

A Bibliometric and Thematic Review of Green Supply Chain Management Research: Trends, Intellectual Structure and Future Research Directions

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ABSTRACT

Purpose: The study directs to outline prominent facets of available literature, research streams and possible future research questions on Green Supply Chain Management (GSCM) to establish a prospective research agenda based on a comprehensive review of literature employing bibliometric analysis.

Design/Methodology/Approach: The present study performed bibliometric analysis on 80 documents from the international Scopus database. The VOS viewer software was adopted for bibliometric analysis.

Findings: Analysis of the documents recognized significant particulars of published literature, highlighted six relevant streams of research: (1) GSCM and Operational Efficiency, (2) GSCM and Competitive Advantage, (3) GSCM and Sustainable Performance, (4) GSCM and Environmental Performance, (5) GSCM and Manufacturing Sector, (6) GSCM and Social Performance and identified significant questions for future studies to help shape the forthcoming research strategy.

Practical Implications: The current analysis contributes significantly to the study by outlining a foundation for advances in research. The structure allows future scholars to investigate the web of relationships between six specified research streams as a future field of study.

Originality/Value: The present study is distinctive in its method of presentment and contribution. According to the researchers' insight, no published literature has covered GSCM in a thorough and extensive manner so far. Current research addresses the gap by executing bibliometric analysis. The study identified influential parts of published literature, identified research streams, and thereby presented a framework for future scholars to investigate further.

Keywords: Green Supply Chain Management, Sustainability, Cluster, Environment-friendly, Bibliometric analysis, Vos-viewer

INTRODUCTION

Supply chain management has traditionally been viewed as a process where in raw materials are converted into final products, and then delivered to the end-consumer (Rajesh et.al, 2012). Supply chain management has become increasingly complex and critical in today's globalized and interconnected business environment as the process involves extraction and exploitation of the natural resources (Srivastava, 2007). The waste and emissions caused by the supply chain have become one of the main sources of serious environmental problems including global warming and acid rain. Advanced technologies, data analytics, and a focus on sustainability are transforming traditional supply chain practices to meet the evolving demands of the market and consumers. The term "green supply chain" or "sustainable supply chain" refers to the concept of incorporating sustainable environmental activities into regular supply chains. This

can involve processes including supplier selection and material procurement, product design, manufacture and assembly, distribution, and end-of-life management. Green supply chain involves value addition and/or value creation through the operations of whole chain (Khan, 2018). Green Supply Chain Management (GSCM) refers to the way in which innovations in supply chain management and industrial purchasing may be considered in the context of the environment (Nimawat and Namdev 2012). GSCM consists of the involvement in activities that include reduction, recycling, reuse and the substitution of materials to make it environment-friendly. (Narasimhan et.al, 1998). It is integrating environmental thinking into a supply chain management, including product design, material resourcing and selection, manufacturing processes, delivery of the final product to the consumer as well as end-of-life management of the product after its useful life (Srivastava, 2009). However, GSCM is not just about being environment friendly, it is

also about good business sense and higher profit (Rituraj and Pradeep 2012). As environmental issues become more critical, GSCM is increasingly seen as an integral part of responsible and forward-thinking business practices.

Emergence of the concept – GSCM

In the year 1980s and 1990s, there was a growing awareness of environmental issues such as pollution, deforestation, and climate change. This heightened consciousness extended to business practices, including supply chain operations. The Kyoto Protocol (1997), an international treaty aimed at reducing greenhouse gas emissions, brought increased attention to the environmental impact of industrial activities. Companies began to consider the carbon footprint of their supply chains. The development and widespread adoption of environmental certifications, such as ISO 14001, and sustainability standards, like the Global Reporting Initiative (GRI), provided frameworks for businesses to formalize and communicate their green supply chain initiatives. However, the United Nations Conference on Environment and Development (UNCED), also known as the Rio Earth Summit, marked a significant moment in the global environmental movement. The summit highlighted the need for businesses to adopt sustainable practices, including those related to supply chain activities. In the 2012 Earth Summit convened in Rio de Janeiro, Brazil, the primary focus was put forward to “Sustainable Economic Development”. To protect the environment from getting despoiled, the international companies along

with the governments from different countries came to a common page and recognized the need for taking corrective action. (Prashant, 2014). Overall, the late 20th century and the early 21st century witnessed a gradual but significant shift towards environmentally responsible business practices, with GSCM playing a crucial role in meeting the challenges of a sustainable and socially responsible global economy. To gather a diverse literature on GSCM, we examined the Scopus database to cover the most relevant publications for our study. However, the study faced hurdles due to the limited quantity of papers and the fact that the first published article in the Scopus database was in 2008. Due to the lack of papers in the Scopus database prior to 2008, the current analysis only covered a 16-year period. A comprehensive assessment of Scopus database of articles was conducted using bibliometric analysis, a popular technique for identifying patterns across big datasets.

2. RESEARCH METHODOLOGY

The current study used a unique blend of qualitative analysis (literature review) and quantitative analysis (bibliometric analysis). The study employed VOS viewer software to conduct bibliometric analysis. Bibliometric analysis is a popular method for performing quantitative analysis based on similarity among articles in the bibliographic database (Bahoo et al., 2020). The detailed methodology employed for the current research has been laid out in Figure 1.

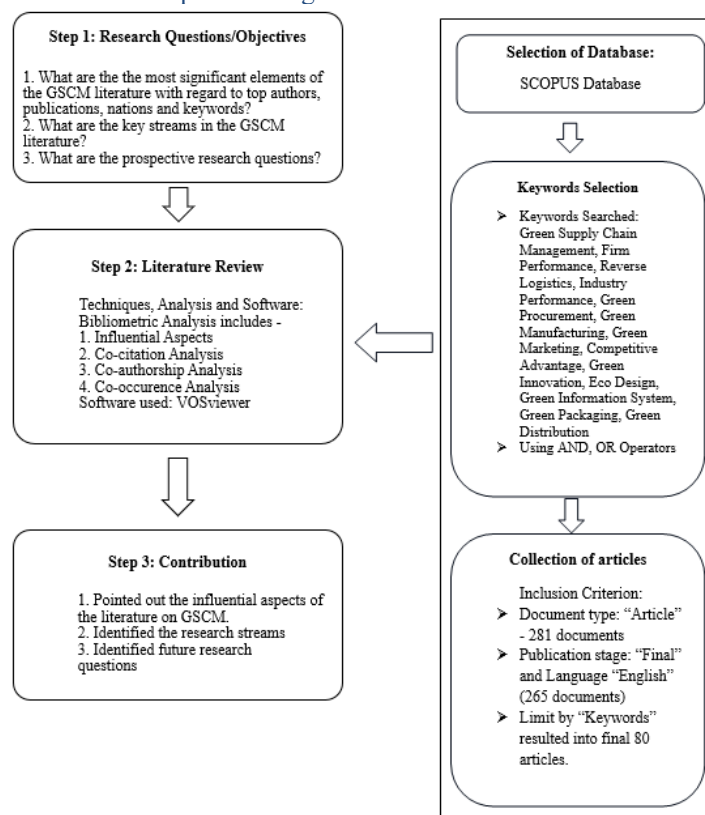


Fig.1 Methodology Structure

2.1 Database Selection

To achieve broad coverage of papers, the authors established a mechanism for exploring articles in

the database of Scopus. A total of 80 articles were found in Scopus with first article published in the year 2008. Scopus includes articles from highly regarded journals as

well as research from notable publishers such as Elsevier, Taylor & Francis, Wiley, Emerald and Springer. The current study reviewed the whole literature published between 2008 and 2023 dealing with the concept of GSCM.

2.2 Keywords Selection

To start with comprehensive data search, an array of keywords was searched to cover significant and cited documents. The International database of Scopus was searched using 'AND' or 'OR' Boolean operators with an array of keywords such as - ("Green Supply Chain Management" AND "Firm Performance") OR ("Green Supply Chain Management" AND "Reverse Logistics")

OR ("Reverse Logistics" AND "Firm Performance") OR ("Green Supply Chain Management" AND "Industry Performance") OR ("Green Procurement" AND "Firm Performance") OR ("Green Manufacturing" AND "Firm Performance") OR ("Green Marketing" AND "Firm Performance") OR ("Green Supply Chain Management" AND "Competitive Advantage" AND "Firm Performance") OR ("Green Innovation" AND "Firm Performance") OR ("Eco Design" AND "Firm Performance") OR ("Green Information System" AND "Firm Performance") OR ("Green Packaging" AND "Firm Performance") OR ("Green Distribution" AND "Firm Performance"). A total of 410 documents were found.

Table 1. Keyword occurrences in Title and Abstract.

KEYWORDS	OCCURENCES	
	TITLE	ABSTRACT
Green Supply Chain Management	27	44
Firm Performance	28	41
Reverse Logistics	5	19
Industry Performance	0	1
Green Procurement	0	2
Green Manufacturing	0	5
Green Marketing	6	9
Competitive Advantage	4	11
Green Innovation	17	21
Eco Design	0	2
Green Information System	1	2
Green Packaging	0	1
Green Distribution	0	3

Source: Scopus database and Author's own compilation.

2.3 Filtering

Filtering 410 documents by subject area of Business, Management & Accounting, Environmental Science, Decision Science, Social Science, Economics, Econometrics & Finance, Arts & Humanities and Multidisciplinary, the documents reduced to 337. Further inclusion criterion of document type 'article' reduced the documents to 281. Limiting the publication stage, "final" AND language, "English", the documents came down to 265. Further limiting the documents by keywords resulted into the output of 80 documents.

2.4 Collection of Articles (Initial Data Statistics)

From Scopus's international database, all articles available in English with the document type 'Article' and published until the year '2023' were examined for inclusion in the current study. This search criteria yielded a total of 80 documents, with the first article dating back to 2008. These papers were saved in Comma Separated Values (CSV) format as database and downloaded for bibliometric analysis. The download included keywords, summaries, citation information, and other information. As per Table1, the least frequency of occurrences of the above-mentioned keywords in abstract and title show a dearth of combination with GSCM, which justifies present research. Figure 2 represents the trend of GSCM articles for the last one and a half decade.

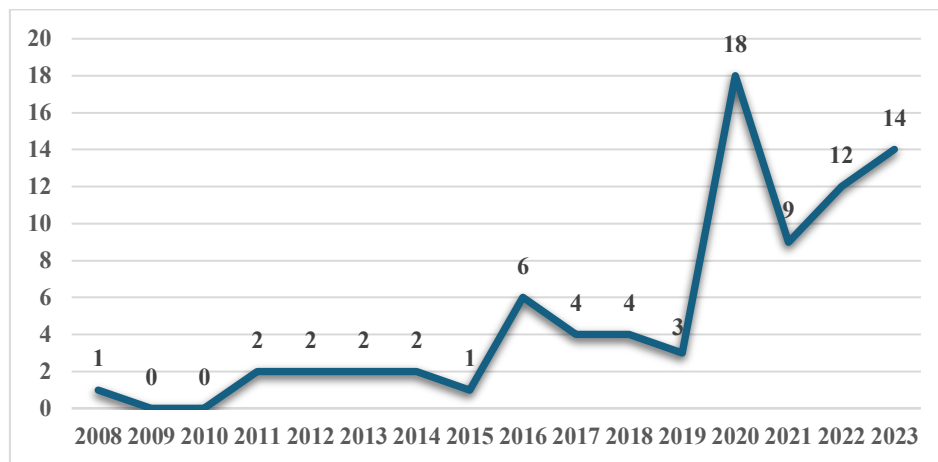


Fig.2 Total Articles on GSCM

The first article was published in year 2008. The graph depicts a very fluctuating trend with highest number of articles at 18 in year 2020. There has been a rise of 14 times the articles in 2023 as compared to the initial year i.e., 2008 which highlights the global increase of academic and industry interest in GSCM.

2.5 Data Analysis

In the current study, data is analysed employing bibliometric analysis and network analysis, as described in Sections 3 and 4, correspondingly. The bibliometric analysis is carried out with the VOS viewer software. The VOS viewer software is widely used for developing and visualizing bibliometric networks. Table 2 summarizes the literature search for bibliometric analysis.

Table2 Summary of Literature Search

DOCUMENT TYPE	JOURNAL ARTICLE
Language	English
Database	Scopus
Technique	Bibliometric Analysis
Software	VOS-viewer
Duration	2008-2023
Total number of articles	80

Source: *Scopus database and Author's own compilation.*

3. BIBLIOMETRIC ANALYSIS

Bibliometric analysis has been employed in a variety of research in the past, in conjunction with other software, to overcome the limitations associated with the approach used. Gong et al. (2019) employed bibliometric analysis to investigate the dynamics of GSCM. The current study conducted its bibliometric analysis using VOS viewer software. Bibliometric analysis is used to carry out co-

authorship analysis based on author and country, co-occurrence analysis based on keyword, and citation analysis based on sources, documents, countries, authors etc. Table 3 summarizes the documents selected for bibliometric study. The following subsections present the influential aspects of the published literature by visualizing co-authorship, sources, keywords, and country.

Table 3 Summary of Bibliometric Analysis

Description	Result
Sources	57
Total Research Documents	80
Articles	80
Total Authors	242

Total Countries/Territories	37
Total Funding Sponsors	14
Total Keywords	320

Source: *Scopus database and Author's own compilation.*

3.1 Author Influence

In a world of increasing competitiveness, GSCM research is at its peak. Similarly, scholars are conducting extensive research in this field. *Novitasari m.* (6 articles), *Agustia d.*

(4 articles), *Gupta s.* (3 articles), *Bag s.* (3 articles), and *Soewarno n.* (3 articles) are among the top ten authors who have worked in this area and produced a significant number of papers (Table 4). The work submitted can serve as a valuable reference for researchers in the future.

Table 4. Top 10 contributing authors – Document wise

Author	No. of Published Articles
Novitasari m.	6
Agustia d.	4
Gupta s.	3
Bag s.	3
Soewarno n.	3
Venkatesh v.g.	2
Ahmad w.n.k.w.	2
Bahrin a.s.	2
Shamsuddin a.	2
Sundram v.p.k.	2

Source: *Vos -viewer and Author's own compilation.*

Table 5 Top 10 contributing authors – Citation wise

Author	Citations
Katsikeas c.s.	280
Leonidou c.n.	280
Morgan n.a.	280
Bag s.	195
Sundarakani b.	160
Vel p.	160
Younis h.	160
Foerstl k.	152
Schaltenbrand b.	152
Schmidt c.g.	152

Source: *Vos -viewer and Author's own compilation.*

Table 5 depicts top 10 highly cited authors who have worked on the domain of GSCM. Some of the notable authors are *Katsikeas c.s.*, *Leonidou c.n.*, *Morgan n.a.* with 280 citations each. *Bag s.* with 195 citations and so on.

3.2 Co-Author Influence Statistics

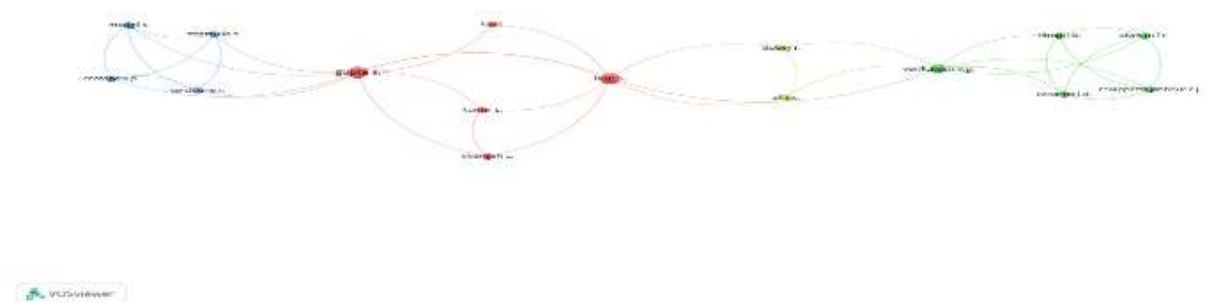


Fig.3 Visualization of Co-authorship map

In total, 242 authors were identified from the selected literatures. Co-authorship map based on authors with minimum threshold limit of one document for an author and one citation of an author, implies that out of 242 authors only 210 authors satisfy the threshold limit and out of this, the highest connected authors stand at 16 as visualized in figure 3. These 16 articles belong to 4 different clusters with Blue, Red, Yellow and Green color. Cluster 1 (5 items, Red), Cluster 2 (5 items, Green), Cluster 3 (4 items, Blue), Cluster 4 (2 items, Yellow).

Table 6 highlights top 20 authors in regards to the number of citations of their published articles as a single or multiple co-authorship in the broad field of GSCM. Out of 242 authors, 210 authors have minimum 1 citation and remaining 32 authors have no citation. *Morgan n.a.*, *Leonidou c.n.* and *Katsikeas c.s.* topped the list with 280 citations followed by *Bag s.* with 195 citations and so on.

Table 6 Influential Documents based on Citations, Documents and Total Link Strength.

Sl. No.	Author	Document(s)	Citations	Total Link Strength
1	Morgan n.a.	1	280	2
2	Leonidou c.n.	1	280	2
3	Katsikeas c.s.	1	280	2
4	Bag s.	3	195	8
5	Youngis h.	1	160	2
6	Vel p.	1	160	2
7	Sundarakani b.	1	160	2
8	Schmidt c.g.	1	152	2
9	Schaltenbrand b.	1	152	2
10	Foerstl k.	1	152	2
11	Tate w.l.	1	149	2
12	Mollenkopf d.a.	1	149	2
13	Kirchoff j.f.	3	149	2
14	Gupta s.	1	125	9
15	Hazen b.t.	1	124	2
16	Hanna j.b.	1	124	2
17	Cegielski c.	1	124	2

18	Cheng c.c.j.	2	101	0
19	Venkatesh v.g.	1	83	7
20	Ilmudeen a.	1	83	2

Source: Vos -viewer and Author's own compilation.

3.3 Country-wise statistics (Based on Geographical Region)

The current section describes the nations where in research on GSCM is prevalent. Figure 4 gives a clear visualization of country-wise network. Several countries, including China, the US, France, and others, have published literature that have a fair linkage with their published literature.

As per Table 7, out of 37 countries, there are only 14 countries which meet the threshold limit of minimum 3

documents and minimum 5 citations of a country. For each of the 14 countries, the total strength of the co-authorship links with other countries are calculated. United States topped with list with 12 documents, 858 citations and having a total link strength of 7 followed by United Kingdom with 4 documents, 406 citations with a total link strength of 4. However, India stands at 8th position with 7 documents, 119 citations and having a total link strength of 2.

Table 7 Top 14 countries are listed below along with their citations and documents.

Sl. No.	Country	Documents	Citations	Total Link Strength
1	United States	12	858	7
2	United Kingdom	4	406	4
3	China	9	251	7
4	France	5	160	9
5	South Africa	5	156	5
6	Taiwan	3	142	3
7	Malaysia	8	131	0
8	India	7	119	2
9	Canada	4	107	4
10	Indonesia	16	75	2
11	Vietnam	4	49	1
12	Turkey	6	42	3
13	Italy	3	21	4
14	United Arab Emirates	3	19	5

Source: Vos -viewer and Author's own compilation.

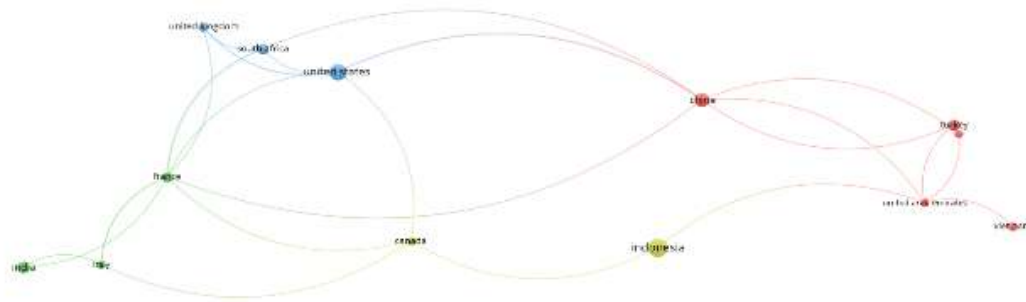


Fig.4 Co-country map

3.4 Top Influential Journals

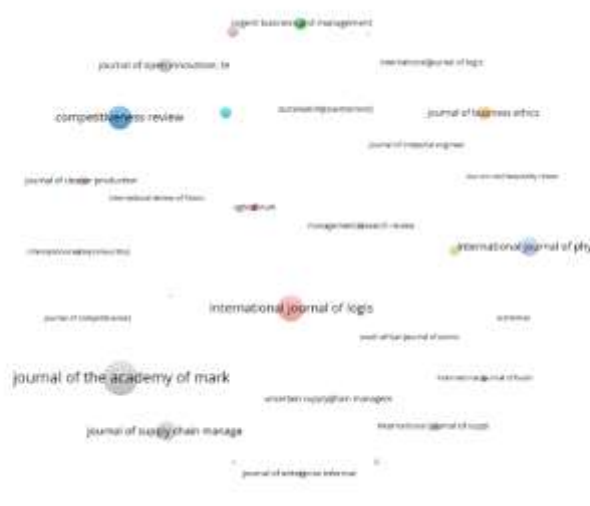


Fig. 5 Visualization of sources citation map.

A Citation map based on sources with threshold limit of at least one document and ten citations per source reveals that only 32 of the 57 sources match the requirement. However, these sources were not found linked with each other (Figure 5). Top 20 highly cited journals based on

citations are shown in Table 8. Journal of the Academy of Marketing Science topped the list with 02 documents and 317 citations, followed by International Journal of Logistics Management with 03 documents and 225 citations and so on.

Table 8 Influential journals based on citations

Sl. No.	Source	Document(s)	Citations
1	Journal of the academy of marketing science	2	317
2	International journal of logistics management	3	225
3	Competitiveness review	2	197
4	Journal of supply chain management	1	152

5	International journal of physical distribution and logistics management	1	149
6	Journal of open innovation: technology, market and complexity	3	110
7	Journal of business ethics	1	101
8	Cogent business and management	1	83
9	Journal of business research	1	79
10	Industrial marketing management	2	78
11	International journal of procurement management	1	72
12	Journal of cleaner production	1	70
13	International journal of supply chain management	11	65
14	Uncertain supply chain management	6	58
15	Journal of enterprise information management	1	56
16	Management research review	1	53
17	International journal of logistics system and management	1	51
18	Agbioforum	1	43
19	Sage open	1	42
20	Sustainability (Switzerland)	1	41

Source: Vos -viewer and Author's own compilation.

3.5 Top Influential Keywords

Analysis of Keyword statistics identifies the most commonly occurring keywords in 'Keywords' and 'Paper Titles.' This is a crucial evaluation to determine the most favoured and minimal studied keywords in order to suggest prospects for future research. Search engines rely heavily on keywords. Selecting the right keywords is critical for increasing the number of citations.

In total, 245 keywords have been recognized. The co-occurrence map based on keywords with threshold limit of minimum three occurrences of keywords reveals that only 20 of the 245 keywords fulfil this threshold limit and

are linked together. Figure 6 shows the co-occurrence map of GSCM with other keywords. It is found that GSCM is strongly related to keywords such as firm performance, reverse logistics, and green innovation.

According to the co-occurrence of keywords, the 20 keywords that topped the list were identified based on their most occurrences, as shown in Table 9. The table shows that "Firm Performance" and "Green supply chain management" appear 32 and 31 times in the articles, with link strengths of 46 and 54, accordingly This demonstrates scholars' rising interest in GSCM, which complements the direction of current research.

Table 9 Top Influential Keywords based on Occurrences.

Sl.No.	Keyword	Occurrences	Total link strength
1	Firm performance	32	46
2	Green supply chain management	31	54
3	Green innovation	17	22
4	Reverse logistics	12	21
5	Sustainability	7	13
6	Competitive advantage	6	14
7	Corporate social responsibility	6	13

8	Environmental performance	6	9
9	Green marketing	6	4
10	Supply chain management	4	10
11	Green supply chain	4	6
12	Environment	4	3
13	Green manufacturing	3	7
14	Green supply chain management practices	3	6
15	Operational performance	3	6
16	Supply chain integration	3	6
17	Supply chain	3	5
18	Environmental sustainability	3	4
19	Manufacturing industry	3	4
20	Sustainable performance	3	3

Source: Vos -viewer and Author's own compilation.

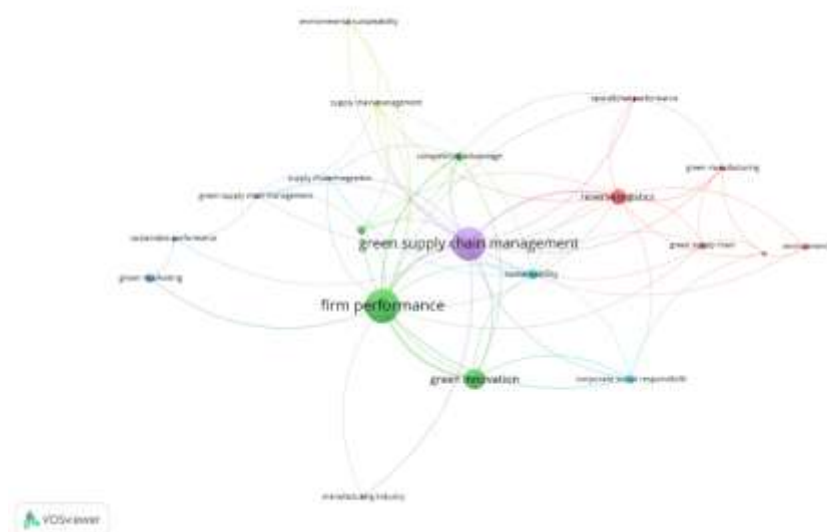


Fig.6 Visualization of keywords co-occurrence map.

3.6 Network analyses of research publications: Research Streams in GSCM Literature

3.6.1 Cluster Analysis

Keyword cluster analysis was used using VOS viewer software to determine the most important research streams. Figure 7 depicts the visualization of keywords after at least three occurrences. Six clusters of streams were identified based on repetition of keywords. The keywords were clustered into six colours: Red (*GSCM*

and *Operational Efficiency*), Green (*GSCM* and *Competitive Advantage*), Blue (*GSCM* and *Sustainable Performance*), Yellow (*GSCM* and *Environmental Performance*), Purple (*GSCM* and *Manufacturing Sector*) and Turquoise Blue (*GSCM* and *Social Performance*) that represents the six main research streams in the literature. (Figure 7). Table 10 details the 6 obtained clusters along with the keywords.

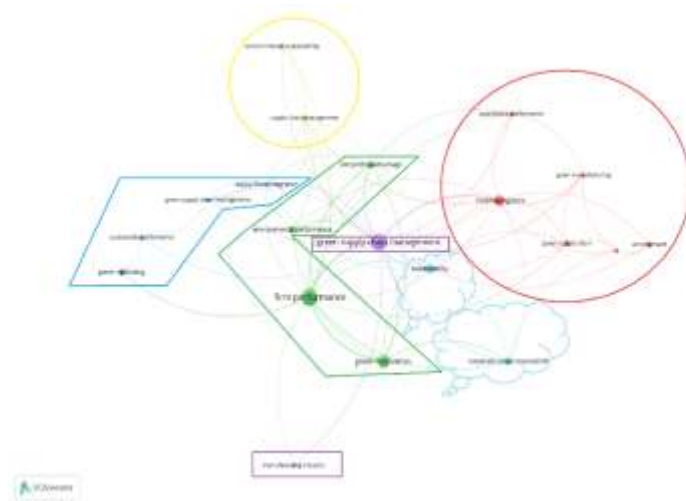


Fig.7 Visualization of keywords map using cluster analysis

Table 10. Significant Clusters with Keywords

Cluster	Color	Name of cluster	Keywords
Cluster 1	Red	GSCM and Operational Efficiency	Environment, green manufacturing, green supply chain, operational performance, reverse logistics, supply chain
Cluster 2	Green	GSCM and Competitive Advantage	Competitive advantage, environmental performance, firm performance, green innovation
Cluster 3	Blue	GSCM and Sustainable Performance	Green marketing, green supply chain management, supply chain integration, sustainable performance
Cluster 4	Yellow	GSCM and Environmental Performance	Environmental sustainability, supply chain management
Cluster 5	Purple	GSCM and Manufacturing Sector	Green supply chain management, manufacturing industry
Cluster 6	Turquoise Blue	GSCM and Social Performance	Corporate social responsibility, sustainability

Source: Vos -viewer and Author's own compilation.

4. RESEARCH PROPOSAL ON GSCM LITERATURE BASED ON CLUSTERS/STREAMS

Using cluster analysis, researchers recognized six research streams, including, (1) GSCM and Operational Efficiency, (2) GSCM and Competitive Advantage, (3) GSCM and Sustainable Performance, (4) GSCM and Environmental Performance, (5) GSCM and Manufacturing Sector and (6) GSCM and Social Performance and thereby developed a comprehensive framework of GSCM for future researchers. In the subsequent subsections, researchers provided feedback on research streams and proposed a structure for future researchers to follow.

4.1 GSCM and Operational Efficiency

The first stream identified is GSCM and Operational Efficiency. Operational Efficiency refers to an organization's capacity to deliver products or services to clients in the most cost-effective way possible while maintaining high quality. It is the ratio between the input

required to conduct a commercial operation and the output obtained from the firm. (Rasi et.al, 2016). It entails optimizing processes, minimizing waste, and efficiently utilizing resources in order to maximize output relative to input. While operational efficiency generally attempts to reduce costs and improve processes, GSCM incorporates an environmental dimension, ensuring that activities are not only effective but also sustainable. (Putri and Soewarno 2020; Schmidt et.al. 2017). Implementing GSCM methods leads to higher performance by boosting organizations' operational efficiency. (Somjai et.al, 2019). Researchers should investigate the impact of GSCM in improving business operating efficiency, as this critical link has received little attention in the published literature.

4.2 GSCM and Competitive Advantage

The second stream identified is GSCM and Competitive Advantage. Competitive advantage relates to the characteristics that enable a business to outperform its competitors. It is critical for a company to achieve larger sales, profitability, and client loyalty than its competitors

over time. The application of competitive advantage to achieve organizational performance enables the corporation to develop a sustainable strategy. (Novitasari and Augustia 2022). A comprehensive and integrated approach to GSCM can help companies retain their competitiveness and sustainability. (Shamsuddin et.al, 2020; Deshmukh & Vasudevan, 2014). Innovation, on the other hand has direct positive and significant influence on competitive advantage. The purpose of revolutionary innovation is to generate a long-term competitive advantage that improves corporate performance. (Novitasari and Augustia, 2022; Setyawati et.al, 2017). Future researchers ought to explore the vital linkage of GSCM with competitive advantage and innovation.

4.3 GSCM and Sustainable Performance

Sustainable performance refers to an organization's capacity to meet its commercial goals while also guaranteeing good environmental, social, and economic benefits. (Liboni et.al, 2023). Firms can achieve this by implementing GSCM strategies such as green marketing, end-of-life practices, eco-innovation, strategic supplier partnerships, and internal environmental management. (Antwi et.al, 2022; Leonidou et.al, 2013; Rameshwar et.al, 2013). This holistic approach to GSCM and Sustainable Performance assures that organizations may satisfy their current demands without jeopardizing future generations' ability to meet their own, hence further study should be supported in this area.

4.4 GSCM and Environmental Performance

ISO 14001 specifies environmental performance as indicators of the effectiveness of the environmental management systems that relate to the management of the company's environmental issues. (Putriand Soewarno 2020; Novitasari et al., 2023). It refers to how well a corporation manages and reduces its environmental impact. GSCM is critical for achieving strong environmental performance because it incorporates sustainable practices into each phase of the supply chain. (Liboni et.al, 2023; Surajit et.al, 2020). This comprehensive approach benefits not only the

environment, but also the company's entire long-term performance and prosperity. It is essential to analyze the impact on environmental performance that can be attributed to GSCM as of yet. (Muma 2014). Hence, more and more research should be encouraged.

4.5 GSCM and Manufacturing Sector

Although the manufacturing industry is a major contributor to economic growth, it is also one of the leading drivers of environmental degradation. This is because industries emit more emissions than other industries in order to meet customer expectations. (Shivam et.al, 2022; Alina et.al, 2020). GSCM is especially important in the manufacturing industry because of its high resource use, waste generation, emissions, and complicated supply chains. Despite increasing customer pressure and worldwide sustainability regulations, manufacturing organizations have been somewhat hesitant to convert from a traditional SCM structure to a GSCM framework. (Alina et.al, 2020; Veera et.al, 2017). The future researchers should investigate GSCM in relation to the manufacturing sector.

4.6 GSCM and Social Performance

Social performance refers to a company's ability to manage its societal impacts, including interactions with employees, customers, communities, and other stakeholders. It covers a wide range of Corporate Social Responsibility (CSR) topics, including ethical practices, fair working conditions, community engagement, and general social well-being. It's basically the social side of sustainable performance. (Novitsari et.al, 2023). GSCM is vital for attaining valuable social performance because it incorporates ethical, fair, and inclusive behaviours throughout the supply chain. (Novitasari and Augustia 2023; Younis et.al, 2016). Yet there has been a dearth of studies investigating the relationship between GSCM and social performance of companies, which should be addressed. Table 11 identifies the probable research questions based on the research gap of different research streams.

Table 11. Future Research Questions

Research Streams	Gap	Future Research Questions
GSCM and Operational Efficiency	The critical significance of GSCM in improving the firm's operational efficiency has not been explored well.	1. How does implementing GSCM methods affect organizations' operational efficiency? 2. What are the main elements influencing the relationship between GSCM and operational efficiency? 3. What are the primary motivators for organizations to adopt GSCM practices targeted at enhancing operational efficiency?
GSCM and Competitive Advantage	Few articles addressed the GSCM and Competitive Advantage combination.	4. How does the adoption of GSCM procedures affect a company's competitive advantage? 5. How does incorporating green innovation into the supply chain affect a company's market positioning and competitive edge?

		6. What are the long-term effects of sustained GSCM activities on competitive advantage and overall business effectiveness?
GSCM and Sustainable Performance	The crucial significance of GSCM in long-term sustainable performance has not been fully explored.	7. What is the impact of GSCM on sustainable performance of the company? 8. How can GSCM be incorporated into business strategy to improve long-term performance? 9. How does GSCM help businesses combine economic performance, environmental sustainability, and social responsibility? 10. What are the primary drivers and barriers for businesses embracing GSCM methods to improve long-term performance?
GSCM and Environmental Performance	Very little work to deal with Environmental Performance was observed.	11. How do specific GSCM strategies, including sustainable procurement and waste reduction, help to ensure environmental sustainability? 12. What impact does GSCM have on decreasing carbon footprints and other environmental indicators across industries? 13. How does the use of green technologies in supply chains affect overall environmental outcomes?
GSCM and Manufacturing Sector	Very research was done regarding the study of GSCM in Manufacturing Sector.	14. What are the key variables influencing the adoption of GSCM practices in the industrial sector? 15. How do GSCM techniques in the manufacturing industry help to reduce environmental consequences including emissions, waste, and resource consumption? 16. How does GSCM affect the environmental performance of various manufacturing processes and sectors (for example, automotive, electronics, and textiles)?
GSCM and Social Performance	The link between GSCM and social performance is not widely researched.	17. What impact does GSCM have on social sustainability, such as labour practices and community engagement? 18. How do GSCM techniques assist in improving social performance and corporate social responsibility (CSR)? 19. What are the consequences of GSCM for employee contentment and company culture in terms of sustainability?

Figure 8 proposes a framework for future research based on the 6 identified clusters and its gap. It proposes a direct impact of Green Supply Chain Management Practices (GSCM) on Sustainable Performance (SP) and an indirect impact of GSCM on SP through Competitive Advantage.

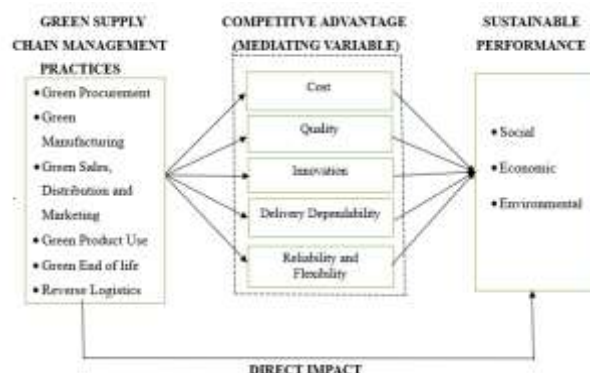


Fig.8 Proposed Framework for Future Research.

5. CONCLUSION

Rising environmental concerns, regulatory demands, and altering customer tastes are all tying the manufacturing sector's future to sustainability. GSCM will be important to address these difficulties and supporting long-term growth. The adoption of GSCM methods in the manufacturing sector will greatly improve the long-term performance of manufacturing enterprises. In the current study, a blend of qualitative techniques (literature review) and quantitative techniques (bibliometric analysis) were used to conduct an extensive evaluation of 80 articles from the Scopus international database to investigate the use of GSCM in the manufacturing industry. The bibliometric study was performed using the VOS viewer software. A thorough assessment of the literature on GSCM and Sustainable Performance in the manufacturing sector was conducted, employing co-citation analysis, co-authorship analysis, keyword analysis, and cluster analysis.

The work contributes significantly to the studies in the field of GSCM by (1) Identifying key aspects in the GSCM literature; (2) Identifying the streams of research; (3) Suggesting future research framework and (4) Proposing prospective research questions. The current analysis highlighted six streams of research: GSCM and Operational Efficiency, GSCM and Competitive Advantage, GSCM and Sustainable Performance, GSCM and Environmental Performance, GSCM and Manufacturing Sector and GSCM and Social Performance. Furthermore, it identified 19 research questions for future scholars to look into.

The study's shortcomings may first be related to citation analysis, as only top cited publications were evaluated in the study, though some dominant quality work might be available in other studies not chosen; secondly, the articles were limited to the Scopus database. As a result, future researchers are advised to do bibliometric analyses utilizing additional databases such as Web of Science, Google Scholar, and others, as well as new software for analysis. The function of GSCM in improving the long-term performance of the industrial industry is an emerging area that future studies should focus on.

REFERENCES

1. Antwi, S., Owusu, E. K., & Boateng, R. (2022). Greening the marketing mix: A key to sustainable supply chain performance. *Sustainability Journal*, 14(8), 4231.
2. Bahoo, S., Alon, I., & Paltrinieri, A. (2020). *Corruption in international business: A bibliometric analysis and research agenda*. *International Business Review*, 29(4), 101660.
3. Khan, M. (2018). *Green supply chain management: A study of industries in India*. *Journal of Cleaner Production*, 198, 1587-1596.
4. Leonidou, C. N., Katsikeas, C. S., & Morgan, N. A. (2013). "Greening" the marketing mix: Do firms do it and does it pay off? *Journal of the Academy of Marketing Science*, 41(2), 151-170.
5. Liboni, L., Cezarino, L., Alves, M., & Chiappetta, C. (2023). Translating the environmental orientation of firms into sustainable outcomes: the role of sustainable dynamic capability. *Review of Managerial Science*, 17(4), 1125-1146. <https://doi.org/10.1007/s11846-022-00549-1>
6. Muma, B. (2014). The impact of green supply chain management on environmental performance. *Journal of Environmental Management*, 132, 250-260.
7. Narasimhan, R., Talluri, S., & Mendez, D. (1998). *Supplier evaluation and rationalization via data envelopment analysis: An empirical examination*. *Journal of Supply Chain Management*, 34(1), 28-37.
8. Nimawat, D., & Namdev, V. (2012). *An Overview of Green Supply Chain Management in India*. *Research Journal of Recent Sciences*, 1(6), 77-82.
9. Novitasari, M., & Augustia, D. (2022). Assessing the Impact of Green Supply Chain Management, Competitive Advantage and Firm Performance in PROPER Companies in Indonesia. *Operations and Supply Chain Management*, 15(3), 395-409. <https://doi.org/10.31387/oscm0500355>
10. Novitasari, M., & Augustia, D. (2022). The role of green supply chain management and green innovation in the effect of corporate social responsibility on firm performance. *Gestão & Produção*, 29. <https://doi.org/10.1590/1806-9649-2022v29e117>
11. Novitasari, M., & Augustia, D. (2023). Competitive advantage as a mediating effect in the impact of green innovation and firm performance. *Business: Theory and Practice*, 24(1), 216-226. <https://doi.org/10.3846/btp.2023.15865>
12. Novitasari, M., Wijaya, A., Agustin, N., Gunardi, A., & Dana, L.-P. (2023). Corporate social responsibility and firm performance: Green supply chain management as a mediating variable. *Corporate Social Responsibility and Environmental Management*, 30(1), 267-276. <https://doi.org/10.1002/csr.2353>
13. Prashant, K. (2014). *Environmental sustainability through green supply chain management*. *International Journal of Scientific and Research Publications*, 4(4), 1-5.
14. Putri, D., & Soewarno, N. (2020). Firm performance in environmentally-friendly firms in Indonesia: The effects of green innovation. *International Journal of Innovation, Creativity and Change*, 13(4), 464-481. https://www.ijicc.net/images/vol_13/Iss_4/13444_Putri_2020_E_R.pdf
15. Rajesh, R., Pugazhendhi, S., Ganesh, K., Ducq, Y., & Lenny Koh, S.C. (2012). *Generic balanced scorecard framework for third party logistics service provider*. *International Journal of Production Economics*, 140(1), 269-282.
16. Rasi, R.Z.R.M., Abdekhodae, A., & Nagarajah, R. (2016). A conceptual framework for green supply chain management in Malaysian automotive industry. *Journal of Cleaner Production*, 141, 1029-1040.

17. Rituraj, A., & Pradeep, P. (2012). *Green supply chain management practices: A case study from Indian automotive industry*. *Journal of Operations and Supply Chain Management*, 5(1), 23-33.
18. Schmidt, C.G., Foerstl, K., & Schaltenbrand, B. (2017). The supply chain position paradox: Green practices and firm performance. *Journal of Supply Chain Management*, 53(1), 3-25.
19. Setyawati, M., Wicaksono, A., & Sugiyanto, S. (2017). Innovation and competitive advantage in the context of business performance. *Journal of Innovation and Entrepreneurship*, 6(4), 45-58.
20. Shamsuddin, A., Ahmad, W. N. K. W., & Peng, L. C. (2020). Green Supply Chain Management Practice and Performance of Manufacturing Companies in Batu Pahat, Johor. *International Journal of Supply Chain Management*, 9(1), 475–482. <https://ojs.excelingtech.co.uk/index.php/IJSCM/article/download/4308/2194>
21. Somjai, S., Jermstittiparsert, K., & Chankoson, T. (2019). Impact of green supply chain management practices on operational performance: The role of environmental performance. *International Journal of Supply Chain Management*, 8(3), 932-940.
22. Srivastava, S. K. (2007). *Green supply-chain management: A state-of-the-art literature review*. *International Journal of Management Reviews*, 9(1), 53-80.
23. Srivastava, S. K. (2009). *Moving toward sustainable supply chain management: A roadmap*. *Business Horizons*, 52(1), 123-132.
24. Younis, H., Sundarkarni, B., & Vel, P. (2016). The impact of implementing green supply chain management practices on corporate performance. *Competitiveness Review*, 26(3), 216–245. <https://doi.org/10.1108/CR-04-2015-0024>