

A Decade of Reverse Logistics Research (2013-2023): A Comprehensive Bibliometric Analysis of Trends, Influences, and Global Engagement

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Abstract. This study presents a comprehensive bibliometric analysis of Reverse Logistics (RL) research from 2013 to 2023, aiming to identify key trends, influential authors, institutional contributions, and global engagement within the field. Utilizing data from 1,650 articles retrieved from the Scopus database, the Analysis reveals the growing importance of RL in supply chain management and sustainability research. The study employs various bibliometric techniques, including authorship analysis, temporal Analysis, institutional contribution analysis, global participation analysis, journal impact analysis, keyword dynamics analysis, and citation network analysis. The results highlight the significant contributions of authors such as Govindan and Kannan, the steadily increasing number of RL publications over time, and the global nature of RL research, with strong participation from countries like China, India, and the United States. The study also identifies the most influential journals in the field, such as the Journal of Cleaner Production, and the core themes and emerging trends in RL research, including sustainable development and circular economy. However, the study is limited by its reliance on a single database and potential biases in selecting search terms and inclusion criteria. Future research should consider incorporating data from multiple sources and employing more diverse methodological approaches to understand the RL research landscape comprehensively.

Keywords: Reverse logistics, supply chain management, bibliometric analysis.

1. Introduction

In recent years, a heightened awareness of environmental sustainability and resource conservation has catalyzed a shift in supply chain paradigms, with traditional forward flows giving way to more holistic approaches encompassing the entire product lifecycle (Ahmed, 2023). The growing focus on Reverse Logistics (RL), which entails the organization, execution, and management of material backward flows, is an example of this progression from manufacturing and distribution points to points of recovery or proper disposal (Kazemi et al., 2019). RL represents a strategic opportunity for businesses to maximize resource value, minimize waste, and enhance profitability through the recovery and reuse of materials (Kaur & Awasthi, 2018). The potential benefits of implementing reverse logistics (RL) include decreased costs, preserved resources, and increased profitability. Transportation Costs: By streamlining shipments, cutting down on empty miles, and optimizing return routes, reverse logistics systems can save transportation costs (Chakraborty et al., 2018). Goods management: By controlling returns and unsold goods, holding costs can be decreased by minimizing write-offs and the requirement for additional inventory storage (Chaves et al., 2020). Processing Costs: Labor costs can be decreased, and operational efficiency raised by simplifying reverse logistics processes, such as refurbishment and return processing (El-Baz & Iddik, 2022). Customer Service Costs: Reducing the expenses related to customer complaints, inquiries, and discontent can be achieved by enhancing the return experience for customers. Material Recovery: Businesses can recover valuable materials and components by remanufacturing, repairing, and recycling returned goods. This lowers the demand for virgin resources and has a positive environmental impact (Kazemi et al., 2019). Energy Savings: Reusing or recycling products helps achieve sustainability and energy conservation goals since it usually uses less energy than creating new products from raw materials (Kaur & Awasthi, 2018). Waste Reduction: Reverse logistics projects contribute to waste reduction by keeping products out of landfills and incinerators and by encouraging the circular economy model, which reuses and recycles resources (Ramos et al., 2014). The concept of RL has gained significant traction across industries, driven by a growing recognition of its potential to align economic objectives with environmental stewardship. Initiatives such as take-back programs and the adoption of reusable packaging underscore the proactive measures undertaken by organizations to integrate RL practices into their supply chain operations (Chakraborty et al., 2018). The concept of Reverse Logistics (RL), which entails the planning, execution, and control of material flows backward, is a prime example of this evolution (Jayant et al., 2012; Rubio & Jiménez-Parra, 2017). Handling consumer returns of items to the manufacturer or merchant is known as reverse logistics (Elsayed, 2015). It entails product disposal, recycling, recalls, repairs, and returns. The following are some particular instances of reverse logistics projects and how they affect businesses and institutions: Product Returns Management: To manage customer product returns, many retailers and e-commerce businesses have set up effective return procedures. This includes supplying return labels, granting exchanges or refunds, and replenishing returned goods. Impact: Good returns management can minimize inventory write-offs, maximize inventory levels, lower return transportation costs, and increase customer satisfaction and loyalty (Rubio & Jiménez-Parra, 2017). Remanufacturing and Refurbishment: To restore returned goods to a marketable state, some businesses remanufacture or refurbish them. This includes fixing, tidying, and repackaging products that have been returned (Shou et al., 2018). Impact: Businesses can increase revenue streams, minimize waste, cut manufacturing costs, and prolong the lifecycle of their products through remanufacturing and refurbishment (De Brito & Dekker, 2002). Recycling and Disposal Programs: To appropriately eliminate returned or unsaleable goods, packaging, and other waste items, many businesses have recycling and disposal programs (Jayant et al., 2012). Impact: Adopting ecologically friendly disposal techniques can help with landfill waste reduction, corporate social responsibility (CSR) efforts, regulatory compliance, and brand reputation (Tutar et al., 2023). Product Recall Management: Businesses must effectively manage product recalls in order to remove faulty products from the market and replace or fix them in the event of product defects or safety hazards. Impact: Good recall management ensures product safety and

compliance, minimizes legal liabilities, preserves brand reputation, and upholds consumer trust (Elsayed, 2015). Asset Recovery and Remarketing: By reselling returned or end-of-life products through secondary markets, auctions, or liquidation channels, organizations can recoup value from these items (Golas & Bieniasz, 2016). Impact: Asset recovery and remarketing programs can minimize the financial burden of unsold inventory or returned goods while increasing revenue and optimizing resource use (Panigrahi et al., 2022). Closed-Loop Supply Chain: To minimize the need for new resource inputs, a closed-loop supply chain is designed with products and materials that are recycled or reused along the supply chain (Ahmad & Zabri, 2018). Impact: Closed-loop supply chains can help businesses adhering to the circular economy principles become more competitive while improving sustainability and reducing resource consumption and expenses (Aljaaidi & Bagais, 2020). In general, industries and organizations can benefit from cost savings, income generation, sustainability goals, customer happiness, and overall operational efficiency by implementing successful reverse logistics programs (Jama et al., 2023). brought to light the significant expense of reverse logistics, which in 1997 totaled around \$35 billion and made up about 4% of the cost of all logistics. Reverse logistics encompasses various operations, from basic resale to intricate procedures like recycling or remanufacturing. One such activity that receives this focus is the processing and administration of products for recovery reasons. While historically driven by resource scarcity, the emergence of mass consumption led to routine disposal without considering environmental concerns. However, environmental disasters in the 1970s, coupled with warnings about the limits to growth, shifted societal focus towards sustainability. Terms like recycling, reuse, and green products became commonplace, with legal enforcement of product recovery and disposal in Africa and stricter landfill regulations in East Africa. More recently, examples like the remanufacturing of mobile phones have underscored the profitability of recovery activities (Mohamud, 2023a). The evolution of the reverse logistics concept over time reflects a shift towards a holistic perspective, with the development of concepts like Closed-Loop Supply Chains (CLSC), emphasizing integration of forward and reverse flows (El Baz & Iddik, 2022). For instance, pioneering efforts by companies like Dell, which implemented a successful take-back program resulting in the recycling of a substantial portion of its plastic waste, demonstrate the tangible benefits of RL adoption (Abdulrahman et al., 2014). Despite the growing significance of RL in contemporary supply chain management, there exists a discernible gap in the literature regarding the systematic Analysis and synthesis of research trends, influential authors, institutional contributions, and global engagement within the field (Agrawal et al., 2015a; Govindan et al., 2015). This gap impedes the development of a comprehensive understanding of RL dynamics and limits the ability of stakeholders to identify emerging areas for research and intervention. To address this gap, this study employs a comprehensive bibliometric approach to analyze the scholarly landscape of RL research from 2013 to 2023. By examining authorship landscapes, temporal trends, institutional contributions, global participation, journal impact, keyword dynamics, and citation networks, this study seeks to provide valuable insights into RL research's evolution and current state. Through a rigorous analysis of a decade's worth of literature, by providing a comprehensive viewpoint on the intricacies and dynamics of reinforcement learning in the larger supply chain management framework, this research seeks to close the gap in the literature. The targeted research questions are:

1. What are the characteristics of the most prolific authors and influential contributors in Reverse Logistics (RL) research from 2013 to 2023?
2. When did RL publications experience notable shifts or trends, and how have citation patterns evolved?
3. Where are the main institutional contributors to RL research, and which institutions are vital hubs of academic activity?
4. Which countries are actively involved in RL research, and how do they collaborate globally?
5. Which journals impact RL research most, and what are their citation metrics?
6. What are the core themes and emerging trends in RL research based on keyword analysis?

7. What common themes and thematic clusters emerge in RL research based on citation network analysis?

2. Literature Review

Reverse logistics (RL) has gained increased attention in supply chain management (SCM) since it is so important for recycling, waste reduction, and managing product returns. Requirements for effective RL processes have grown significantly as companies work to implement sustainable practices and reduce their environmental impact (Chakraborty et al., 2018; Wang et al., 2017). Reverse logistics refers to the movement of resources, goods, and information from the place of origin or manufacturer back to the manufacturer. This concept goes beyond the conventional forward flows of supply chain management. (Chaves et al., 2020). This reverse flow presents unique challenges and opportunities, including the need for a successful recovery, recycling, and disposal of products and packaging materials (Govindan & Soleimani, 2017). One of the fundamental drivers of RL adoption is the rising awareness of environmental sustainability and corporate social responsibility (CSR) among businesses and consumers alike (Ayvaz et al., 2015; Govindan & Bouzon, 2018). By implementing RL practices, organizations can reduce waste, conserve resources, and mitigate the environmental footprint of their operations (El Baz & Iddik, 2022). In the last few years, scholars have conducted extensive research to explore various aspects of RL, including its impact on supply chain efficiency, cost-effectiveness, and the environment (Agrawal et al., 2015b; Govindan & Soleimani, 2017). This study yielded valuable insights into the strategies, technologies, and best practices associated with RL implementation across diverse industry sectors (Adabavazaeh & Nikbakht, n.d.). Furthermore, RL initiatives often involve collaboration among multiple stakeholders, including manufacturers, retailers, third-party logistics providers, and regulatory bodies (Mousavi et al., n.d.). Effective coordination and communication among these parties are essential for optimizing RL processes and maximizing value recovery from returned products (Ramos et al., 2014). Despite the growing body of literature on RL, there remains a need for comprehensive synthesis and Analysis of research trends, influential authors, institutional contributions, and global engagement within the field (Agrawal et al., 2015b; El Baz & Iddik, 2022). This literature gap impedes the development of a holistic understanding of RL and hampers efforts to identify emerging areas for further research and intervention. In response to this gap, the present study aims to conduct a rigorous bibliometric analysis of RL research spanning the past decade (2013-2023). By systematically examining authorship landscapes, temporal trends, institutional contributions, global participation, journal impact, keyword dynamics, and citation networks, this study seeks to provide valuable insights into the state of RL research and facilitate informed decision-making in this critical area of SCM.

3. Research Methodology

3.1. Research design

To evaluate previous study findings and ideas, researchers have used a wide range of quantitative and qualitative approaches (Bensalem & Kin, 2019). These techniques include bibliometric Analysis, meta-analysis, and systematic literature reviews based on frameworks (Tutar et al., 2023). In this study, we synthesize the current knowledge on reverse logistics using science mapping. Science mapping provides a methodical way to fully comprehend the landscape of Reverse Logistics research by analyzing literature and academic publications using bibliometric data (Wang et al., 2017). Researchers can objectively and quantitatively find meaningful correlations, similarities, and trends in articles using bibliometric Analysis, a frequently used review approach. With more qualitative reviews, there is a chance of idiosyncratic bias. This method helps reduce that risk. Scholars in various disciplines, including reverse logistics, have employed bibliometric techniques to assess the significance of particular journals, authors, and articles (Kushartadi et al., 2023). Furthermore, by highlighting important themes found in the literature, the integration of bibliometric Analysis with text mining and

content analysis makes science mapping easier (Wang et al., 2017). These methods offer insightful information on potential reverse logistics applications and the issues that must be resolved to be widely adopted and successful. Therefore, this work aims to perform a bibliometric review of reverse logistics research that spans ten years. We accomplish this by combining bibliometric and thematic analysis methods in a stepwise manner, beginning with the selection of the literature sample.

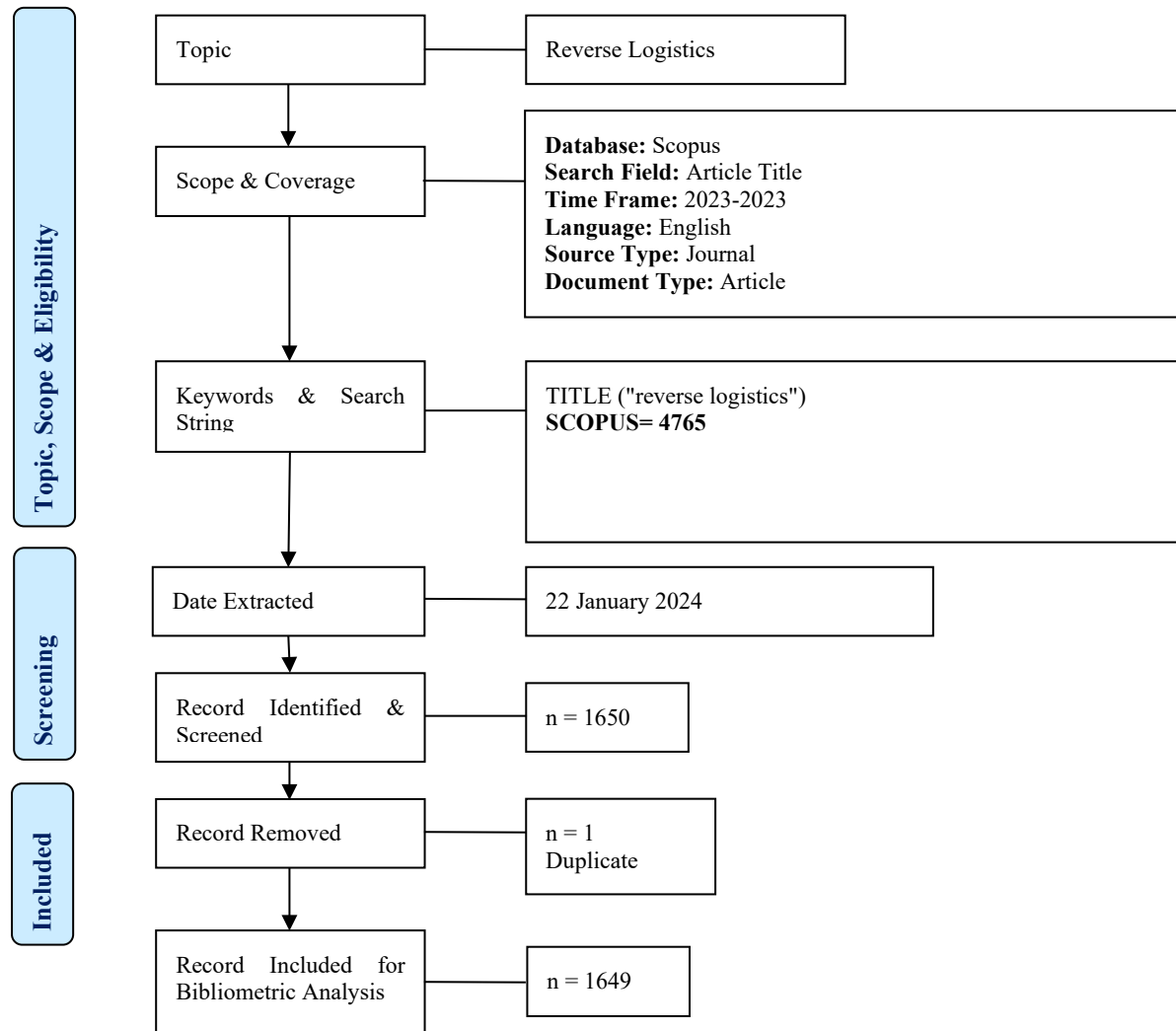


Fig. 1: Flow diagram of the search strategy

3.2. Getting and cleaning data

A substantial quantity of academic and professional literature was obtained from the Scopus database in order to conduct a comprehensive analysis of worldwide research on reverse logistics. For this study, electronic data from published articles on reverse logistics that were exclusively obtained from the Scopus database between 2013 and mid-2023 were used (Zhang et al., 2023). To ensure that the recovered papers were suitable for Analysis and to enable well-informed conclusions, independent appraisals of the articles were carried out using predetermined inclusion and exclusion criteria. Complete records and referenced references were included in the exported Scopus records, which were saved as CSV files and had extensive information. These documents included information about the year of publication, the author, affiliations, and the source journals (Abdullahi et al., 2023). The primary focus of the search technique was on titles, keywords, and abstracts to investigate hypotheses and content relationships related to reverse logistics. In addition, the search strategy used for this database's

Analysis focused on phrases frequently connected to reverse logistics. The research was limited to conference papers and journal articles published in the English language. Thus, the instructions for searching the database required searching for articles with the term "Reverse Logistics." After that, the data was thoroughly cleaned, meaning that any missing or incorrect entries were eliminated. The remaining entries were combined into a different Microsoft Excel (.xls) file after the data was cleaned. The new file was saved as a Text (tab-delimited) file for analysis reasons, which made it easier to import into VOSviewer.

3.3. Bibliometric Analysis

In recent years, several techniques have been employed to assess papers. The research evaluation methodology of bibliometric and citation Analysis is well-established, especially when examining the content and network of publications (Ellegaard & Wallin, 2015). The quantitative method of bibliometric Analysis is used to assess scientific publications. This technique makes authorship and keyword analysis easier while concentrating on various elements like authorship and keywords (Chang et al., 2015), Affiliation (Ellegaard & Wallin, 2015), geography (Zhuang et al., 2013), and topics (Zibareva et al., 2013). Furthermore, the international publication map was examined using VOSViewer, a program designed to produce and display bibliometrics maps. Quoting an article or issue allows users to use a text-mining algorithm to build and display a network or relationship. With various display settings and functions, such as scrolling, zooming, and searching, it can map longer articles and publications. With VOSViewer, individual data can be shown and depicted on the Bibliometrics graphic map (Mohamud, 2023b). Additionally, publications and researchers are frequently evaluated using citation and co-citation analysis (White, n.d.). Authorship, keyword, citation, and co-citation analysis were done in this instance. Bibliometric analysis visualization has recently caught the interest of academic publishers and research organizations (van Eck & Waltman, 2017) As a result, researchers used software such as VOSviewer, CiteNetExplorer, and BibExcle to visualize bibliometric Analysis. Therefore, we choose to use VOSviewer because it is practical software for bibliometric Analysis and provides apparent visualization (van Eck & Waltman, 2017) "Network," "bibliographic," and "text" data are the three forms of data that VOSviewer uses to build maps. Bibliographic data is utilized to give an Analysis of authorship, keywords, citations, and co-citations. We chose "create a map based on bibliographic data." All seven of the types of Analysis we wanted to perform were provided by the software after selecting Scopus as the source and uploading the generated CSV file.

4. Results and Discussions

4.1. Authorship Landscape

Authorship Landscape examines and delineates the top 10 authors influencing the field of Reverse Logistics, presenting insights into their article count and citation impact. Based on the bibliometric study, our article pool consisted of 4,149 authors, of which 3,404 had published at least one article. Table 1 lists the top 10 authors who were notably productive and influential. Among the top authors, Govindan, Kannan distinguished himself as a productive researcher with 27 articles and 4,234 citations. With at least seven publications and 340 citations each, these authors satisfied the requirements, demonstrating their significant impact in the field. Interestingly, most of the top authors have a background in management science, particularly in supply chain management, underscoring the interdisciplinary nature of the field.

Table 1: The top 10 authors, number of articles and citations

Authors	No. of Articles	No. of Citations
Govindan, Kannan	27	4234
Diabat, Ali	13	886
Bouzon, Marina	11	591
Paydar, Mohammad Mahdi	11	564
Soleimani, Hamed	9	1262
Hajiaghaei-Keshteli, Mostafa	8	455
Jha, P.C.	7	277
Kumar, Vikas	7	434
Sarkis, Joseph	7	1337
Tavana, Madjid	7	340

Source: Author (2024)

4.2. Temporal Analysis

Investigate the temporal evolution of Reverse Logistics publications by analyzing the yearly distribution of articles from 2013 to 2023. This objective aims to identify trends, shifts, and emerging focus areas over the specified time and assess how citation patterns have evolved. The graphs demonstrate the steady increase in articles regarding reverse logistics over time. There were 128 publications in 2013, but by 2022, there were 195. Additionally, while the average number of citations for publications published between 2018 and 2023 is increasing consistently, the number of highly cited articles is declining. As a result, the slope is declining because it requires more time to obtain citations for contemporary articles than for earlier ones. So, throughout time, the ratio of highly cited papers to all publications on the topic will remain constant. Researchers' continued interest in the publications and the subject matter is further evidenced by the quantity of highly cited articles. Reverse logistics is, therefore, still a significant topic after a few decades.

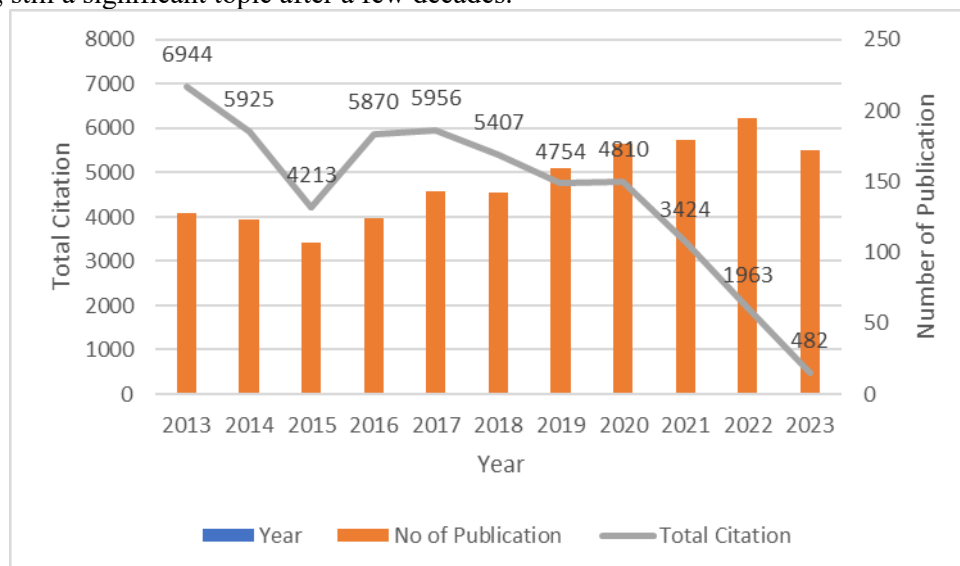


Fig.2: Publications by yearly

4.3. Institutional Contributions

Identify and assess the institutions contributing significantly to Reverse Logistics research. This involves mapping the institutional landscape to understand the key players and their impact on advancing research in Reverse Logistics, considering both publication and citation networks. Table 2 presents a comprehensive overview of affiliations contributing significantly to research in reverse logistics, with a focus on the number of documents and citations associated with each organization. The School of Industrial Engineering at the University of Tehran, Tehran, Iran, emerges as a notable hub, generating 13 documents and accumulating 631 citations, indicating a robust and impactful research output. The Department of Industrial Engineering at Babol Noshirvani University of Technology, Babol, Iran, closely follows with 12 documents and 579 citations, underscoring its substantial contribution to the field. Additionally, the Department of Mechanical and Industrial Engineering at Ryerson University in Toronto, Canada, exhibits a strong presence, producing ten documents garnering 659 citations. These top affiliations demonstrate a global distribution, including institutions in South Korea, India, Denmark, China, the United Arab Emirates, and further highlighting the interdisciplinary and international nature of reverse logistics research. To delve deeper into collaboration patterns and network dynamics among these affiliations, data ware analysis in VOSviewer will be instrumental, providing visual insights into the knowledge exchange and co-authorship relationships within this network of institutions.

Table 2: The affiliations contributing to Reverse Logistics

Affiliations	Documents	Citations
School Of Industrial Engineering, The University Of Tehran, Tehran, Iran	13	631
Department Of Industrial Engineering, Babol Noshirvani University of Technology, Babol, Iran	12	579
Department Of Mechanical and Industrial Engineering, Ryerson University, Toronto, Canada	10	659
Department Of Industrial Engineering, Yonsei University, South Korea	7	232
Department Of Management Studies, Indian Institute of Technology Delhi, New Delhi, India	7	438
Department Of Operational Research, University Of Delhi, Delhi, India	7	277
Center For Sustainable Supply Chain Engineering, Danish Institute for Advanced Study, University Of Southern Denmark, Denmark	5	235
China Institute of Ftz Supply Chain, Shanghai Maritime University, Shanghai, China	5	235
Masdar Institute of Science and Technology, Abu Dhabi, United Arab Emirates	5	331
Department Of Industrial Engineering, Mazandaran University of Science and Technology, Babol, Iran	5	78

Source: Author (2024)

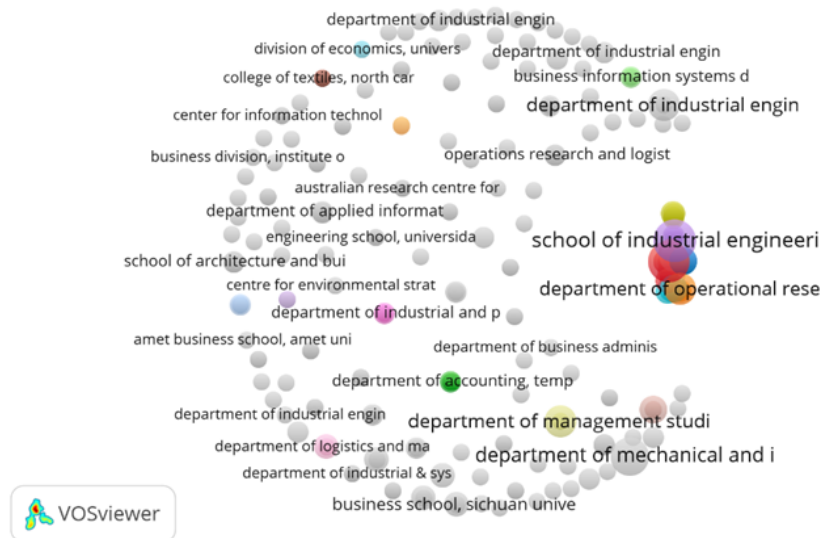


Fig.3: Visualization of institution collaboration network.

4.4. Global Participation

Delineate the global landscape of contributions to Reverse Logistics research by identifying and analyzing the countries actively involved. This objective provides a comprehensive overview of the geographical distribution of research activity in the field, incorporating citation network analysis. The Analysis of co-authorship networks assists in the definition of scientific partnerships (Liu et al., 2005). As a result, we completed the network analysis of the co-authors' nations. We generated a similar co-authorship study using VOSviewer, but this time, we selected "country" as the unit of Analysis to evaluate the coauthor's network of nations. The proportion of the countries is represented by the size of the circles, and the degree of connectivity is indicated by the size of the connecting lines. A remote demonstration is provided via VOSviewer. Since the distance between nodes indicates how related the nodes are to one another, the network analysis groups the more linked countries (van Eck & Waltman, 2017) Thus, we conducted the co-authors' country network analysis. We generated a similar co-authorship study with VOSviewer, replacing the unit of Analysis with "country" to evaluate the coauthor's network of nations. Whereas the connecting line size indicates the degree of connectivity, the circle size indicates the percentage of the countries. A remote demonstration is available using VOSviewer. Because node distance indicates node relatedness, the network analysis clusters the highly linked countries. The Analysis, utilizing VOS viewer to assess contributions from 98 countries based on Scopus data, highlights China as the leading contributor in Reverse Logistics research, with 271 documents and 7041 citations. India and Brazil follow, demonstrating significant scholarly outputs with 220 and 196 documents, alongside 6522 and 4009 citations, respectively. The United States, despite a lower volume of publications (167 documents), shows considerable impact with 8403 citations. Other notable countries include Iran, the United Kingdom, Canada, Turkey, France, and Malaysia, each showcasing a balance between document output and citation impact, albeit with varying degrees of research presence. This condensed overview underscores the diverse and significant contributions of these nations to the field, with China standing out for its dominant research influence.

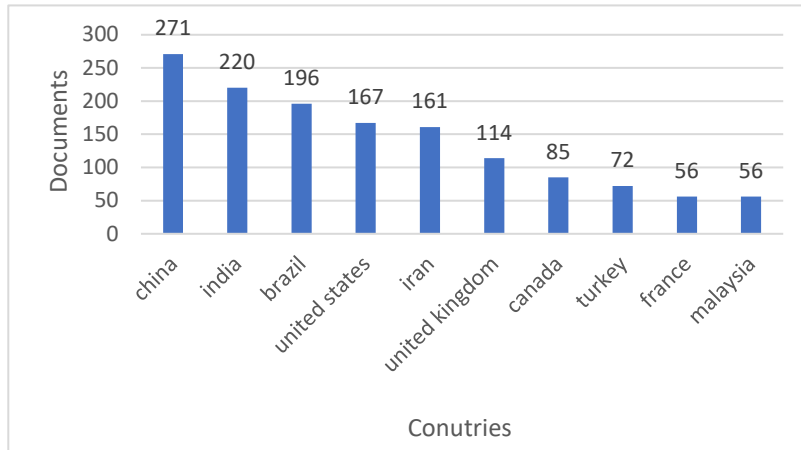


Fig.4: All the contributed countries

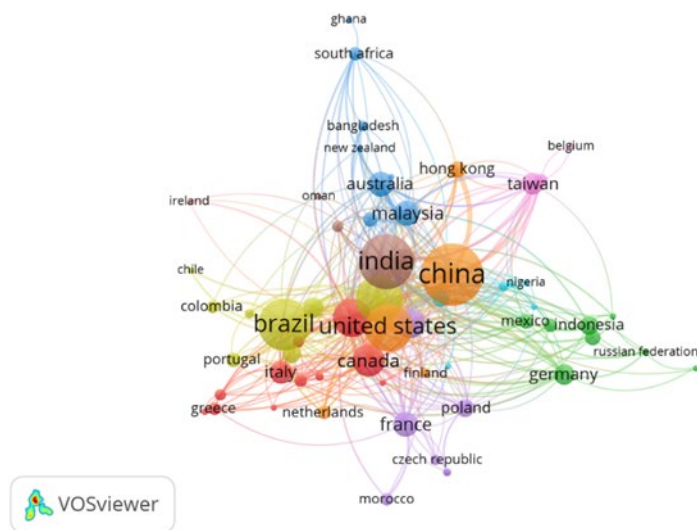


Fig.5: All the contributed countries' network map

4.5. Journal Impact Analysis

Conduct an in-depth analysis of the top 10 journals with the most-cited publications in Reverse Logistics. The top 10 journals with the most cited publications are listed in Table 3, along with information about each one, including the journal name, ranking, publisher, average Citations per Publication (CPP), total number of publications (TP), total number of citations (TC), Cite score, Source Normalized Impact per Publication (SNIP), Scimago Journal & Country Rank (SJR), and Cite score. Table 3 uses SNIP as a metric to assess the average CPP in each publication in relation to its potential for citation within the field of study (Waltman et al., n.d.). A journal is considered to have exceeded the citation potential in its field when its average CPP is more significant than one (SNIP score greater than 1). With 8641 citations, the journal "Journal of Cleaner Production" is the most cited, as the table below demonstrates. It is followed by "International Journal of Production Economics" (3290 citations) and "Sustainability (Switzerland)" (1326 citations). Furthermore, "Journal of Manufacturing Systems" has the highest Cite score of 16 and the highest SNIP of 3.137. Most journals are ranked by ScimagoJR in Q1 and Q2, as seen in the table.

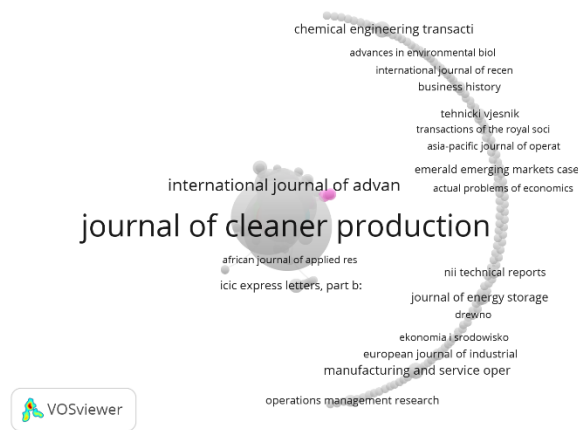


Fig.6: Journals with most-cited publications Network map

Table 3: Top 10 journals with most-cited publications

Journal name	TP	TC	CPP	Cite Score	SNIP	SJR	Ranking
Journal of Cleaner Production	143	8641	60	18.5	2.379	1.981	Q1
Sustainability (Switzerland)	96	1326	14	5.8	1.198	0.664	Q2
International journal of production economics	50	3290	66	19.3	2.918	3.028	Q1
Computers and industrial engineering	45	1922	43	11.9	2.238	1.76	Q1
Resources, conservation, and recycling	38	2857	75	20.3	2.771	2.682	Q1
Waste management	23	1333	58	15.1	1.912	1.745	Q1
Expert systems with applications	17	1722	101	12.6	2.582	1.873	Q1
Journal of Manufacturing Systems	17	1381	81	16	3.137	2.742	Q1
European journal of operational research	15	2185	146	11.2	2.706	2.371	Q1
Applied mathematical modelling	15	1576	105	9.4	1.743	1.08	Q1

Note: TP stands for total publication; TC stands for Total citations; CPP stands for citation per publication; SNIP stands for source normalized impact per paper; SJR stands for Scimago Journal Ranking

Source: Author (2024)

4.6. Keyword Dynamics

Identify and analyze the most frequently occurring keywords in Reverse Logistics research, along with their respective frequencies. This objective aims to unveil the core themes and evolving trends that have shaped discussions within the Reverse Logistics field, considering their prominence in citation networks. Using VOSviewer, keywords are extracted from abstracts and titles to provide a co-occurrence analysis (van Eck & Waltman, 2017), and before doing the network analysis, a ranking list is offered. Three units, including "All keywords," "Author keywords," and "Index keywords," are also provided for examination. We choose "All keywords" to include every connected term. Due to their frequent searches on Scopus, Reverse Logistics, and Logistics, they emerge as the most popular keywords. The keywords and their frequency are displayed in Table 4. Upon choosing "All keywords," the software sets minimum occurrence number of three, yielding a total of 935 terms. The keyword's network analysis is shown in Figure 5. Thanks to the search terms that were used on Scopus, supply chain management and reverse logistics are the two largest nodes and most closely related. Additionally, the cluster that includes reverse logistics and logistics also includes sustainable development, sustainability, and decision-making.

Table 4. The most repeated keywords and their number of occurrences

keywords	No. of Occurrences
Reverse logistics	1204
Logistics	515
Supply chain management	253
Sustainable development	240
Decision making	235
Sustainability	216
Circular economy	121
Environmental management	62
Green supply chain management	61
Reverse logistics	59

Source: Author (2024)

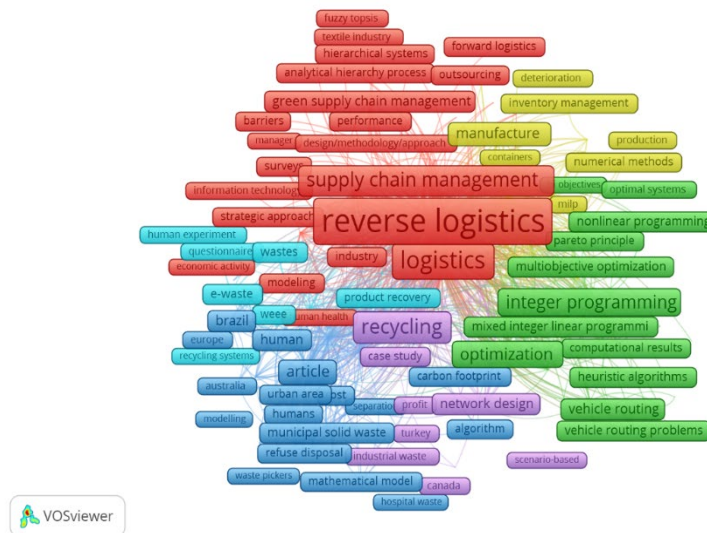


Fig.7: The keywords and their connection network map.

4.7. Citation network

In this part, we looked at the references listed in the reverse logistics publications that are most

commonly cited in order to identify recurring themes among the writers who cited these articles. The results of this subject's bibliometric Analysis using VOSviewer are graphically represented in Figure 8. Our research revealed that four separate clusters could be identified using the sources cited in the most-cited papers. For example, papers exploring the emergence of a theory of reverse logistics are shown by the red cluster. Likewise, the green cluster denotes articles that have explored the field of RL closed-loop supply chains. Furthermore, the blue cluster includes publications mostly devoted to investigating third-party providers, and the yellow cluster is linked to publications concerning RL practice and trends. The mentioned works inside the green and yellow clusters are not significantly similar, even if they are separated from one another and have tight links. On the other hand, other clusters—like the red and blue ones—are positioned next to one another and have a lot of links, which suggests that the referred works in these publication groups are more comparable to one another.

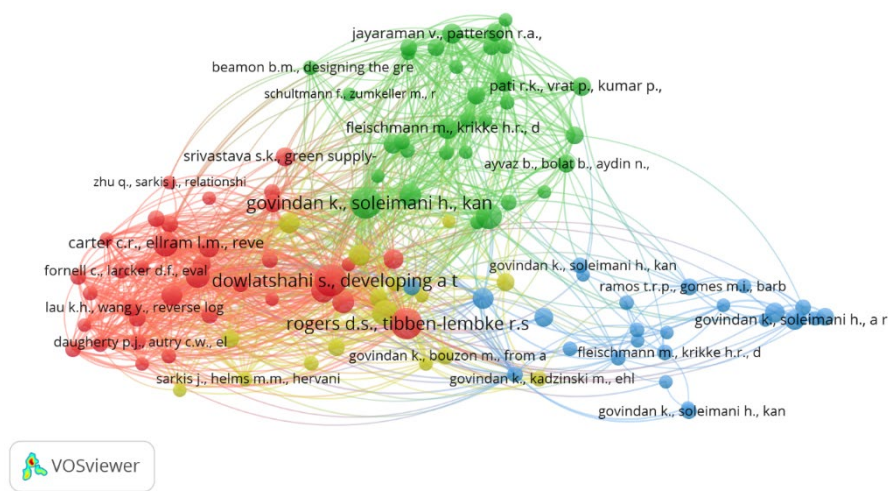


Fig.8: Author collaboration network

5. Conclusion

This comprehensive bibliometric Analysis of RL research from 2013 to 2023 provides valuable insights into the key trends, influential authors, institutional contributions, and global engagement within the field. The study demonstrates the growing importance of RL in supply chain management and sustainability research, with a steadily increasing number of publications and solid global participation. The Analysis also identifies the most influential journals in the field and the core themes and emerging trends in RL research, including sustainable development and circular economy. However, the study is limited by its reliance on a single database and the potential biases in the selection of search terms and inclusion criteria. Future research should consider incorporating data from multiple sources, employing more diverse methodological approaches, and conducting more in-depth qualitative analyses to gain a more comprehensive understanding of the RL research landscape. Despite these limitations, this study makes an important contribution to the field by providing a systematic and data-driven overview of the current state and future directions of RL research, which can inform the work of researchers, practitioners, and policymakers alike.

Contributions By the Author

All authors contributed equally to the conception, design, execution, Analysis, and interpretation of the research, ensuring its integrity and academic integrity.

Funding

SIMAD University contributed funding for data collection, Analysis, and publication fees to support this research. The study design, data interpretation, and manuscript preparation were all done independently of the sponsoring agency.

Conflict Of Interest

The authors declare no conflicts of interest related to the research, including financial interests, affiliations, or personal relationships. These can affect how results are interpreted or whether they are published.

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