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Mapping the Research Landscape of Reverse Logistics in E-Commerce: A Bibliometric Analysis from 2003 to 2023

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ABSTRACT

This study aims to conduct a comprehensive bibliometric analysis to map the research landscape of reverse logistics in e-commerce from 2003 to 2023. This comprehensive bibliometric analysis employs VOSViewer and R as essential methodological tools and searches into the evolving landscape of reverse logistics in the e-commerce era. The study uses the Scopus database to gather and thoroughly analyze 1073 documents from 2003 to 2023. With a specific aim to bridge existing gaps in the literature, the research not only identifies prolific authors, productive countries, and top frequent keywords but also utilizes publication and citation trends to highlight periods of growth and stability. Notably, the absence of African contributions prompts critical reflections on global research inclusivity. By providing a unified perspective on reverse logistics in e-commerce, this research enhances academic understanding and offers practical insights for supply chain management. Using VOSViewer and R adds methodological rigor and depth to the study's findings.

1. INTRODUCTION

The rapid growth of e-commerce can be attributed to several factors, including the wide range of options available to consumers, the transparency of pricing across different shops, the availability of discounts, and the increasing internet penetration worldwide. According to Statista's report on the global retail e-commerce market size in 2021, there was a significant increase of 228% in worldwide retail e-commerce sales from 2014 to 2020. The swift growth has resulted in a heightened level of complexity within the e-commerce supply chain. The expansion of e-commerce sales is accompanied by a significant % product return rate of 30%, which contributes a distinctive aspect to this intricacy [1]. The effectiveness of the material, financial, and informational streams within a supply chain is crucial for its success [2]. The scenario involving reverse logistics is similar, emphasizing the critical significance of maximizing the movement of materials, finances, and information, as previously elucidated.

Hence, it is imperative to consider the reverse logistics process and network architecture, which is a pivotal component of the supply chain. Kleminski et al. [3] defined reverse logistics as the systematic management of raw materials, in-process inventory, finished items, and associated information. This management process involves planning, implementation, and control stages.

Additionally, it is specified that this procedure must uphold its efficacy and cost-efficiency, spanning from the moment of consumption to the moment of origin, to reclaim value or ensure appropriate disposal. Reverse logistics might encompass remanufacturing and refurbishment operations within its scope. The topic of reverse logistics and its network design has been a significant subject of discussion due to the lack of information in logistics literature about the design of reverse logistics networks in e-commerce companies [4]. Return management has emerged as a crucial component of reverse logistics operations for an e-commerce company in the present scenario. Chen et al. [5] defined Returns management as the systematic management of activities related to returns, including gatekeeping and avoidance, inside the company and among the main participants of the supply chain.

Furthermore, research has demonstrated that implementing efficient return management practices can enhance customer loyalty, providing a competitive advantage [6]. The reverse logistics function in an e-commerce company primarily pertains to the process of handling returns [4]. Product returns can occur due to several reasons, such as defective products, product recalls prompted by rapid shifts in demand, returns for maintenance, repair, and overhaul purposes, and excess returns [7]. Within e-commerce, certain returned products possess high integrity and typically do not require any repairs. As a result, these products can be promptly reintroduced into the sales channels after a simple repackaging process [8].

Likewise, certain returned products may encounter issues with their quality and necessitate being sent back to the vendors for repairs [9]. Before taking action, companies should endeavor to identify and categorize the causes of returns and choose appropriate methods for recovery and disposal. Subsequently, the acquired data can be utilized to comprehend clients' behaviors and market trends, with a

specific emphasis on forthcoming supply chain modifications to enhance cost efficiency, minimize processing duration, and augment the value of returned products [5].

The investigation of bibliometric research in diverse fields, such as medicine [10], business [11], the environment [12], education [13], and manufacturing [14], has provided a comprehensive understanding of their scholarly progressions and present conditions. A comprehensive search was undertaken in the Scopus database in January 2024, using "bibliometric" as the key search term, to gain insights into the relationship between reverse logistics and e-commerce. The search sought to determine the extent and comprehensiveness of research in this specialized field. Although bibliometric studies have been conducted on many aspects of the supply chain, such as the analysis of e-commerce [15], the study on reverse logistics [16], and the examination of sustainable logistics in e-commerce [17], a significant deficit has been observed. There is an apparent absence of a thorough bibliometric analysis incorporating reverse logistics within the e-commerce framework.

This gap in the existing literature strongly motivates the present research. There is a distinct opportunity to combine these interconnected but previously separate areas to provide a unified perspective that can uncover the complex difficulties and solutions unique to reverse logistics in the e-commerce context. Engaging in a comprehensive bibliometric analysis is groundbreaking in the academic field and highly important in practical terms. This will improve our comprehension of the development, current complexities, and future possibilities of reverse logistics techniques in the rapidly expanding e-commerce industry. Addressing this deficiency can significantly enhance the academic research and practical approaches utilized in supply chain management.

2. METHODS

This paper employs scientific mapping to visually represent the current reverse logistics in e-commerce. Science mapping is a bibliometric technique for evaluating books and other scholarly works. An intriguing bibliometric analysis involves detecting and visually illustrating the relationships between developing and broadening scientific notions over time [18]. One could employ several criteria to analyze these connections, such as keywords, authors, publications, journals, institutions, and nations [19].

A science mapping study can be categorized into seven stages: data gathering, pre-processing, network extraction, normalization, mapping, analysis, and visualization [20]. Nevertheless, the software seamlessly incorporates several stages, executing them concurrently with minimal effort through a simple user interface. After setting the necessary settings, the VOSviewer software efficiently performs the five stages of network extraction, normalization, mapping, analysis, and visualization. According to other authors, these operations can be completed in three steps: identifying, obtaining, and examining the data [13] as this study used VOSviewer software to analyze the most productive countries in these fields. The following is a step-by-step account of the measures the study took to gather and analyze the data for this research.

2.1 Search criterion and data cleaning

Researchers can employ diverse bibliographic sources, such as online databases, to obtain and retrieve data for bibliometric analysis. Notable databases include Google Scholar, Scopus, the Institute for Scientific Information (ISI), and the Web of Science (WoS) [18]. The researchers in this study employed the Scopus database because of its comprehensive compilation of publications and broader scope compared to the WoS database [14]. Google Scholar was excluded due to the challenges of retrieving bibliometric data from its database and its less rigorous indexing criteria than Scopus and ISI (WoS).

Figure 1 shows all the stages taken as the first stage of this study entails creating the exact definitions of phrases or keywords that will be utilized to gather information regarding reverse logistics and e-commerce. Extracting significance from the keywords and carefully analyzing word derivatives and equations is crucial. The Scopus database, accessible at www.scopus.com, is extensively utilized as the leading worldwide indexer for identifying reference papers of outstanding caliber. This stage aims to select the most relevant articles from the initial search keyword results and then save them. The study leveraged the comprehensive and well-structured Scopus database to build a robust foundation for the investigation. The search scope was restricted to articles related to reverse logistics and e-commerce using multiple search terms. The search queries employed relevant terms such as "reverse logistics" OR "reverse supply chains" OR "product return" AND "e-commerce" OR "online shopping" OR "technology" OR "innovation" to refine the search to English language publications during the chosen period of 2003 to 2023. Furthermore, by limiting the search to the specific timeframe of 2003-2023, we can effectively capture the latest advancements and trends in reverse logistics and e-commerce. This approach also ensures that we obtain a comprehensive historical perspective.
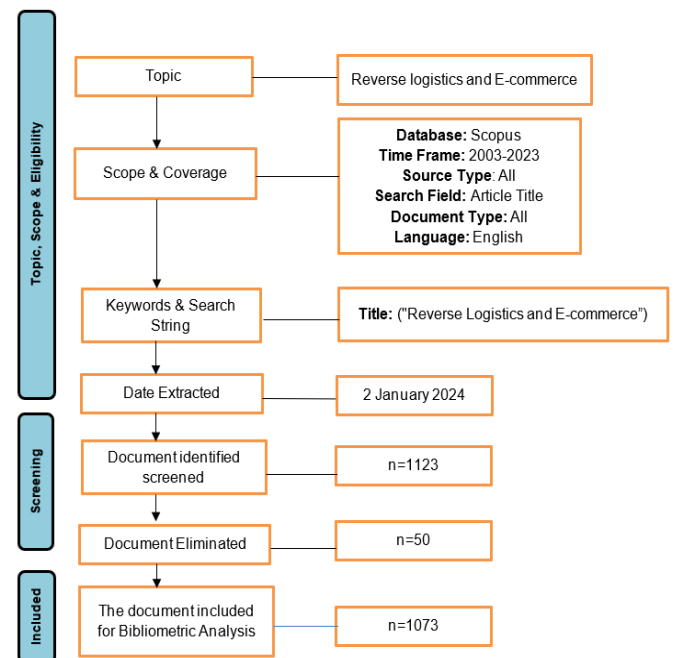

Figure 1. Flow diagram of article searching strategy of food supply chain documents

After locating the data in the database, it was exported as Comma-Separated Values (.csv) files using the previously mentioned instructions. Due to limitations on the Scopus website, I can only quickly extract all the bibliometric data for the initial 2,000 entries. We need data exclusively from the

100 most-cited articles for our research. Consequently, we exported only 2,000 articles and disregarded the remaining ones. Subsequently, the researchers rectified the data by identifying and correcting any missing or erroneous items. A practical approach to achieve this objective is to verify that all essential fields are included and that the data entered corresponds accurately to the field labels. For instance, the author field should not contain the publisher's name. The data cleaning process eliminated 50 erroneous, missing, and duplicated records. After completing the data-cleaning process, the remaining entries were transferred to a distinct Microsoft Excel (.xls) file. To facilitate import into VOSviewer, the new file was saved as a Text file with tab-delimited formatting for analysis purposes.

2.2 Bibliometric analysis

Bibliometric studies offer diverse possibilities for comprehending the importance of all research endeavors. Bibliometric analysis employs a combination of quantitative and qualitative methods to examine the publication of journals and articles, including examining their citations over time [21]. It assesses the current research status of a country and institution by quantifying their scientific achievements. This assessment has historically significantly impacted policy decisions and the advancement of scientific knowledge [22]. This feature also enables researchers to identify and assess the extent of study topics, strategically organize their targeted mindset, and anticipate future trends [15]. This method offers a statistical output that calculates and estimates the quantity and growth patterns within a particular domain [23]. Multiple studies have investigated the food supply chain with the bibliometric technique [24]. This study offers a quantitative analysis of the existing literature by establishing correlations among different keywords associated with the food supply chain. This standardized method is used to calculate and evaluate written communication between authors [25]. It involves measuring and analyzing various aspects of a specific research area, such as research titles, keywords, affiliations, authors, and article publication [26]. It also considers networks and countries [18] and co-authorship links, co-citation links, and bibliographic coupling links, which can be used to create citation maps that visualize clusters or themes [22].

Additionally, it has applications in supply chain management [23]. This study utilizes Scopus databases to obtain the required information. It has been selected as the primary source for the largest database of abstract indexing. Previous studies have recommended it for its ability to cover a wide range of areas and offer comprehensive search options. This helps researchers develop accurate search strings, particularly in broad research areas [26, 27].

2.3 Thematic evaluation

Thematic evolution is a novel research technique presently the most widely accepted approach for employing multiple disciplines to quantify a specific research field's development, progression, and movement over time, aiding scholars in comprehending the systematic growth of a particular research area. This work employed Biblioshiny, a shiny application designed for the Bibliometrix R package, to map theme assessment [28]. To examine the evaluation theme, the proportion of keywords used by all authors is represented by plotting the subject direction on a coordinate axis. The

expansion and contraction of the alluvial region exemplify temporal variations in scale.

3. RESULTS AND DISCUSSIONS

3.1 Descriptive analysis

The study examines the literature on reverse logistics developments in e-commerce, analyzing 596 sources from 2003 to 2023. As shown in Table 1 below the dataset consists of 1073 documents, with a 16.8% annual growth rate indicating a continuous interest in the topic. The average age of the documents is 7.15 years, indicating a substantial amount of up-to-date content. The citation metrics show a significant influence, with 22.51 citations per document, indicating the importance of the research among scholars. The study uses a wide range of keywords, including 4496 Keywords Plus and 2617 Author's Keywords, to comprehensively examine the subject. The study includes 2596 writers, with 106 contributing to publications. Collaboration is evident, with 113 documents authored by a single individual and an average of 3.03 co-authors in each document. The international co-authorship rate of 19.85% emphasizes global cooperation in researching reverse logistics in e-commerce. The dataset includes various document categories, demonstrating a thorough approach to analyzing reverse logistics trends. This bibliometric analysis demonstrates a dynamic, internationally cooperative, and influential environment.

Table 1. Overview of the bibliographic information

Description	Results
Main Information about the Data	
Timespan	2003:2023
Sources (journals, books, etc)	596
Documents	1073
Annual growth rate %	16.8
Document average age	7.15
Average citations per doc	22.51
References	43903
Document Contents	
Keywords plus (ID)	4496
Author's keywords (DE)	2617
Authors	
Authors	2596
Authors of single-authored docs	106
Authors Collaboration	
Single-authored docs	113
Co-authors per Doc	3.03
International co-authorships %	19.85
Document Types	
Article	599
Book	8
Book chapter	55
Conference paper	337
Editorial	3
Retracted	4
Review	66
Short survey	1

3.2 Publication and citation trends over the years

The report thoroughly analyzes the reverse logistics patterns in e-commerce over the years. Figure 2 displays intriguing patterns in the publishing and citation trends. From 2003 to 2008, there was a discernible rise in the number of documents

and citations. The number of documents experienced a growth from 6 in 2003 to 32 in 2008, while the total number of citations surged from 220 to 1519 during the corresponding time frame. This indicates an increasing interest and acknowledgment in reverse logistics in the e-commerce sector.
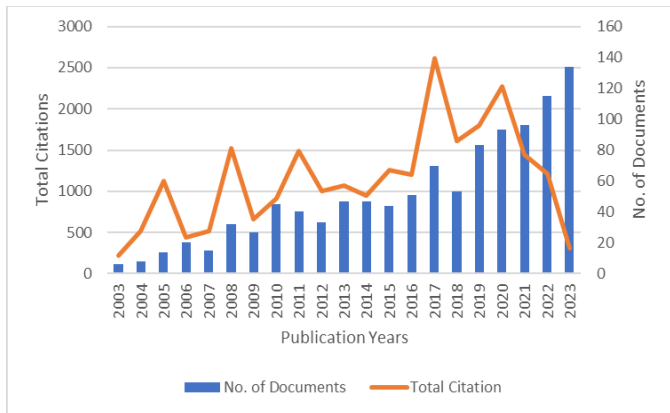

Figure 2. Publication and citation trends

From 2009 to 2013, a steady and relatively stable presence was observed, with minor variations in the number of papers and the total number of citations. The number of documents ranges from 27 to 47, while the number of citations fluctuates between 663 and 1075 during this period. This suggests a consistent interest in the topic with different levels of scholarly contributions.

Significantly, between 2014 and 2018, there is a noticeable increase in the quantity of papers and the overall number of citations. The document count varies between 47 and 83, whereas the number of citations rises from 947 to 1801. This time frame demonstrates a notable increase in the quantity and influence of research, indicating a development and transformation of the reverse logistics field in e-commerce.

From 2019 to 2023, there will be a significant increase in the number of documents and the total number of citations. In 2023, 134 documents and 303 citations peaked, demonstrating a significant increase in scholarly activity and recognition.

This growth may indicate a heightened recognition of the significance of reverse logistics in the changing realm of e-commerce. Hence, the bibliometric analysis of the study emphasizes the gradual expansion and acknowledgment of reverse logistics trends in the e-commerce era. The trends demonstrate a consistent and enduring interest over time, with noteworthy surges in research productivity and influence, indicating the importance of this field in the academic domain.

3.3 Most productive authors

The field of reverse logistics in e-commerce research, from 2003 to 2023, features 2069 individual authors, focusing on the twenty most prolific contributors as shown in Table 2, offering valuable insights into the domain's academic influence and evolution. Among these, Gupta S emerges as a prolific author with 150 publications, indicating a significant and broad engagement with the subject matter. This contrasts with authors such as Liang C and Liu X, who, with 4 and 3 publications, might represent either new entrants or specialists within more niche areas of this field. The Number of Publications (NP) thus serves not only as a measure of productivity but also as an indicator of the breadth and depth of each author's engagement with the topic.

Regarding Total Citations (TC), which reflects the academic community's reception and recognition of the work, Shankar R stands out with 608 citations, suggesting a strong influence and the high relevance of his research. This high citation count and an initial publication year of 2005 positions Shankar R as a seasoned and well-established voice in the field. On the other hand, authors like KONGAR E, despite a substantial publication count of 142, have a relatively lower citation number (215), potentially pointing to a more recent foray into the field or a focus on less frequently cited niche topics. The analysis of the Year of First Publication (PY_start) further enriches this understanding, revealing the dynamic nature of the field where experienced researchers with extensive histories coexist and interact with newer academics rapidly making their mark, collectively shaping the trajectory of research in reverse logistics in e-commerce.

Table 2. Productive author

Authors	TC	NP	h_Index	g_Index	m_Index	PY_Start
Gupta SM	150	10	6	10	0.316	2006
Shankar R	608	6	6	6	0.3	2005
Genchev SE	554	5	5	5	0.25	2005
Kazancoglu Y	225	5	5	5	1	2020
Li X	338	9	5	9	0.263	2006
Agnusdei GP	55	4	4	4	1.333	2022
Chen H	334	7	4	7	0.2	2005
Chileshe N	129	7	4	7	0.364	2014
Govindan K	445	6	4	6	0.308	2012
Gunasekaran A	200	4	4	4	0.364	2014
Guo J	155	6	4	6	0.4	2015
Hazen BT	215	4	4	4	0.286	2011
Kongar E	142	4	4	4	0.2	2005
Kumar A	65	8	4	8	0.444	2016
Li J	36	9	4	5	0.211	2006
Li Y	62	9	4	7	0.286	2011
Li Z	100	7	4	7	0.308	2012
Liang C	43	4	4	4	0.4	2015
Liu X	133	8	4	8	0.4	2015
Rameezdeen R	129	7	4	7	0.364	2014

NP: Number of publications; TC: Total citation; 1PY: Year of 1st publication

3.4 Most productive countries

The study examined the worldwide trends in reverse logistics within the e-commerce framework. This is demonstrated by analyzing document distribution and citations across different countries.

Figures 3 and 4 show the most productive countries; Figure 4 highlights China's significant position in the sector, with 297 documents and 3226 citations. This demonstrates a strong research output and significant academic influence, highlighting China's leadership in investigating and contributing to reverse logistics trends in the e-commerce industry.

The United States establishes itself as a prominent participant in generating documents and exerting influence through citations. The United States has a significant research presence and exerts enormous influence on the discourse on reverse logistics in e-commerce, as evidenced by 157 documents and a remarkable 6916 citations.

India closely adheres to this trend, making a significant contribution of 109 documents and earning an impressive 3022 citations. India's significant involvement in the discussion on reverse logistics trends in the e-commerce era positions it as a crucial actor, highlighting its active engagement with the subject.
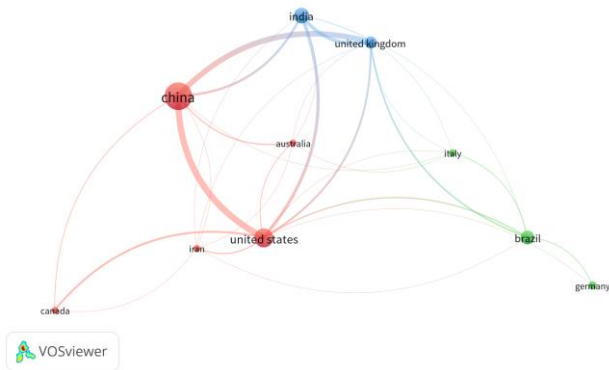

Figure 3. Most productive countries

Brazil, with 92 documents and 1876 citations, demonstrates significant engagement in the research field, establishing itself as a prominent participant in the discussion on e-commerce reverse logistics. The data indicates substantial scholarly engagement and influence among the Brazilian academic community.

The United Kingdom, Germany, and Italy contributed 72, 38, and 32 documents, showcasing their dedication to investigating reverse logistics trends in the e-commerce sector. Although the quantity of documents produced by the UK, Germany, and Italy is relatively low, their citation numbers (2603 for the UK, 520 for Germany, and 936 for Italy) demonstrate a significant impact and influence on the world arena.

Canada, Iran, and Australia also contribute significantly to the field, with 29, 28, and 27 documents, respectively. The citation numbers (1422 for Canada, 814 for Iran, and 845 for Australia) indicate a significant academic reputation and influence, reinforcing their positions in the current scholarly discourse.
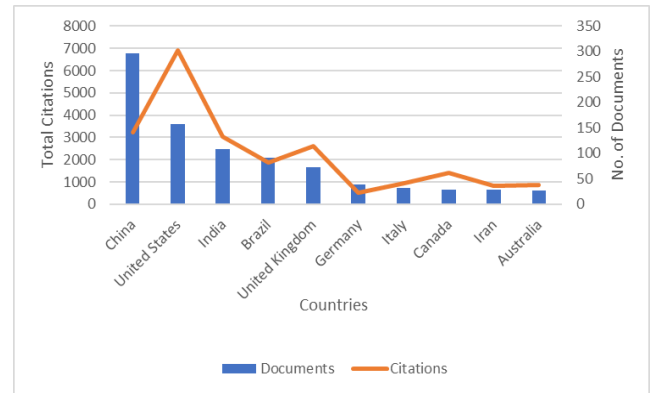

Figure 4. Most productive countries

Although the analysis received widespread global attention, it is evident that no African country generated any document about reverse logistics in e-commerce from 2003 to 2023. The absence of this representation prompts inquiries on the level of scholarly involvement and research emphasis on reverse logistics in the e-commerce sector throughout the African continent. By addressing this gap, it is possible to gain valuable views and perspectives from various settings. This will promote a more inclusive and thorough knowledge of the challenges and opportunities in reverse logistics in the global e-commerce era.

This analysis provides transparent information about the worldwide distribution of research output and its impact on reverse logistics trends during the e-commerce era. The different levels of participation and impact among countries highlight the diverse and ever-changing nature of the academic contributions to this developing topic.

3.5 Top frequent authors' keywords

Table 3's analysis of keyword frequencies in reverse logistics in e-commerce literature highlights the dominance of 'reverse logistics' as a primary focus, with 303 mentions emphasizing the significance of moving goods from their final destination for value recovery or disposal. 'Logistics' with 234 occurrences, further emphasizes the importance of managing the flow of goods from origin to consumption. Additionally, 'recycling' and 'supply chains', with 204 and 193 mentions, respectively, point towards a strong emphasis on sustainability and the complexities of supply networks in this domain. In contrast, terms like 'sales' and 'decision making' appear less frequently, suggesting their peripheral role in the core discussions of product return and e-commerce, overshadowed by the more central themes of logistics and supply chain management.

Table 3. Top frequent author's keywords

Words	Occurrences
reverse logistics	303
logistics	234
recycling	204
supply chains	193
electronic commerce	141
supply chain management	137
sustainable development	118
waste management	108
sales	87
decision making	85

Figure 5 shows the word cloud map of the author's keywords. Among the top words, cloud-focused reverse logistics, logistics, recycling, supply chains, electronic commerce, supply chain management, sustainable development, waste management, sales, and decision-making are the core analyzed research topics. Based on this analysis, it was found that a relationship has been established linking circular economy, information management, product returns, and reverse logistics. These top words are not expected or considered in the search string. However, these associations indicated severe influences on reverse logistics in e-commerce.

Figure 5. Word cloud of top author's keywords

3.6 Thematic evaluation

The examination employed Biblioshiny software to analyze author-provided keywords concerning reverse logistics in e-commerce research, covering the temporal span from 2003 to 2023. The objective was to assess fundamental research themes. Illustrated in the figure is a Sankey diagram portraying the developmental trajectory of themes within journals focused on reverse logistics in e-commerce. Each rectangular entity in the diagram represents a distinct theme, its size directly proportional to the frequency of occurrence [28]. The connecting lines delineate the evolution of these themes, with the thickness of the lines indicating the strength of thematic connections [21]. Figure 6 illustrates a thematic literature evaluation of product return and e-commerce over two distinct periods: 2003-2003 and 2004-2023. The size of the boxes represents the relative frequency of each theme within the corpus. During the single year of 2003, "electronic commerce" was the sole highlighted theme, indicating that the focus within this period was primarily on the commercial transactions conducted electronically on the internet. However, from 2004 to 2023, the theme "reverse logistics" became prominent, suggesting a shift in research focus towards the processes associated with the return of products from consumers back to manufacturers or retailers. This shift could reflect the increasing importance of sustainability practices, customer satisfaction, and the cost implications of returns within the growing e-commerce sector.

In the depiction presented in Figure 7, the thematic representation of reverse logistics in e-commerce is evident. The upper-right quadrant highlights the motor theme characterized by high centrality and density, indicating its well-established and crucial role in shaping the research field. Conversely, the lower-right quadrant portrays basic themes marked by moderate centrality, specifically addressing resilience and serving as the focal point in product return and e-commerce research. This quadrant encompasses both transversal and general themes. The upper-left quadrant features niche themes, demonstrating strong interconnections and substantial centrality in external research contexts. These concerns are notably comprehensive and influential. Contrarily, the theme depicted in the lower-left quadrant pertains to growing or decreasing themes, exhibiting minimal development. Themes in this quadrant exhibit low density and centrality, often disclosing emerging thematic elements.
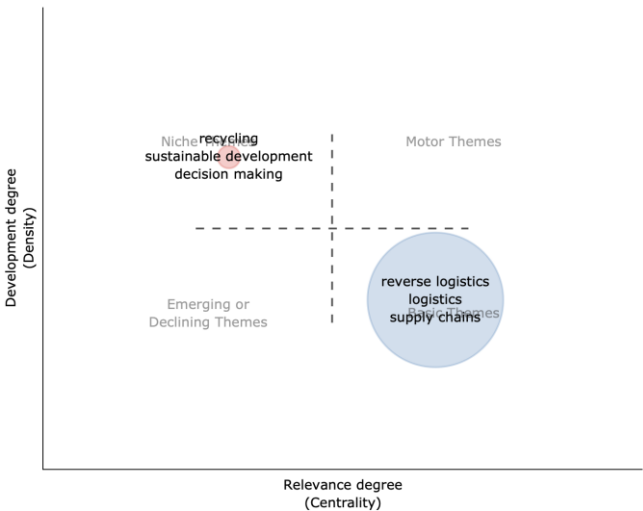

Figure 6. Thematic evaluation

Figure 7. Thematic map

3.7 Most cited sources

Table 4 presents a bibliometric analysis of scholarly sources on reverse logistics in e-commerce, assessing them across various performance metrics. 'Journal of Cleaner Production' and 'Resources, Conservation and Recycling' emerge as the leading publications with 36 and 14 publications, respectively, indicating their significant engagement with the research topic. In contrast, 'IFIP Advances in Information and Communication Technology' registers the lowest in Total Publications (TP) with eight entries. The Total Citations (TC) metric further distinguishes 'Journal of Cleaner Production' as the most impactful, with 2,644 citations, followed by 'Resources, Conservation and Recycling' with 1,933 citations, revealing a high degree of academic referencing and suggesting their centrality in the discourse on product return in e-commerce. The lower citation count of the 'IOP

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Conference Series: Earth and Environmental Science,' at 21, may suggest a more specialized or emerging focus within the field.

Regarding Citations Per Publication (CPP), the 'International Journal of Production Economics' demonstrates considerable academic influence with an average CPP of 68.1, indicating that publications from this journal are frequently cited in the field. This contrasts with 'IFIP Advances in Information and Communication Technology,' which has a lower CPP of 1.3, hinting at less citation traction. The

CiteScore and other bibliometric indices like SNIP and SJR align with these trends, with 'The Journal of Cleaner Production' and 'The International Journal of Production Economics achieving high scores, denoting their contextual impact and prestige. Publishers like Elsevier dominate these metrics, showcasing the strong influence of their journals. At the same time, Emerald Publishing, Taylor & Francis, and the Multidisciplinary Digital Publishing Institute (MDPI) have a more modest representation of TC and bibliometric scores yet still contribute valuable research to the field.

Table 4. Cited sources

Sources	TP	TC	CPP	Cite Score	SNIP	SJR	Publisher
Computers and Industrial Engineering	17	1002	58.9	11.9	2.238	1.76	Elsevier
IFIP Advances in Information and Communication Technology	8	10	1.3	1.4	0.364	0.255	Springer Nature
International Journal of Physical Distribution and Logistics Management	9	399	44.3	11.7	1.611	1.795	Emerald Publishing
International Journal of Production Economics	22	1499	68.1	19.3	2.918	3.028	Elsevier
International Journal of Production Research	10	292	29.2	18.1	2.875	2.976	Taylor & Francis
IOP Conference Series: Earth and Environmental Science	9	21	2.3	0.8	0.255	0.197	
Journal of Cleaner Production	36	2644	73.4	18.5	2.379	1.981	Elsevier
Resources, Conservation, and Recycling	14	1933	138.1	20.3	2.771	2.682	Elsevier
Sustainability	36	719	20.0	5.8	1.198	0.664	Multidisciplinary Digital Publishing Institute (MDPI)

4. CONCLUSION AND LIMITATIONS

The bibliometric analysis in this study offers significant insights into the research trends and landscape of reverse logistics in the e-commerce field. The results indicate a rising enthusiasm in this area, evidenced by a substantial surge in published works and references in the last twenty years. Significantly, starting from 2019, there was a notable increase in both areas, demonstrating a greater acknowledgment of the significance of reverse logistics in the changing e-commerce environment.

The research also determined the authors and nations that contributed significantly to this topic. Gupta S. is the most productive author, whereas China, the United States, and India are the top contributors regarding the number of documents produced and their impact on citations. Curiously, no African nation researched this subject during the study period, emphasizing a probable deficiency in research representation and understanding of reverse logistics within the African continent.

In addition, examining author keywords and theme evaluation uncovers the core areas of emphasis in reverse logistics research. The conversation is mainly focused on the importance of "reverse logistics," "logistics," "recycling," and "supply chains" in effectively handling product returns and addressing their environmental and economic consequences. The thematic evaluation highlights the change in study emphasis over time, moving from "electronic commerce" to "reverse logistics." This transition reflects the increasing importance of product returns in the e-commerce industry.

Ultimately, the analysis determined the sources that were cited the most in this field. The journals "Journal of Cleaner Production" and "Resources, Conservation and Recycling" are at the top of the list due to their significant emphasis on and impact on reverse logistics research. The bibliometric success of these journals, as measured by criteria such as citations per

publication and impact ratings, solidifies their dominant positions.

Although this study provides helpful insights, it is crucial to recognize certain limits. The study depends on data solely obtained from a particular database (Scopus), which may result in the exclusion of pertinent research published on alternative platforms. In addition, the analysis examines explicitly bibliometric markers, which may not comprehensively capture the qualitative elements and subtleties of research contributions. The thematic evaluation, although helpful, depends on author keywords and may cover a partial range of study issues in this discipline.

Eventually, the bibliometric study outlined in this paper offers a valuable summary of the research patterns and environment of reverse logistics in the e-commerce field. Although recognizing the study's constraints, the results provide valuable knowledge for scholars, practitioners, and policymakers interested in this developing area. Subsequent studies can overcome the limitations mentioned by integrating data from diverse sources, utilizing qualitative analysis techniques, and conducting thorough thematic analyses to better comprehend the intricacies and possibilities of reverse logistics in the e-commerce industry.

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