1. Implementing SSCM

Professionals were asked how they perceive sustainable supply chain management, revealing the mindset and knowledge of supply chain professionals regarding sustainability.

- **Gap Between Theory and Practice:** Interviews highlighted a common challenge in SSCM—the gap between sustainability theory and business practice. One interviewee noted, “Well, unfortunately, even if sustainability is in their values, I think economics come first, unfortunately” (Interviewee 1). This emphasizes how economic factors often overshadow environmental priorities.
- **Circular Economy:** Several interviewees emphasized the importance of promoting a circular economy. For example, one interviewee discussed integrating waste, such as ‘drèches’ (or spent grains) from beer production, back into operations. Another stressed the use of life cycle analyses to understand environmental impacts and support decision-making.
- **Reverse Supply Chain and Returnable Packaging:** A significant strategy mentioned was a reverse supply chain that operates in a closed circuit, emphasizing the reuse of materials and packaging throughout their lifecycle. Interviewees also highlighted future trends towards consignment-based models rather than recycling.
- **Eco-Design:** Experts underscored the role of thoughtful product and packaging design in SSCM. This involves considering environmental factors from the outset, optimizing packaging use, and ensuring recyclability.

Industry experts provided insights into strategies adopted by their companies to integrate sustainability into supply chain practices.

- **Product and Packaging:** Key strategies included returnable packaging, eco-design, and self-service products. Returnable packaging, such as refillable perfume bottles, was highlighted for reducing waste and enhancing sustainability.
- **Economic Viability:** There was emphasis on the economic benefits of sustainability initiatives, such as cost savings from redesigning supply chains and using returnable packaging.
- **Green Logistics**
 - **Commitment to Sustainable Practices:** Interviewees emphasized a commitment to sustainable logistics, with a strategic preference for maritime transport over air transport due to its environmental and cost benefits.
 - **Shift to Rail Freight:** Success in transitioning projects from truck to rail freight was highlighted, showcasing efforts to reduce environmental impact.
 - **Holistic Approach:** Sustainable logistics involves considering geographical factors and economies of scale, as well as optimizing environmental and social impacts.
- **Supplier Selection**
 - **Green Procurement:** Six out of seven interviewees used green procurement methods, focusing on ethical and environmentally friendly suppliers.
 - **Ethical and Environmental Selection:** Suppliers are chosen based on their ethical standards and environmental policies.

- Due Diligence and Compliance: Ensuring suppliers adhere to environmental and social standards.
- Local Sourcing: Preference for local or regional suppliers to minimize environmental impact and transportation costs.
- Setting Requirements: Establishing criteria for selecting durable suppliers balancing economic, environmental, and social performance.
- Energy Management
 - Investments in Renewable Energy: Significant efforts and investments were made in energy-saving technologies and renewable energy sources.
 - Renewable Energy in Facilities: Examples include Procter's transition to renewable energy for the Amiens factory and the use of biogas in manufacturing processes.
 - Economic Benefits: Sustainable energy initiatives also provided substantial cost savings.
- CSR Governance
 - Governance Framework: Implementation of governance frameworks to integrate Corporate Social Responsibility (CSR) into project evaluations.
 - Decision Criteria: Evaluation by management teams includes CSR-related factors using comprehensive models encompassing social and environmental aspects.
- Supply Chain Optimization
 - Efficiency in Transport and Packaging: Emphasis on optimizing trucks and packaging to reduce waste and resource usage.
 - Sales Forecasting: Better sales predictions and supply management help choose slower but less polluting transport modes.

5.2. KPIs and Metrics

- Environmental Metrics:
 - Operational Disconnect: Operational managers showed a lack of focus on sustainability metrics, with challenges in measuring small environmental actions.
 - Proactive Data Collection: Sustainability managers focused on collecting data on carbon emissions and other environmental KPIs.
- Performance Metrics:
 - Service Level and Cost Metrics: Maintaining high service levels and scrutinizing costs were crucial, with cost savings from eco-friendly methods emphasized.
 - Truck Fill Rates: Optimizing truck fill rates to reduce environmental impact and cost.
- Supplier Audits: Regular audits to assess and ensure suppliers' sustainability practices, focusing on climate strategy and renewable energy usage.

5.3. Internal Challenges in SSCM

- Supply Chain Design: The foundational role of design in sustainability, with reverse logistics introducing complexity.
 - Impact on Production Sites: Challenges with sorting and handling returned items, and implications of new sustainable products on production capacity.
 - Human Resources Management: Effective change management is essential for transitioning to new processes, with significant human involvement required.
- Investments in R&D: Substantial investments in research and development are necessary for sustainable supply chains, with long timelines for return on investment.

- Uncertainty of Product Success: Financial risks if sustainable products do not perform well in the market.
- Procter's R&D Success: Procter's strategic investment in R&D led to high-quality, eco-friendly products, demonstrating the importance of R&D in achieving sustainability.

5.4. Economic Challenges

- Dual Benefits: Some participants emphasize that SSCM can simultaneously reduce costs and enhance supply chain efficiency. Optimized and eco-friendly solutions can lead to cost savings and improved overall performance, aligning sustainability with business competitiveness (Interviewee-1).
- Long-term Savings: Investments in sustainable practices, such as reusable packaging, can result in long-term savings despite high initial costs. This highlights the potential for durability and cost amortization over time (Interviewee-6).
- Complexity of Benefits: The interconnected benefits of sustainable practices can be difficult to understand and communicate. Improvements in one area, like recycled content, may not immediately translate to visible economic benefits, necessitating clear communication about co-benefits (Interviewee-4).
- Strategic Investment: The decision to invest in sustainable techniques often involves substantial upfront costs with returns that may not be immediate. However, sustainable choices, like refillable containers, are seen as future competitive advantages (Interviewee-3).

5.4.1. Challenges in Implementation

- Economic Challenges: Six interviewees highlight cost constraints as significant barriers to SSCM. These include the high costs of sustainable materials, techniques, and the transition towards new processes. The economic pressures to source from low-cost countries also pose a challenge (Interviewees-2, 3, 4, 5, 6, 7).
- Social Challenges (Supplier-Oriented):
 - Understanding and Communication: Suppliers often lack comprehensive understanding of sustainability challenges, requiring improved communication and education. Training efforts should target both internal and external stakeholders (Interviewees-4 and 6).
 - Supplier Availability and Influence: Limited availability of suppliers, especially those crucial for sustainable goods, poses a challenge. Existing suppliers can exert significant influence due to their unique offerings (Interviewees-3 and 5).
- Environmental Challenges: Balancing product effectiveness with environmental considerations is difficult. The transition to sustainable practices, like reducing waste, requires careful adjustments to maintain product quality (Interviewees-1 and 3).
- Method Alignment: Aligning methodologies, particularly in assessing the carbon footprint, is crucial. Discrepancies in methodologies can lead to varying results, complicating the process of assessing and comparing sustainability efforts globally (Interviewee-4).

5.4.2. External Challenges

- Customer Behaviours:
 - B2C Operations: Convincing consumers to adopt eco-friendly products is challenging. Consumer habits and preferences often clash with sustainable solutions, and effective marketing and communication are essential for success (Interviewees-1, 3, 6).

- B2B Operations: Adapting to clients' needs, particularly in diverse locations, and overcoming their reluctance to adopt sustainable technologies are significant challenges. A lack of awareness and understanding within organizations further complicates SSCM implementation (Interviewees-2 and 7).
- Unforeseen Events and Resilience: Unforeseen events, like the COVID-19 pandemic and the Suez Canal blockage, highlight the need for adaptability and resilience in SSCM. These events can significantly disrupt supply chains, necessitating quick adaptations that may conflict with sustainability goals (Interviewees-1 and 2).

5.5. Regulatory Framework and Institutional Support

- Certifications and Organizations: Tools like carbon footprint measurements and ISO 14040 certification are vital in SSCM. These provide recognized standards for evaluating environmental impacts, helping companies align their practices with sustainability goals (Interviewees-4 and 5).
- Legal Obligations: Legal mandates play a crucial role in driving collective action towards sustainability. Increased financial accountability for environmental impacts is necessary to ensure companies internalize these costs (Interviewees-6 and 7).
- Government Support: Government intervention through legislation, financial incentives, and subsidies is essential in encouraging sustainable practices. Effective laws create a framework that motivates companies to adopt environmentally friendly practices (Interviewees-1 and 6).

5.6. Collective Responsibility and Collaboration

- Stakeholder Engagement: A consistent theme is the shared responsibility of all stakeholders—customers, suppliers, businesses, and institutions—in fostering sustainability. Collaboration and long-term partnerships are crucial for the successful implementation of sustainable solutions (Interviewees-6 and 7).

The findings are summarized in Table 1.

Table 1. Summarizes the findings on sustainable supply chain in the perfume industry.

Category	Key Findings	Challenges	Strategies/Innovations
Environmental Impact	Sustainable practices help reduce carbon emissions and waste generation.	High carbon emissions from transportation and waste during production.	Adoption of renewable raw materials, energy-efficient production, eco-friendly packaging.
Social Responsibility	Ethical sourcing and fair labor practices improve community well-being.	Ensuring fair wages, safe working conditions, and transparency in global supply chains.	Ethical sourcing initiatives, stakeholder engagement, supplier audits.
Economic Viability	High implementation costs for sustainable practices in supply chains.	Balancing profitability with sustainable practices, managing initial investment costs.	Cost optimization, improved efficiency through technology, green marketing to appeal to eco-conscious consumers.
Regulatory Compliance	Compliance with international environmental regulations is increasingly important.	Navigating complex and evolving environmental laws.	Adoption of international sustainability standards, proactive regulatory adaptation.
Consumer Demand	Growing demand for eco-friendly and socially responsible products in the perfume market.	Price sensitivity among consumers can hinder the adoption of sustainable practices.	Green branding, transparent sustainability reporting, eco-conscious product lines.

In conclusion, SSCM presents both significant opportunities and challenges. The alignment of sustainable practices with cost-effectiveness, clear communication of benefits, strategic investments, and collective responsibility among all stakeholders are vital for overcoming the barriers to successful SSCM implementation.

6. Discussion

The insights gleaned from the interviews significantly enrich our understanding of the research questions outlined in the methodology section and address a notable gap identified during the literature review. By delving into the perspectives shared by industry stakeholders, these findings not only align with the initially posited research inquiries but also cover a gap in the literature review: how do companies address these challenges and implement SSCM?

6.1. The Social Dimension

The research question has given rise to two subsidiary questions, both of which the study has successfully addressed.

RQ1. What social responsibility challenges are encountered by the companies in sustainable supply chain management within the perfume industry?

RQ2. How do companies address social challenges, and what initiatives have they undertaken to engage with stakeholders along the supply chain?

6.1.1. Supplier Challenges

In addressing the challenges associated with ensuring human rights and fostering fair and ethical labor practices throughout their supply chains, companies acknowledged the imperative of extending these principles to their network of suppliers. Their response encompassed candidly communicating concerns to suppliers and adapting supplier selection processes to ensure a thorough consideration of these challenges. Companies implemented rigorous audits to affirm the implementation of ethical standards throughout their partnerships.

Another significant challenge highlighted by companies pertained to cultivating robust relationships with suppliers grounded in trust, collaboration, and shared values. The emphasis on collaboration, involving stakeholders such as suppliers and customers, emerged as a primary challenge in effectively addressing broader social responsibilities. In response, companies advocated for adopting sustainable and socially responsible practices by suppliers, fostering a cooperative approach to shaping an ethically grounded supply chain. This collaborative ethos extended to engagement with suppliers, nurturing a collective commitment to ethical and environmentally conscious processes, thereby addressing both social and environmental concerns. The companies recognized long-term partnerships and collaborative initiatives as potent tools for instigating positive change across the spectrum of challenges inherent in supply chain management.

Furthermore, navigating the complexities of compliance with social responsibility laws and regulations across diverse regions emerged as a formidable challenge. In response, companies proactively embraced industry standards and certifications related to social responsibility, demonstrating a comprehensive commitment to legal compliance. Notably, certifications such as ISO 14040 served as robust benchmarks, offering assurance to consumers and stakeholders that the company adhered to recognized standards across all dimensions of social responsibility. Seeking support from governmental and institutional bodies emerged as a strategic approach for reinforcing social responsibility initiatives and ensuring alignment with overarching regulatory frameworks.

6.1.2. Consumer Challenges

Addressing the challenge of educating consumers about a company's social responsibility initiatives proves crucial, given consumer hesitancy to embrace eco-friendly products. In response, companies actively undertake consumer education initiatives, imparting information on product sourcing and ethical practices to foster responsible consumption. To further encourage sustainable choices, companies explore innovative incentives, offering benefits, discounts, or loyalty programs tied to eco-friendly practices, such as recycling or using refillable containers, exemplified by the approach taken with Le Labo's perfume bottle. This strategy not only aligns with the overarching goals of supply chain transparency but also contributes to cultivating an informed and socially responsible consumer base.

Simultaneously, achieving transparency in the supply chain, elucidating supplier practices, and sourcing for consumers emerges as a substantial challenge. Companies counter this challenge by strategically investing in technologies and systems designed to provide end-to-end visibility into the intricacies of the supply chain. Through transparent communication regarding the origin of raw materials, production processes, and supplier practices, companies empower consumers to make informed decisions, fostering a heightened awareness of the ethical dimensions associated with their product choices. This commitment addresses the challenge of supply chain transparency and aligns with the broader objective of cultivating an informed and conscientious consumer base. Moreover, educating consumers about the value of sustainable products and practices helps create demand.

6.2. The Economic Dimension

RQ3. What economic challenges do companies face when maintaining profitability while adopting sustainable supply chain practices in the perfume industry?

RQ4. What strategies have they employed to sustain economic performance while implementing sustainable principles in their supply chains?

6.2.1. Costs Related to SSCM

Securing environmentally friendly and ethically produced materials at potentially elevated costs is a formidable and recurrent challenge. The resultant increase in the cost of sustainable materials significantly impacts product prices. In response, companies strategically pivot towards optimizing operational efficiency and streamlining processes, leveraging lean principles to curtail costs while upholding overall performance standards. Identifying and implementing cost-effective sustainable practices emerge as imperative measures, aligning environmental considerations seamlessly with economic viability. This strategic alignment addresses the challenge of elevated material costs and empowers companies to sustain competitive product pricing.

Simultaneously, companies face the crucial task of evaluating the economic viability of fortifying supply chain resilience while preserving profitability. A strategic shift towards circular economy business models becomes paramount in tackling this intricate challenge. This transition fosters resource efficiency, minimizes waste, and explores innovative avenues for product life extension, reuse, and recycling—endeavours that collectively generate economic value. By adopting this holistic approach, companies enhance their financial resilience and contribute to the broader goals of sustainability, effectively harmonizing economic viability with environmental responsibility within the intricate landscape of supply chain management.

6.2.2. A Need for Investment

The imperative for investments to overhaul supply chain structures represents a significant challenge, particularly given the substantial upfront commitments required for sustainable practices. Companies face the intricate task of harmonizing these initial investments with the pressing need for immediate profitability.

Companies are advised to embrace innovative technologies and solutions to navigate this challenge effectively. This strategic shift not only yields operational improvements but also concurrently diminishes costs and environmental impact. Recognizing the integral role of investments in sustainable technologies for long-term competitiveness, companies adopt a forward-thinking perspective, acknowledging the enduring benefits that such sustainability-focused investments confer.

The paramount challenge lies in striking a delicate balance between short-term profitability imperatives and the enduring benefits of sustainability. Potential resistance from stakeholders, especially investors with a penchant for immediate returns, underscores the complexity of this endeavour. In response, companies proactively communicate the far-reaching advantages of sustainability, accentuating its positive impact on brand value and competitiveness. This proactive communication strategy serves to address resistance, fostering a comprehensive understanding of sustainable goals among stakeholders.

Despite the potential reluctance from investors, companies recognize the pivotal role of ongoing research and innovation in sustaining their commitment to environmentally responsible practices. However, the financial demands associated with such endeavors necessitate a careful balancing act between the costs of innovation and the imperative for profitability.

In the event of investor reluctance, companies can strategically leverage government incentives and subsidies tailored for sustainable practices. This approach serves a dual purpose: alleviating initial implementation costs and providing crucial support for sustained research and innovation efforts. Within the context of this study, companies actively seek and participate in programs that align with their sustainability initiatives, ensuring a dynamic interplay between innovation and the ever-present economic realities that shape their strategic decision-making.

6.2.3. Market Challenges

Persistent market dynamics pose challenges for companies adopting Sustainable Supply Chain Management (SSCM). The constraint of consumer expectations for affordable products creates a limitation on passing on the costs associated with sustainability, complicating the delicate balance between sustainability and price competitiveness. This complexity is exacerbated by competitors prioritizing low pricing, sometimes sidelining sustainability efforts.

In response to this challenge, companies within the industry can strategically cultivate long-term partnerships, even with competitors, fostering stability in the supply chain. This collaborative approach facilitates joint sustainability initiatives, mitigating the impact of additional costs on product affordability. A vital aspect of this strategy involves collaborating with stakeholders across the value chain. This inclusive and collaborative approach becomes essential for aligning collective efforts toward sustainability, potentially overcoming resistance from various quarters and justifying premium prices for sustainable products. By fostering stability and shared sustainability goals through strategic collaborations, companies can navigate the intricate landscape of market dynamics while advancing their commitment to sustainable practices.

6.3. The Environmental Dimension

RQ5. *What specific environmental sustainability challenges do companies face in their supply chains?*

RQ6. *What sustainable practices and innovations have they implemented to mitigate environmental impacts in their supply chains?*

6.3.1. Sourcing Challenges

In the perfume industry, numerous challenges surround the sourcing of raw materials, presenting complexities that warrant careful consideration.

Procuring environmentally sustainable sources for raw materials, especially in the case of natural ingredient sourcing, poses a particularly intricate challenge in the perfume industry. Companies must ensure that their supply chain activities do not inadvertently contribute to the loss of biodiversity, compelling a need for thorough assessments and strategic actions to address potential impacts on ecosystems. The ongoing transition to sustainable and responsibly sourced materials involves deliberately exploring alternatives with lower environmental footprints.

A critical facet of these challenges is the assurance that suppliers adhere to sustainable practices—a fundamental element for achieving holistic sustainability within the supply chain.

Companies can proactively engage with suppliers in response to these challenges, establishing mechanisms to ensure steadfast adherence to sustainable practices. This entails a rigorous evaluation of suppliers based on stringent criteria encompassing environmental practices and ethical standards. The effectiveness of this engagement relies on collaborative efforts and a shared commitment to sustainable practices, forming the cornerstone of a resilient and environmentally responsible supply chain.

A noteworthy trend emerging within companies is an increasing recognition of the importance of biodiversity conservation. Initiatives in this area include implementing responsible sourcing practices designed to circumvent contributions to deforestation and other activities that harm ecosystems. Furthermore, some companies actively explore alternative materials with lower environmental impacts, exemplified by substituting natural ingredients in perfumes with synthesized options—a strategic move toward reducing ecological footprints.

6.3.2. Minimizing Carbon Footprint

Addressing the challenge of mitigating the carbon footprint across the entire supply chain, encompassing production, transportation, and distribution, is a formidable task. The complexity is further pronounced when it comes to reducing emissions from transportation, particularly in the context of global supply chains.

In response to these challenges, companies proactively undertake initiatives to reduce their carbon footprint, a concerted effort involving adopting eco-friendly transportation options, such as electric or hybrid vehicles. Striking a delicate balance between efficiency and environmental impact in transportation becomes a focal point, prompting companies to explore strategies that minimize emissions without compromising the efficacy of the supply chain. External conditions, such as those exemplified by the Suez Canal incident, can introduce complexities, adding another layer of challenge.

To further address this, emphasis is placed on optimizing logistics to minimize the environmental impact of transportation. This strategic approach ensures a delicate equilibrium between emission reduction and operational efficiency. For instance, companies may focus on optimizing truckloads to their total capacity, thereby avoiding unnecessary transportation and enhancing the overall efficiency of the supply chain.

Companies engage in comprehensive life cycle assessments for their products in tandem with these efforts. This involves identifying environmental hotspots throughout the supply chain and meticulously assessing the carbon footprint—from raw material extraction to end-of-life disposal. This holistic evaluation allows for a thorough understanding of the environmental impact associated with each stage of the product's life cycle, enabling informed decision-making and targeted strategies for emission reduction.

6.3.3. Waste Management

Minimizing waste and transitioning to circular economy practices involve challenges in redesigning products, recycling infrastructure, and changing consumer behavior. Improving energy efficiency across the supply chain, from manufacturing facilities to transportation, is a continuous challenge. Therefore, adopting renewable energy sources and innovative technologies poses a challenge, especially in cost.

Finding sustainable and eco-friendly packaging solutions that meet both environmental and functional requirements is another critical challenge.

Companies implement sustainable packaging solutions to address these challenges, incorporating recycled and alternative environmentally friendly materials. Some transition to reusable packaging to minimize waste, as seen with Heineken and Le Labo. Companies invest in energy-efficient technologies and practices to reduce overall energy consumption. Adopting renewable energy sources like solar or wind power is a crucial consideration. Though it may seem like a significant investment initially, it is a source of cost savings in the long run. Implementing sustainable packaging solutions is a common practice, involving using recycled materials and exploring alternative environmentally friendly materials, as demonstrated by the Pochet Group, a supplier of perfume brands that uses recycled glass. Moreover, implementing effective waste sorting and recycling programs and initiatives promoting a zero-waste approach contributes significantly to environmental sustainability.

6.4. Additional Examples of Successful SSCM Practices Within the Perfume Industry

Here are a few examples of successful Sustainable Supply Chain Management (SSCM) practices within the perfume industry to enrich this discussion:

1. **L'Oréal's Sustainable Sourcing and Packaging Initiatives:** L'Oréal, one of the largest global perfume manufacturers, has adopted several sustainable supply chain practices. They focus on sustainable sourcing of raw materials, especially essential oils used in perfumes. Their sustainability strategy includes working directly with local farmers to promote eco-friendly farming techniques, ensuring that these communities benefit economically. L'Oréal is also committed to reducing the environmental footprint of its packaging, using 100% recyclable materials for most of its products. Key SSCM practices are ethical sourcing of raw materials, collaboration with local farmers for sustainable agricultural practices, and use of sustainable packaging materials;
2. **Chanel's Commitment to Biodiversity:** Chanel has invested in preserving biodiversity in regions where it sources key raw materials, such as flowers used for perfumes. The company works closely with suppliers and farmers to ensure that sourcing methods do not harm local ecosystems. For instance, Chanel has partnered with the French company Le Jardin d'Osier to source jasmine while protecting the biodiversity of the region in which it is grown. Key SSCM practices are preservation of biodiversity in sourcing regions, collaboration with local communities for sustainable cultivation of raw materials, and transparent, ethical sourcing practices;
3. **The Body Shop's Sustainable Ingredients Sourcing:** The Body Shop has been a leader in implementing sustainable practices, including in its perfume production. The company sources ingredients for its perfumes through its Community Trade program,

which ensures that suppliers and farmers meet fair trade standards. For example, The Body Shop sources its Community Trade sesame oil from Nicaragua, supporting local farmers with fair wages and sustainable farming practices. Key SSCM practices are community trade programs that ensure fair wages and sustainability, commitment to sourcing ingredients from sustainable and ethical suppliers, and transparency in the supply chain to improve trust with consumers;

4. **Hermès and Sustainable Leather Production:** While primarily a fashion house, Hermès has applied SSCM principles in sourcing materials for its perfume bottles and packaging. They use sustainable materials for perfume packaging, such as eco-friendly leather for certain bottle cases. Hermès works closely with suppliers to ensure that its raw materials are sourced sustainably, particularly with an emphasis on reducing environmental impact in its production processes. Key SSCM practices are sustainable packaging design and sourcing, reduction of waste in production, and commitment to long-term, ethical relationships with suppliers;
5. **Estée Lauder's Green Chemistry in Perfume Production:** Estée Lauder has embraced the use of green chemistry to reduce the environmental impact of its perfume production processes. They focus on reducing the use of harmful chemicals and solvents in the formulation and manufacturing of fragrances. They have also worked to reduce water consumption in production facilities and improve energy efficiency. Key SSCM practices are green chemistry to reduce harmful chemicals and solvents, water and energy reduction in production, and commitment to using renewable resources in fragrance production.

Key practices across these companies show a range of successful SSCM practices that can serve as examples for others in the perfume industry. Companies like L'Oréal, Chanel, and The Body Shop engage in ethical sourcing practices, ensuring that raw materials are sustainably produced and traded. Brands such as L'Oréal and Hermès focus on eco-friendly packaging, which reduces waste and supports the circular economy. Moreover, companies like The Body Shop and Chanel have invested in local communities, promoting fair wages and sustainable farming practices. Furthermore, Estée Lauder and Aveda use green chemistry and renewable energy to reduce their carbon footprint and improve their sustainability efforts.

Incorporating these case studies into this research highlights the diversity of approaches to SSCM in the perfume industry, showcasing both challenges and solutions that have worked for leading brands.

6.5. Small and Medium-Sized Enterprises (SMEs) Implementing SSCM Methods

Small and Medium-sized Enterprises (SMEs) represent most of the perfume industry and face unique challenges and opportunities when it comes to implementing SSCM methods. While SMEs may have fewer resources than large multinational companies, they can still adopt effective and innovative sustainable practices that contribute to environmental, social, and economic sustainability. SMEs in the perfume industry may implement SSCM methods by sustainable sourcing of raw materials, local and ethical sourcing, ensuring fair trade standards, and using organic and natural ingredients. Eco-friendly packaging is one area where SMEs can make a significant impact in packaging. By using recyclable, biodegradable, or compostable materials for packaging, SMEs can minimize their environmental impact. Moreover, offering refillable perfume bottles or minimalist packaging (using less plastic or unnecessary materials) can reduce packaging waste and lower costs in the long run.

Furthermore, SMEs can adopt energy-efficient technologies, such as LED lighting, efficient heating systems, and renewable energy sources (e.g., solar or wind power), to reduce

the environmental impact of their production facilities. In perfume manufacturing, water usage can be significant. SMEs can implement water-saving technologies, such as closed-loop systems, to reuse water in the production process, reducing consumption and waste. In addition, small businesses can also implement strategies to minimize production waste.

SMEs can collaborate with other companies, industry organizations, and sustainability-focused networks to share best practices, resources, and solutions. By joining initiatives like the Responsible Beauty Initiative or local sustainability networks, SMEs can learn from others' experiences and access tools that may otherwise be out of reach. Even SMEs can work toward greater transparency in their supply chains by collaborating with suppliers to ensure that environmental and social standards are being met. Digital platforms that provide supply chain traceability tools (such as blockchain) can help SMEs track the sustainability of their raw materials and ensure compliance with ethical practices.

Additionally, SMEs can prioritize ethical labor practices in their supply chain by ensuring workers are paid fairly and work in safe conditions. By building strong relationships with suppliers and ensuring the well-being of those involved in the supply chain, SMEs can support social sustainability. SMEs may not have the resources to make large-scale changes all at once, so they can start by implementing small, cost-effective sustainable practices and gradually scale up. For example, switching to energy-efficient lighting or opting for eco-friendly packaging are relatively low-cost options that can make a difference. Many governments, NGOs, and organizations offer financial incentives, grants, or tax breaks for companies adopting sustainable practices. SMEs can take advantage of these resources to offset some of the costs of implementing SSCM practices. Furthermore, SMEs can use their commitment to sustainability as a key selling point in their marketing strategies. They can craft compelling stories around their sustainable practices, whether it's about how they source ingredients or how they reduce waste in production. These stories resonate with consumers who care about sustainability and help build brand loyalty.

Even as small businesses, SMEs must be aware of and comply with regulations related to sustainability, especially in regions with stringent environmental laws, such as the European Union's REACH regulations. Ensuring compliance not only avoids penalties but also improves the company's reputation. They can stay ahead of future regulations by adopting sustainable practices early on.

Despite facing limitations in resources, SMEs in the perfume industry can adopt effective and impactful SSCM practices by focusing on sustainable sourcing, eco-friendly packaging, energy and resource efficiency, and social responsibility. By leveraging collaboration, incremental changes, and a strong commitment to sustainability, SMEs can build a strong brand identity, contribute to environmental and social goals, and achieve long-term profitability.

In summary, the discussion highlights the multifaceted challenges and strategic responses associated with implementing Sustainable Supply Chain Management (SSCM). The interplay between social, economic, and environmental dimensions underscores the complexity of adopting sustainable practices. Companies face significant hurdles, from managing supplier relationships and consumer education to balancing cost considerations and environmental impacts. However, through strategic investments, collaboration, and leveraging technological advancements, they navigate these challenges, aligning their supply chain practices with broader sustainability goals. The insights from this study not only address the initial research questions but also provide a comprehensive understanding of the dynamic landscape of SSCM, offering valuable implications for industry stakeholders committed to sustainability.

7. Conclusions

This study on the challenges of implementing Sustainable Supply Chain Management (SSCM) in the perfume industry has yielded valuable insights into the complexities and opportunities for sustainability in this specialized sector. By interviewing seven industry experts, the research has illuminated the intricate dynamics of SSCM and underscored the shared responsibility of all stakeholders in fostering sustainability.

7.1. Key Findings

Collaborative Efforts: A consistent theme from the interviews was the crucial role played by various actors within the supply chain. Each participant emphasized the necessity of collaboration and collective action to tackle urgent environmental challenges. The concept of the “triangle of inaction”, introduced by one expert, advocates for moving beyond blame and instead working together to address sustainability issues. This collaborative approach is essential for effective SSCM.

Economic Challenges: Economic barriers and the costs associated with implementing SSCM are significant. However, the study highlights that adopting a long-term perspective and investing in sustainable practices as strategic business decisions can help companies overcome these challenges. Potential solutions include financial incentives, subsidies, integrating sustainability into core business strategies, and adopting circular economy principles. These strategies can create more sustainable and resilient supply chains.

Social Responsibility: The study also addressed the social responsibility challenges faced by companies in supply chain management. The interviews revealed how companies confront these challenges and implement SSCM. Ensuring human rights and ethical labor practices throughout the supply chain, cultivating robust supplier relationships, and navigating compliance with diverse social responsibility laws were identified as key areas requiring attention.

Environmental Sustainability: The research identified specific environmental sustainability challenges, such as sourcing sustainable raw materials and minimizing the carbon footprint. Companies are actively engaging with suppliers to ensure adherence to sustainable practices and investing in eco-friendly transportation and energy-efficient technologies. These efforts are crucial for reducing the environmental impact of supply chains.

7.2. Limitations

While the study provides valuable insights, it is essential to acknowledge its limitations:

- **Sample Size and Scope:** The relatively small sample size and limited scope might restrict the perspectives represented. Critical stakeholders, such as manufacturers of synthesized ingredients like Givaudan, were not included.
- **Response Bias:** Given that professionals may be inclined to present their companies in a favorable light, a response bias could affect the findings.

7.3. Future Research Directions

Considering these limitations, several potential directions for future research are suggested:

- **Global Comparative Analysis:** A broader comparative analysis across different regions would provide a more comprehensive understanding of SSCM. This study predominantly focused on Europe and North America, where sustainability is widely acknowledged. Exploring the variations in awareness, regulatory frameworks, consumer behaviors, and cultural distinctions in other regions could offer valuable insights.
- **Inclusion of Diverse Stakeholders:** Future research should aim to include a wider array of stakeholders, such as manufacturers of synthesized ingredients and other critical actors within the supply chain.

- **Longitudinal Studies:** Conducting longitudinal studies would help understand the long-term impacts and effectiveness of SSCM practices.

This study underscores the importance of a collaborative and holistic approach to SSCM in the perfume industry. By addressing economic, social, and environmental challenges through strategic investments and collaborative efforts, companies can create more sustainable and resilient supply chains. Despite the limitations, the findings contribute significantly to the understanding of SSCM and offer practical implications for industry stakeholders committed to sustainability. Future research should continue to explore these themes, expanding the scope and depth of analysis to include diverse perspectives and global comparisons.

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