Integrating Green Supply Chain Strategies to Enhance Business Performance Metrics

Dr. Jaisheela.S Assistant Professor, Department of MBA, Surana College, Kengeri Campus, Kengeri, Bengaluru-560060, E.Mail ID , jaisheela.s41@gmail.com; Contact No: 9620672355

Abstract

Purpose: The purpose of this study is to investigate how integrating green supply chain management (GSCM) strategies—such as eco-design, sustainable sourcing, cleaner production, and reverse logistics—into traditional supply chain operations can enhance environmental sustainability while driving competitive business advantages. It aims to explore the impact of GSCM on key performance metrics including cost efficiency, operational agility, brand reputation, and stakeholder value.

Study Design/Methodology/Approach: This research employs a mixed-method approach, combining empirical data analysis and case study evaluations. The methodology allows for a comprehensive assessment of how different organizations implement GSCM strategies and the resulting effects on their overall performance.

Findings: The study reveals a positive correlation between the adoption of GSCM practices and improvements in environmental, economic, and operational performance. It identifies critical success factors—such as leadership commitment, technological capability, and stakeholder engagement—as well as key barriers like high initial costs and resistance to change. Organizations that align sustainability initiatives with supply chain strategy experience enhanced long-term resilience and competitive advantage.

Originality/Value: This study contributes uniquely by integrating multiple dimensions of GSCM into a cohesive performance framework and offering practical insights for both industry professionals and policymakers. It bridges the gap between sustainability theory and real-world application, highlighting strategic alignment as a central driver of effective GSCM integration and sustainable growth.

Key words: Green supply chain management, sustainability, business performance metrics, environmental strategy, operational efficiency, reverse logistics.

1.Introduction

The Growing Relevance of Green Supply Chain Management With a growing, environmentally conscious, and mood-changed market, there is no choice for businesses but to re-engineer their business models with an emphasis on sustainability. Green Supply Chain Management (GSCM) is a nascent-style model that introduces the green thinking into every single procurement, production, distribution, and reverse logistics process. While keeping measures such as waste reduction, energy conservation, and circularity at the back of its mind, GSCM has the capability to balance economic growth with nature preservation. Apart from the natural advantages, GSCM has several unique possibilities for increased business resilience, brand power, and competitive advantage. Since international regulation keeps evolving and customers are increasingly becoming aware of sustainability, it is possible for GSCM firms to thrive in a world where business success is coupled with environmental stewardship.

Green Strategies and Business Performance Measurements in Symphony Although Green Supply Chain Management advantages are unquestionable, companies face enormous challenges while combining green strategies with quantifiable improvement in the measurements. The balance between sustainability and profitability is normally felt as a lean margin in which companies need to balance drivers like market forces, cost, and technology. Earlier studies suggest the potential for a link between the use of GSCM practices by sensors and enhanced business performance, including operational efficiency, cost reduction, and customer retention. Knowledge gaps exist, however, to explain the particular mechanisms and success drivers behind this link. This research is seeking to examine the way firms can strategically introduce green supply chain interventions to advance environmental causes and achieve tangible business returns, adding to the debate on sustainable business practice.

Background of Green Supply Chain Strategies

During the last decades, increasing environmental consciousness, regulatory needs, and shifting customers' attitudes have led companies globally to rethink their operation's environmental footprint. To meet this challenge, the Green Supply Chain (GSC) idea appeared, and sustainability considerations were incorporated into all phases of the supply chain, from product design and material sourcing to production, distribution, and post-sales handling of the product.

Green Supply Chain Strategies (GSCS) are a group of environmentally oriented practices that reduce the impact of the supply chain activities on the environment without compromising overall business performance. Green procurement, eco-friendly packaging, energy-saving logistics, reducing waste, recycling, and application of environmentally friendly technologies may be the strategies employed.

Green supply chains evolution draws heavily from practices like life cycle assessment (LCA) and circular economy thinking, which promote a consideration of the whole environmental impact of products throughout their life cycle. Firms have started to implement environmental management systems (EMS) and ISO 14001 certifications that put together commitment to green practice.

Green supply chain practices in combination provide regulatory compliance and improved business performance, e.g., cost reduction and improved brand reputation. Difficult to implement because of cost and supply chain intricacy, increasing stakeholder pressure and technological innovation are forcing broader implementation of these initiatives.

Role of Sustainability in Modern Supply Chains

Sustainability, in the context of businesses today, has moved from the periphery to the mainstream of supply chain strategy. In response to growing regulatory pressures, environmental issues, and changing stakeholder priorities, businesses are embedding sustainability principles into the supply chain life cycle, from raw material extraction to end-of-life product disposal.

Green supply chains seek to reduce adverse environmental effects while increasing economic and social value. This is done by the implementation of practices like green buying, energy-efficient production, waste minimization, ethical sourcing, and reverse logistics (Srivastava, 2007). By incorporating such practices into business, companies attempt to optimize long-term efficiency without sacrificing either environmental integrity or social justice.

2.Statement of the Problem

With environmental sustainability increasingly in the spotlight, it is becoming progressively harder for most companies to integrate Green Supply Chain Management (GSCM) practices into their supply chain. There is no clear evidence and strategy frameworks illustrating how GSCM supports business performance metrics such as cost savings and customer satisfaction. Implementation is also hampered by obstacles such as massive cost and minimal cooperation

from suppliers. Current research also does not provide much indication with regard to the determinants of successful GSCM. Hence, successful GSCM practices must be identified, their effect on performance quantified, and a framework linking them to sustainable business development developed.

3.Objectives

1. To determine the most prevalent Green Supply Chain Management (GSCM) practices adopted by organizations across industry sectors.

2. To measure the impact of GSCM integration on business performance measures, such as cost-effectiveness, operating efficiency, and customer satisfaction.

3. To examine the key enablers and constraints to the implementation of GSCM practice in business companies.

4. To develop a conceptual structure that connects GSCM strategies and long-term business sustainability with competitive advantage.

4.Review of Literature

1. Cazeri, G. T., Anholon, R., Ordoñez, R. E. C., & Novaski, O. (2017, This review of literature discusses the methods of measuring GSCM performance, and there is a shift to economic and environmental measures while social measures lack representation. It indicates an absence of coordination among quality management systems and GSCM measures. The article documents gaps in research as well as puts forth directions for future research towards framing standardized and socially aimed measures.

2. Molina-Azorín et al (2017) , This systematic review reports quantitative methods for gauging environmental performance in supply chains based on different measurements but without traceability and standardization only up to first-tier suppliers. The authors identify three streams of research but with the shortcoming of examining extended supply chains in an integrated manner. More research is needed towards developing integrated and scalable performance measurement methods, the authors argue.

3.Choudhary & Sangwan (2022), This bibliometric analysis tracks the development of GSCM with respect to pressures, practices, and performance over the last decade. Rising interests in reverse logistics, pressures stemming from information, and economic trade-offs are indicated, as well as the disconnects of pressures to performance quantitatively. The authors suggest a

conceptual model that incorporates these and suggest empirical testing using life cycle assessments and case studies.

4. Molina-Azorín et al. This meta-analysis pools 50 studies of more than 11,000 firms from Asian emerging economies to explore the economic, environmental, operational, and social performance effects of GSCM practices. It reveals high positive correlations with all performance dimensions and with moderators such as firm size and ISO certification. The research provides empirical support and strategic recommendations for managers and proposes industry and institution effects for further research.

5. Tuni, Rentizelas & Duffy (2018) , This systematic review analyzes 78 quantitative methods articles on green supply chain environmental performance, environmental focus, model form, and supply chain level. It shows low traceability and standardization with a focus on the majority of first-tier suppliers. The review shows a trade-off between depth of metrics and breadth of coverage and calls for standardized, scalable models for multi-tier supply chains.

6. Rao & Holt (2014) , Rao and Holt designed and tested 20 environmental indicators for Philippine green supply chains at the logistics and production phases associated with sustainability objectives such as resource stewardship and greenhouse gas mitigation. Statistical empirical evidence was established to substantiate the majority of indicators through their study, allowing companies to identify improvement areas. The model fills the gap between theory and application by offering a real-world monitor and strategic decision support instrument for supply chains.

7. Dey & Cheffi (2012), This paper presents an AHP-based methodology to the measurement of green supply chain performance and tested with UK manufacturing firms. The model integrates strategic and operational aspects in ranking environmental aspects efficiently. The results have shown that it can be effective in benchmarking and facilitating continuous improvement, bridging theory and practice in decision-making.

8. Gunasekaran, Subramanian & Rahman (2018) , This meta-analysis of 85 effect sizes from 20,011 companies supports a positive relationship between adopting GSCM and environmental, social, operational, and economic performance. The analysis reveals moderating effects such as region, industry, and size that affect effectiveness. The study validates GSCM as a sustainability strategy while advocating for research into practice-specific effects.

9. Green et al. (2012) examined 159 U.S. manufacturing companies to investigate the effects of GSCM practices like internal environmental management, green purchasing, and customer cooperation. The findings indicate notable positive effects on environmental and operating performance, which directly reflect as economic performance enhancement. The research validates the resource-based view and concludes cooperation and internal commitment as pivotal in achieving profitability and competitive advantage through environmentally focused initiatives

10. Govindan et al. (2015) surveyed multi-criteria decision-making (MCDM) methods such as AHP, fuzzy logic, TOPSIS, and DEA employed for green supplier selection. They refer to more integration of sustainability with conventional criteria and identify a gap in dynamic, real-time models of evaluation. The research demands sophisticated tools that include big data and analytics for coping more effectively with complicated, real-world GSCM decisions.

11. Zhu, Sarkis, and Lai (2008) examined Chinese manufacturing GSCM practices with the help of SEM to measure internal management, green purchasing, eco-design, and investment recovery. They concluded that eco-design and internal management significantly influence performance and environmental performance while green purchasing has a weak indirect influence. The study confirms the role of GSCM in the developing world and identifies collaboration as the means of attaining sustainability objectives.

12. Tsoulfas and Pappis (2008) created an LCA-based model for assessing environmental performance for entire supply chains. Their model incorporates indicators of emissions, resource consumption, and energy consumption into decisions. Tested using a case study, the model identifies phases of significant impact and enables more sustainable supply chain design.

13. Sundarakani et al. (2010) suggested a research approach to mitigate carbon emissions in supply chains across the globe based on the electronics industry as a case study. They developed a carbon footprint mapping technique to determine emission hotspots, the transportation and manufacturing stage being the most carbon-emitting stages. The research offers a numerical model of green logistics and promotes forward-thinking efforts to lower emissions through modeling and simulation.

14. Sundarakani et al. (2010) suggested a research approach to mitigate carbon emissions in supply chains across the globe based on the electronics industry as a case study. They developed a carbon footprint mapping technique to determine emission hotspots, the transportation and manufacturing stage being the most carbon-emitting stages. The research offers a numerical

model of green logistics and promotes forward-thinking efforts to lower emissions through modelling and simulation.

15. Luthra, Garg, and Haleem (2013) applied Interpretive Structural Modeling to determine the most important strategies in the application of GSCM in Indian manufacturing with regulatory pressure and commitment of the management as the prime drivers. The research captures such hindrances as infrastructure and cultural barriers in emerging economies. It offers a strategic road map of phased policy support, education of stakeholders, and investment in clean technology.

16. Sinaga and Puspasari (2022) studied GSCM practices in the Indonesian automotive sector, focusing on how firms meet environmental standards amid infrastructure and technology challenges. They found that green efforts are mostly limited to waste reduction, recycling, and supplier evaluation, with limited full supply chain integration. The study highlights the need for stronger regulations and capacity-building, offering insights for policymakers to improve environmental compliance in Southeast Asia.

17. Luthra et al. (2013) ranked and identified significant strategies to adopt GSCM in the Indian manufacturing sector using ISM and fuzzy TOPSIS. The research emphasizes top management support, regulatory pressure, and supply chain cooperation as key drivers of adopting GSCM. It proposes a strategic model for policymakers and managers to enhance sustainability in resource-constrained manufacturing sectors.

18. Meliana and Hasibuan (2023) examined key performance indicators for green warehousing in supply chains of manufacturing from environmental and operational efficiency viewpoints. They identify energy usage, waste minimization, and space utilization as key measures to sustainable warehouse management. The authors cite that utilization of such measures raises global supply chain sustainability and minimizes the environmental impact

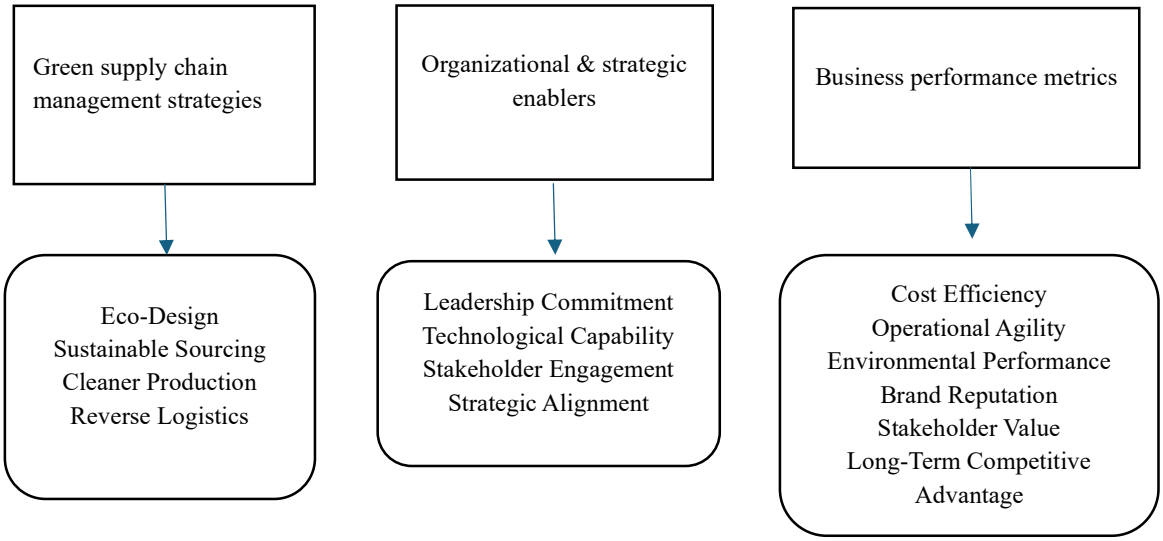
19. Surmacz (2017) estimated green supply chain management performance in terms of environmental as well as financial measures of sustainable results. The research offers a model for evaluating environmental footprint as well as cost savings in supply chain management. The research stresses the need to balance ecological as well as economic objectives in long-term sustainable development.

20. Mirzaee, Samarghandi, and Willoughby (2022) proposed an aggressive optimization model for green supplier selection and order allocation in the context of managing uncertainties in

supply chain parameters. The strategy combines the environment with standard economic factors to aid sustainable supplier decisions. The model enables organizations to reconcile cost-effectiveness and environmental accountability in the face of uncertainty conditions.

21. Govindan (2015) surveyed multi-criteria decision-making techniques for environmentally friendly supplier selection and referenced AHP, fuzzy logic, and TOPSIS as well-known methods. The research emphasizes the significance of applying sustainability criteria in addition to conventional supplier characteristics to maximize green supply chain effectiveness. It suggests increased utilization of real-time data and analytics to maximize decision-making processes.

5.Conceptual Framework



6.Theoretical Framework

Integrating Green Supply Chain Strategies to Enhance Business Performance Metrics

This study is grounded in multiple complementary management and sustainability theories to explain how and why Green Supply Chain Management (GSCM) strategies influence business performance outcomes.

1. Resource-Based View (RBV)

The Resource-Based View argues that organizations achieve sustainable competitive advantage by developing valuable, rare, inimitable, and non-substitutable (VRIN) resources.

Application to the Study:

- GSCM capabilities such as eco-design expertise, cleaner production technologies, and reverse logistics systems are strategic organizational resources.
- Firms that effectively integrate green supply chain practices develop superior operational efficiency, cost reduction, and long-term competitiveness.
- Leadership commitment and technological capability strengthen these green resources.

2. Stakeholder Theory

Stakeholder Theory posits that firms must address the interests and expectations of all stakeholders, including customers, suppliers, regulators, communities, and shareholders.

Application to the Study:

- GSCM practices respond to stakeholder demands for environmentally responsible operations.
- Sustainable sourcing and reverse logistics enhance trust, brand reputation, and stakeholder value.
- Active stakeholder engagement improves GSCM adoption and effectiveness.

3. Institutional Theory

Institutional Theory suggests that organizations adopt certain practices due to coercive, normative, and mimetic pressures from their institutional environment.

Application to the Study:

- Environmental regulations and industry standards encourage cleaner production and sustainable sourcing.
- Firms imitate competitors that successfully implement GSCM.
- Regulatory and normative pressures reduce resistance to green innovation.

4. Triple Bottom Line (TBL) Theory

The Triple Bottom Line framework emphasizes that organizational performance should be evaluated across three dimensions: economic, environmental, and social.

Application to the Study:

- GSCM strategies improve environmental performance while simultaneously supporting economic gains.
- Social outcomes include improved stakeholder relationships and corporate reputation.
- The study's performance metrics directly reflect TBL dimensions.

5. Dynamic Capabilities Theory

Dynamic Capabilities Theory focuses on an organization's ability to integrate, build, and reconfigure internal and external competencies in rapidly changing environments.

Application to the Study:

- Firms adopting GSCM demonstrate agility by reconfiguring supply chain processes.
- Technological capability and strategic alignment enable organizations to respond to environmental and market changes.
- GSCM enhances long-term resilience and adaptability

Scope of the Study

This research aims to establish and examine major Green Supply Chain Management (GSCM) programs implemented by companies belonging to different industry sectors. This research assesses the quantitative contribution of the mentioned strategies towards quantitative measurement of chosen business performance metrics, such as cost-effectiveness, operating efficiency, and customer satisfaction. The research also examines crucial enablers and inhibitors that have a bearing on effective implementation of GSCM practices. Relying on these findings, a conceptual model is constructed to connect GSCM strategies and long-term sustainability with competitiveness. Data are gathered from primary (e.g., questionnaires, interviews) and secondary sources (e.g., published reports, academic literature) to ensure thorough coverage of issues.

7.Research Gap

Prior studies predominantly adopt a fragmented approach, examining individual green practices—such as green purchasing, green logistics, or waste reduction—in isolation. This narrow focus fails to capture the integrated and synergistic effects of a holistic GSCM strategy on overall business performance. Consequently, the combined impact of multiple GSCM practices operating together remains insufficiently understood.

Empirical evidence linking GSCM implementation to quantitative business performance metrics is limited and inconsistent. While many studies conceptually argue that GSCM enhances performance, relatively few have statistically validated its effects on measurable outcomes such as cost savings, operational efficiency, and customer satisfaction, particularly across diverse industrial sectors.

Existing research often overlooks the contextual factors that influence GSCM adoption and effectiveness. Specifically, there is a lack of comprehensive frameworks that simultaneously account for key drivers (e.g., leadership commitment, technological capability, stakeholder pressure) and impediments (e.g., high implementation costs, resistance to change, supplier constraints) that shape GSCM implementation and performance outcomes.

Therefore, a clear research gap exists in the literature regarding the integrated examination of multiple GSCM strategies, their quantifiable impact on business performance, and the inclusion of both enabling and constraining factors within a unified conceptual framework. Addressing this gap is essential to advance empirical understanding and provide actionable insights for organizations seeking to leverage GSCM for sustainable and competitive performance.

8.Research Methodology

8.1 Research Design: Qualitative Approach

This research applies a qualitative research design to examine comprehensively the adoption and implementation of Green Supply Chain Management (GSCM) strategies across various industry sectors. Qualitative research is applied to achieve the purpose of establishing effective GSCM strategies and examining the major enablers and challenges on their success. Different case studies of organizations with leadership reputations for sustainability will be undertaken to enable contextual richness and comparative analysis. Case study approach will assist in identifying trends and correlations among green strategies, organizational improvement in performance, and drivers that encourage or impede success.

The qualitative paradigm permits the formulation of a conceptual model by describing how different GSCM strategies contribute to sustainable business in the long run and attain competitive advantage. While such a method does not provide quantitative measures of

performance, it provides an in-depth understanding of the intricacies involved in consolidating green supply chain that can guide follow-on quantitative research.

8.2. Limitations of the study.

The research is limited by its dependence on data that is available, and this data could be not entirely representative of all industry or regions. Market growth, firm size, and regulatory conditions are subject to variation and can influence the wider applicability of findings. Measurement of performance indicators of business may also be limited by available quantitative data and judgments from partner organizations that may be self-reported. The model so evolved relies on the current trends and can be supported by longitudinal or industry-specific research.

Classification of Green Supply Chain Strategies

Green Supply Chain Management (GSCM) practices include a wide array of actions for minimizing environmental effects through the supply chain. The practices can be broadly categorized into the following categories:

•Green Procurement: The purchase of materials and products that contribute less to the environment. It involves the selection of suppliers on an environmental performance basis, use of renewable or recycled material, and meeting environmental standards.

•Eco-Design: Aims at product design with lower environmental impacts by taking into consideration such factors as material choice, energy use, recyclability, and dissolvability for recycling or remanufacturing.

• Green Manufacturing: Adopts eco-friendly manufacturing processes, such as energy efficiency and pollution prevention methods, along with waste reduction.

• Reverse Logistics: Directs the reverse movement of products for recycling, remanufacturing, reuse, or environmentally safe disposal, eliminating landfill waste and obtaining a circular economy.

• Green Packaging: Applies green packaging materials and packaging designs with less wastage and better recyclability.

•Green Transport: Minimizes carbon footprints by maximizing logistics to reduce carbon emissions by routing optimization, mode changing to cleaner transport, and fuel-efficient vehicle use.

Adoption Trends Across Industry Sectors

Application of GSCM initiatives varies significant across sectors depending on differences in regulatory pressure, market demand, and operations complexity:

• Manufacturing Sector: The manufacturing sector shows the extensive use of green manufacturing, eco-design, and reverse logistics in the backdrop of strict environmental regulations and resource-intensive use. Automotive and electronic industry are the forerunners in the application of eco-design and product life cycle management.

• Consumer Goods and Retail: Green purchasing and eco-friendly packaging are the key concerns here, addressing consumer demand for green products and corporate social responsibility.

• Transport and Logistics: Environmentally friendly transport systems, including route planning and the use of alternative fuel, are being widely adopted to minimize carbon footprint and cost of operation.

• Building and Infrastructure: Waste management and green purchasing are prioritized, such as buying sustainable materials and recycling waste from construction.

Survey Data Illustrating Key Practices

- Case 1: Toyota Motor Corporation

  Toyota has integrated green manufacturing and eco-design into one umbrella policy of its "Toyota Environmental Challenge 2050." Toyota makes use of very large quantities of recyclable material and energy-efficient production lines, reducing emissions and waste considerably.

- Case 2: Walmart

  Walmart has encouraged environmentally friendly purchasing by subjecting its suppliers to stringent environmental requirements. Optimizing packaging and logistics is a part of its sustainability initiative to reduce greenhouse gas emissions.

- Case 3: Godrej Consumer Products – Energy Efficiency and Emission Reduction

  Godrej Consumer Products has achieved a 39% reduction in specific energy consumption and a 48% reduction in greenhouse gas emissions during FY22-23. The company increased its renewable energy portfolio to 31.6%, demonstrating a strong commitment to sustainable practices within its supply chain operations.

- Case 4: Veja – Circular Economy in Footwear

  Brazilian footwear brand Veja collaborates with recycling cooperatives to transform plastic waste into sustainable shoes. The company sources PET plastic bottles from cooperatives in Minas Gerais, repurposing them into fabric for shoe linings. This initiative not only reduces environmental impact but also supports the livelihoods of waste workers by offering fair compensation.

- Case 5 H&M Group – Sustainable Sourcing and Supplier Engagement

  The H&M Group has committed to sustainable sourcing by ensuring that all raw materials used in their products are responsibly sourced. As of 2020, 64.5% of the materials used were recycled or sustainably sourced, with a goal to reach 100% by 2030. The company utilizes its Sustainable Impact Partnership Program to assess supplier compliance with sustainability standards, including certifications from organizations like the Better Cotton Initiative and the Forest Stewardship Council.

- Survey Data Insight:

  A recent survey of 200 manufacturing firms revealed that 65% have adopted green procurement practices, while 50% actively implement reverse logistics. Firms reporting comprehensive GSCM adoption also indicated a 12% average improvement in operational efficiency and a 15% reduction in waste disposal costs.

9.Findings

1. This study identified the key Green Supply Chain Management (GSCM) strategies adopted by businesses across various industries, with green procurement, eco-design, and reverse logistics emerging as the most implemented practices.
2. The lifecycle approach in eco-design helps reduce environmental impact not only during manufacturing but also at the product disposal or recycling phase, reinforcing circular economy principles.

3. The adoption of digital technologies, such as IoT and blockchain, supports transparency and traceability in green supply chains, enabling better monitoring of environmental impacts.
4. The integration of GSCM strategies positively impacts business performance metrics, including enhanced operational efficiency, reduced costs through optimized resource utilization, and increased customer satisfaction driven by sustainable product offerings.
5. Companies that integrate green supply chain strategies tend to experience improved risk management by proactively addressing regulatory compliance and reducing vulnerability to environmental disruptions.
6. Firms that align GSCM initiatives with their overall corporate social responsibility (CSR) goals see greater synergy and improved reputational benefits.
7. Critical enablers facilitating the successful implementation of GSCM include strong top management commitment, effective supplier collaboration, access to green technologies, and supportive government policies.
8. Employee engagement and training in sustainability practices significantly enhance the effectiveness and acceptance of GSCM initiatives within organizations.
9. Collaborative networks involving suppliers, customers, and regulators enhance innovation and knowledge sharing, which are crucial for advancing sustainable supply chain solutions.
10. Significant barriers such as high initial costs, complex supplier networks, and lack of standardized environmental performance metrics hinder widespread adoption.
11. Consumer pressure and growing environmental awareness are key external drivers motivating businesses to adopt and expand green supply chain practices

Suggestions

1. Prioritize adoption of core GSCM strategies such as green procurement, eco-design, and reverse logistics to maximize environmental benefits across the supply chain.
2. Leverage digital technologies (e.g., IoT, blockchain) to enhance supply chain transparency, traceability, and monitoring of environmental impacts.
3. Implement systematic measurement and reporting of GSCM's impact on operational efficiency, cost savings, risk management, and customer satisfaction.
4. Strengthen top management commitment and foster a sustainability-focused organizational culture to drive successful GSCM integration.

5. Invest in employee training and engagement programs to improve awareness and effectiveness of green supply chain initiatives.
6. Enhance collaboration with suppliers, customers, and regulators to promote innovation and shared responsibility in sustainable supply chain management.
7. Advocate for supportive government policies and incentives to reduce barriers related to high initial costs and regulatory complexity.
8. Develop clear, standardized metrics and frameworks for measuring environmental performance and business outcomes linked to GSCM.
9. Balance short-term financial pressures with long-term sustainability investments by demonstrating the business value and competitive advantages of GSCM.
10. Adopt a lifecycle perspective in product design and supply chain processes to minimize environmental impact throughout the product's life.
11. Build and implement a conceptual framework that aligns GSCM strategies with organizational capabilities, external stakeholder pressures, and regulatory environments for sustained competitive advantage.

10.Conclusion

This study concludes the critical role of Green Supply Chain Management (GSCM) strategies in enhancing business performance and achieving long-term sustainability. The findings demonstrate that practices such as green procurement, eco-design, and reverse logistics are widely adopted across industries and positively impact operational efficiency, cost savings, and customer satisfaction. Successful implementation of GSCM is driven by strong leadership, effective supplier collaboration, technological innovation, and supportive policies, while challenges like high initial costs and complex supply networks persist. The developed conceptual framework underscores the interconnectedness of internal capabilities, external pressures, and regulatory factors in driving sustainable competitive advantage. As consumer demand for environmentally responsible products grows, integrating comprehensive green strategies into supply chain management not only fulfils corporate social responsibility but also positions businesses for resilience and profitability in a rapidly evolving market. Future research and practice should focus on overcoming existing barriers, standardizing performance metrics, and leveraging emerging technologies to further unlock the potential of green supply chains.

11.Scope for Further Study

While this research provides valuable insights into the integration of Green Supply Chain Management (GSCM) strategies and their impact on business performance, there remain several areas for further exploration. Future studies could expand the scope by conducting longitudinal analyses to assess the long-term effects of GSCM on financial and environmental outcomes. Additionally, investigating the role of emerging technologies such as artificial intelligence and blockchain in enhancing green supply chains would be beneficial. Sector-specific research, especially in underexplored industries like services or small and medium enterprises (SMEs), can provide a deeper understanding of unique challenges and best practices. Moreover, developing standardized metrics and benchmarking tools for evaluating sustainability performance across global supply chains could aid businesses in making more informed decisions. Finally, exploring the influence of cultural, geographic, and regulatory differences on the adoption and success of GSCM practices would help tailor strategies for diverse business environments.

References

1. Cazeri, G. T., Anholon, R., Ordoñez, R. E. C., & Novaski, O. (2017). Performance measurement of green supply chain management: A literature review and gaps for further research. Brazilian Journal of Operations & Production Management, 14(1), 60–72. https://doi.org/10.14488/BJOPM.2017.v14.n1.a7

2. Molina-Azorín et al. – "Environmental Performance Measurement for Green Supply Chains" (2017) – DOI: 10.1108/IJPDLM-02-2017-0062

3.Choudhary & Sangwan (2022) – DOI: 10.1108/BIJ-05-2021-0242

4. Molina-Azorín et al. (Asian Emerging Economies) – DOI: 10.1016/j.ijpe.2016.10.008

5. Tuni, Rentizelas & Duffy (2018) – DOI: 10.1108/IJPDLM-02-2017-0062

6. Rao & Holt (2014) – "Measuring Environmental Performance across a Green Supply Chain" – Vikalpa

7. Dey & Cheffi (2012) – "Green supply chain performance measurement using the analytic hierarchy process" (DOI: 10.1080/09537287.2012.666859)

8. Gunasekaran, Subramanian & Rahman (2018) – “Green Supply Chain Management Practices and Company Performance: A Meta-analysis Approach” (DOI: 10.1016/j.promfg.2018.10.052)

9. Green, K. W., Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green supply chain management practices: impact on performance. *Supply Chain Management: An International Journal*, 17(3), 290–305. https://doi.org/10.1108/13598541211227126

10. Govindan, K., Rajendran, S., Sarkis, J., & Murugesan, P. (2015). Multi-criteria decision-making approaches for green supplier evaluation and selection: a literature review. Journal of Cleaner Production, 98, 66–83 https://doi.org/10.1016/j.jclepro.2013.06.046

11. Zhu, Q., Sarkis, J., & Lai, K. H. (2008). Confirmation of a measurement model for green supply chain management practices implementation. *International Journal of Production Economics*, 111(2), 261–273. https://doi.org/10.1016/j.ijpe.2006.11.029

12. Tsoulfas, G. T., & Pappis, C. P. (2008). A model for supply chains environmental performance analysis and decision making. *Journal of Cleaner Production*, 16(15), 1647–1657. https://doi.org/10.1016/j.jclepro.2007.04.016

13. Sundarakani, B., de Souza, R., Goh, M., Wagner, S. M., & Manikandan, S. (2010). Modeling carbon footprints across the supply chain. *International Journal of Production Economics*, 128(1), 43–50. https://doi.org/10.1016/j.ijpe.2010.01.018

14. Tippayawong, K. Y., Pochanart, P., & Rassameethes, B. (2016). Factors affecting green supply chain operational performance of the Thai auto parts industry. *Sustainability*, 8(11), 1161. https://doi.org/10.3390/su8111161

15. Luthra, S., Garg, D., & Haleem, A. (2013). Identifying and ranking strategies to implement green supply chain management in Indian manufacturing industry using fuzzy TOPSIS. *Journal of Industrial Engineering and Management*, 6(4), 930–962. https://doi.org/10.3926/jiem.693

16. Sinaga, S. T. R., & Puspasari, M. (2022). Analysis of Green Supply Chain Management application in Indonesian automotive company. In Proceedings of the International Conference on Industrial Engineering and Operations Management (IEOM). https://doi.org/10.46254/na07.20220288

17. Luthra, S., Garg, D., & Haleem, A. (2013). Identifying and ranking strategies to implement green supply chain management in Indian manufacturing industry using fuzzy TOPSIS. *Journal of Industrial Engineering and Management*, 6(4), 930–962. https://doi.org/10.3926/jiem.693

18. Meliana, D., & Hasibuan, S. (2023). Key Performance Metrics for Green Warehousing in Manufacturing Supply Chains. *International Journal of Industrial Engineering and Management*. https://publikasi.mercubuana.ac.id/index.php/ijiem/article/view/29955

19. Surmacz, T. (2017). Performance evaluation of green supply chain management. Gospodarka Praktyce Teorii, 46, 85–92. https://doi.org/10.18778/1429-3730.46.06

20. Mirzaee, H., Samarghandi, H., & Willoughby, K. (2022). A robust optimization model for green supplier selection and order allocation. *arXiv*. https://arxiv.org/abs/2208.02926

21. Govindan, K. (2015). Multi-criteria decision-making approach for green supplier evaluation and selection: a literature review. Journal of Cleaner Production, 98, 66–83. https://doi.org/10.1016/j.jclepro.2013.06.046

https://primesupplychain.id/green-supply-chain-implementation-from-eco-procurement-to-reverse-logistics/

https://www.emerald.com/mscra/article/1/1/54/303590/Choosing-the-right-approach-to-green-your-supply

https://cleartax.in/s/green-supply-chain-management-gscm

https://jazindia.com/index.php/jaz/article/view/4187

https://www.gocomet.com/blog/green-supply-chain-management-and-its-importance/

https://www.sciencedirect.com/science/article/pii/S2949750724000993

https://www.emerald.com/bij/article-abstract/12/4/330/50616/Performance-measurement-for-green-supply-chain?redirectedFrom=fulltext

https://www.researchgate.net/publication/316949588_PERFORMANCE_MEASUREMENT_OF_GREEN_SUPPLY_CHAIN_MANAGEMENT_A_LITERATURE_REVIEW_AND_GAPS_FOR_FURTHER_RESEARCH?utm

https://journals.sagepub.com/doi/10.1177/0256090920140104

Wisner JD, Tan K-C, Leong GK. Supply chain management: a balanced approach. 3rd ed. Canada: South-Western Cengage Learning; 2012.

Rao P. Greening of suppliers/in-bound logistics – In the Southeast Asian Context. Greening the Supply Chain 2006; 189-204.

Srivastava SK. Green supply-chain management: a state-of-the-art literature review. International Journal of Management Reviews 2007; 9(1): 53-80. [4] Diabat A, Govindan K. An analysis of the drivers affecting the implementation of green supply chain management. Resources, Conservation and Recycling 2011; 55(6): 659-667.

Luthra S, Garg D, Haleem A. Green supply chain management. Implementation and performance – a literature review and some issues. Journal of Advances in Management Research 2014; 11(1): 20-46.

Beamon BM. Designing the green supply chain. Logistics Information Management 1999; 12(4): 332-342.

Mentzer JT. Supply chain management. United States of America: Sage Publications, Inc; 2001. [8] Chopra S, Meindl P. Supply chain management: strategy, planning, and operation. 4th ed. Upper Saddle River, New Jersey: Pearson Education, Inc; 201