

Mapping the Global Landscape of Electronic Supply Chain Management (e-SCM): A Bibliometric and Visual Analysis

Aditya Lapu Kalua¹, Mochamad Agung Wibowo², Luther Alexander Latumakulita³

¹Doctoral Program of Information Systems, Postgraduate School, Universitas Diponegoro, Indonesia

²Postgraduate School, Universitas Diponegoro, Semarang, Indonesia

^{1,3}Department of Information Systems, Sam Ratulangi University, Manado, Indonesia

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Corresponding Author:

Author Name*:

Aditya Lapu Kalua

Email*:

adityalapakalua@students.
undip.ac.id

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Abstract. This study maps the intellectual structure of global electronic supply chain management (e-SCM) research through a bibliometric analysis of Scopus-indexed publications published between 2015 and 2025. The retrieval workflow began with the Scopus query TITLE-ABS-KEY ("supply chain management") and was followed by structured interface-based refinement using publication period, subject area, and document type constraints to construct the final analytical corpus. Bibliometric performance indicators were analyzed using the Bibliometrix R- package, while science mapping and network visualization were conducted using VOSviewer. The findings show that the e-SCM literature is organized around five major thematic concentrations: sustainability in supply chain management, environmental and circular-economy integration, operational decision support and risk analytics, sectoral and stakeholder coordination, and the recent acceleration of blockchain, Industry 4.0, and digital transformation. Co-authorship and country-level mappings indicate a multicentric global research structure led by China, India, and the United Kingdom, while temporal overlay visualization shows a marked shift toward digitally enabled governance and resilience-oriented research during 2022–2023. These results provide an evidence-based synthesis of the evolution of the field and a replicable bibliometric foundation for future sector-specific studies in sustainability-sensitive supply networks.

Keywords: electronic supply chain management, bibliometric analysis, digital transformation, sustainability, VOSviewer, Bibliometrix.

1. INTRODUCTION

Supply chain management (SCM) has undergone a substantial paradigm shift over the last decade, moving beyond linear logistics coordination toward digitally integrated and data-intensive ecosystems. Within this trajectory, electronic supply chain management (e-SCM) has emerged as an important domain at the intersection of information systems, interorganizational coordination, and operational intelligence. The spread of Industry 4.0 technologies, including artificial intelligence (AI), blockchain, the Internet of Things (IoT), and advanced analytics, has expanded the role of SCM from transactional efficiency to broader concerns of real-time visibility, resilience, transparency, and sustainability [3, 4, 8, 11, 15].

The rapid expansion of the e-SCM literature reflects the increasing complexity of global supply networks and the growing demand for digitally enabled coordination mechanisms. Recent studies indicate that e-SCM is no longer a peripheral technological layer, but a strategic capability supporting circular-economy implementation, risk mitigation, traceability, and ESG-oriented governance [7, 12, 25, 19, 10]. At the same time, the growing volume of scholarship has made it more difficult to identify the dominant conceptual clusters, emerging technological trajectories, and collaboration structures that define the field's scientific development. Existing reviews often focus on specific subdomains such as blockchain integration, supply chain risk, digital twins, or green SCM [5, 6, 16, 18], while fewer studies synthesize the broader intellectual structure of the e-SCM field through a single bibliometric design that integrates thematic, temporal, and collaborative perspectives.

This study addresses that gap by providing an evidence-based bibliometric mapping of global e-SCM-related scholarship indexed in Scopus during 2015–2025. Specifically, the study aims to map keyword co-occurrence patterns, identify co-authorship structures, examine country collaboration networks, and trace the temporal evolution of dominant themes. The analytical scope is limited to the global scientific record retrieved from Scopus through a structured and reproducible filtering procedure; it does not claim to represent any single industrial sector or geographic region directly. The contribution of this paper is to provide a consolidated view of how the field is organized, which themes

are most established or emergent, and how collaborative structures shape the continuing development of e-SCM scholarship.

2. METHODS

2.1 Research Design and Workflow

This study follows a quantitative bibliometric design to examine the scientific structure of research associated with e-SCM. Bibliometric analysis is appropriate for synthesizing large volumes of bibliographic metadata in order to reveal publication patterns, collaboration structures, and thematic clusters within an evolving research domain [1]. The investigation followed six stages: (1) database selection, (2) construction of the search strategy, (3) systematic filtering in Scopus, (4) data export and normalization, (5) bibliometric performance analysis using Bibliometrix, and (6) science mapping using VOSviewer.

2.2 Database Selection

Scopus was selected as the sole data source because it provides broad multidisciplinary coverage across business, engineering, decision sciences, and information systems, while also offering standardized metadata that support bibliometric reproducibility and high-fidelity network visualization [1, 2]. Using one curated database also avoids duplication and metadata harmonization issues that often arise when merging records from multiple sources.

2.3 Search Query and Document Retrieval

Data retrieval was conducted on October 10, 2025, using an institutional Scopus subscription. The exact executable search query used at the initial retrieval stage was:

TITLE-ABS-KEY ("supply chain management")

The search strategy was implemented as an interface-based Scopus workflow rather than as one long compound Boolean expression. In other words, the base query above was executed first, and the exported dataset used in this study corresponds to the records retained after the configured Scopus refinement steps were applied. Because the Scopus refinement was performed through interface-based filtering rather than a

single compound Boolean command, the executable retrieval procedure is reported as a stepwise workflow in Table 1.

Table 1: Scopus retrieval and refinement workflow used in this study

Step	Operational procedure
1	Initial query executed in Scopus: TITLE-ABS-KEY ("supply chain management")
2	Publication period restricted to 2015–2025
3	Subject-area refinement applied to retain records from Engineering, Computer Science, Environmental Science, Business/Management/Accounting, and Decision Sciences
4	Document-type refinement applied to retain Journal Articles and Conference Papers only
5	Bibliographic export and normalization performed for Bibliometrix and VOSviewer analysis
6	No manual screening applied; refinement relied on the Scopus interface and bibliographic normalization for reproducibility

The final analytical corpus consisted of 10,491 records. In this study, that value refers to the final exported dataset analyzed in Bibliometrix and VOSviewer after the configured Scopus filtering steps were applied. This clarification is important because the study did not use a separate manual reduction stage after export; therefore, the mapped corpus and the reported final count are identical.

The decision to begin with a broad SCM query was conceptual rather than terminologically narrow. Many studies relevant to electronically enabled, digitally coordinated, and information-intensive supply chains do not consistently use the exact label electronic supply chain management in their titles, abstracts, or keywords. Accordingly, the broader SCM query was used to capture the wider research stream within which digital coordination, sustainability, decision support, traceability, and resilience are discussed. In this design, the terms electronic and digital transformation are treated primarily as conceptual lenses for interpretation, not as the sole operational search terms.

2.4 Analytical Tools

Two complementary tools were employed. Bibliometrix, an R-based bibliometric package, was used to generate descriptive performance indicators such as publication trends, productive authors, and country-level output [1]. VOSviewer version 1.6.20 was used for science mapping and visualization, specifically for keyword co-occurrence analysis, co-authorship network analysis, and country collaboration mapping [2]. In the network maps, node size represents occurrence or link intensity, edge thickness indicates association strength, and cluster colors denote algorithmically detected groupings.

3. RESULTS AND DISCUSSION

3.1 Keyword Co-Occurrence Visualization

Keyword co-occurrence analysis was performed in VOSviewer using a minimum threshold of 10 occurrences to retain the most salient terms. The analysis identified five major thematic clusters within the e-SCM literature.

The first cluster (Sustainability and SCM) represents the conceptual foundation of the field, where operational performance and environmental responsibility converge. The second cluster (Environmental and Circular Economy), which highlights climate change, carbon management, and resource efficiency, indicates that ecological concerns are now integrated into the mainstream of e-SCM scholarship rather than treated as peripheral issues [19, 10]. The third cluster groups operational decision support, risk management, and profitability-related themes, reflecting the field's continuing methodological roots in optimization and managerial analytics [16, 21]. The fourth cluster captures sectoral coordination and stakeholder-linked applications, particularly in domains requiring traceability and multi-actor governance. The fifth cluster, composed of blockchain, Industry 4.0, and digital transformation, represents the most dynamic recent expansion and signals a strong move toward digitally enabled governance and real-time interorganizational connectivity [5, 6, 23, 24].

The overlay visualization indicates clear temporal progression. While the sustainability and operational analytics clusters appear relatively mature, the blockchain- and digital-transformation-related themes accelerated strongly during 2022–2023, suggesting that

the digital–sustainability nexus has become one of the field’s most important current frontiers [17, 22, 20].

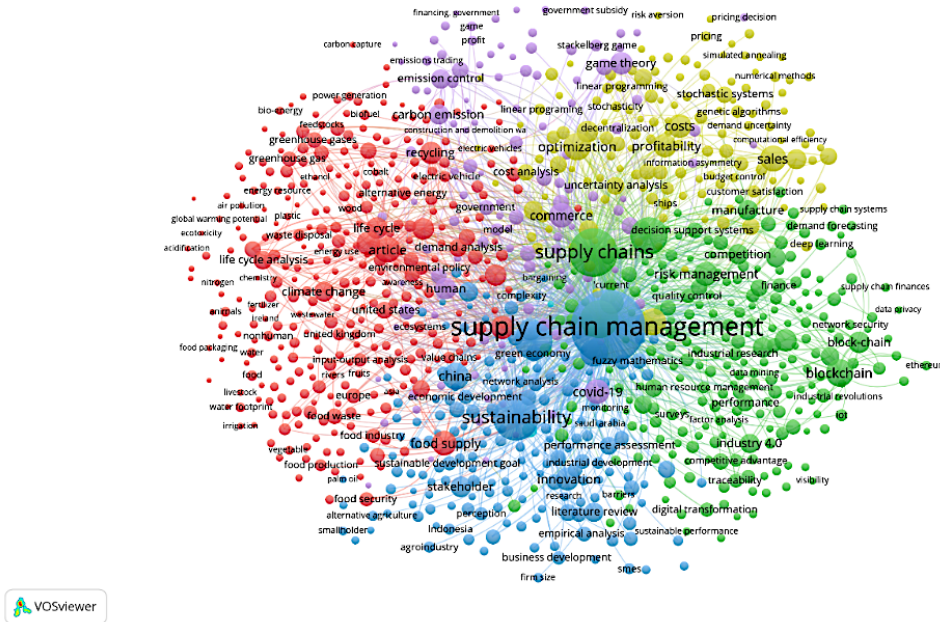


Figure 1. Keyword co-occurrence network visualization generated in VOSviewer.

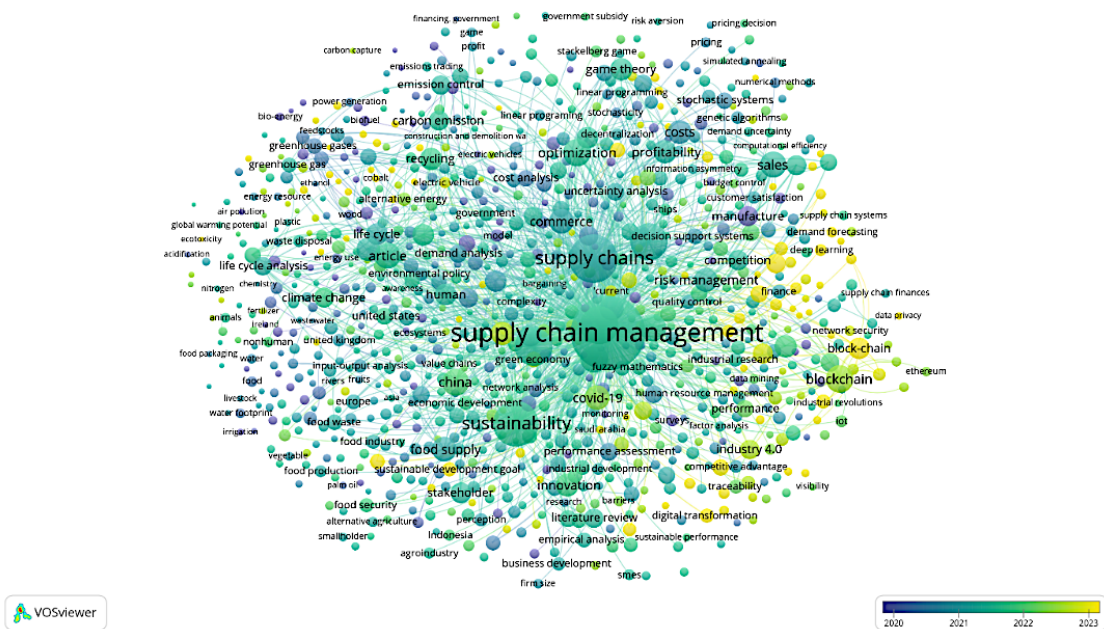


Figure 2. Keyword overlay visualization generated in VOSviewer.

3.2 Co-Authorship and Country Collaboration Analysis

The co-authorship map reveals concentrated research communities, particularly in South and East Asia, with dense internal connectivity among authors working on digital supply chains, sustainability integration, and risk-oriented optimization. This structure suggests that e-SCM is a mature collaborative field in which knowledge production is distributed across recurring research clusters rather than concentrated around a single dominant author.

Country-level mapping shows a multicentric landscape led by China, India, and the United Kingdom. European countries also form a dense collaboration bloc, likely supported by strong cross-border sustainability agendas and established research infrastructures. The United States appears to play an important bridging role, connecting Asian and European research clusters. Taken together, these patterns show that e-SCM has become a globally distributed research priority shaped by both manufacturing-intensive economies and internationally networked academic systems.

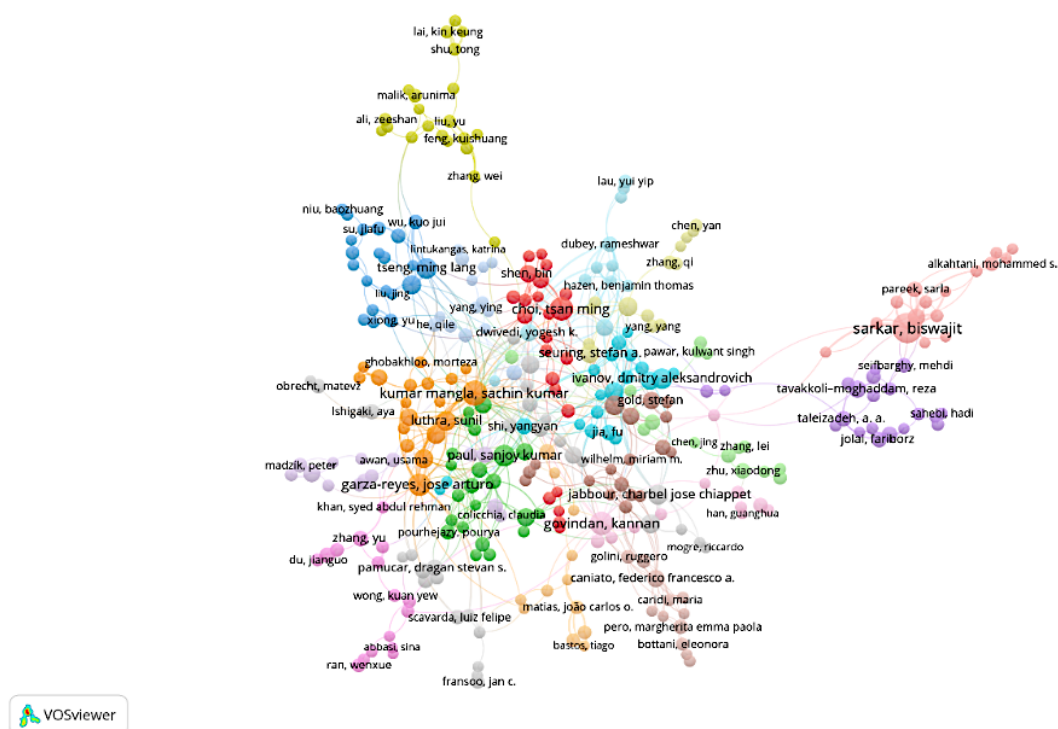


Figure 3. Co-authorship and country collaboration visualization generated in VOSviewer.

3.3 Discussion and Interpretive Synthesis

The bibliometric findings indicate that electronic supply chain management (e-SCM) has evolved from a narrowly defined technology-support function into a broader digitally enabled governance framework. Earlier understandings of SCM were often centred on coordination efficiency, logistics optimization, cost reduction, and information sharing across organizational boundaries. However, the keyword co-occurrence structure in this study shows that the field is now increasingly connected to sustainability, resilience, circular economy, traceability, blockchain, Industry 4.0, and digital transformation. This shift suggests that e-SCM is no longer viewed merely as an operational tool for improving transaction speed or process automation. Instead, it has become a strategic mechanism for managing complex, uncertain, and sustainability-sensitive supply networks [4], [13], [9].

The emergence of blockchain, Industry 4.0, and digital transformation as prominent themes reflects the growing importance of real-time visibility, transparency, and data-driven coordination in modern supply chains. These technologies are increasingly discussed not only as technical innovations, but also as mechanisms that reshape interorganizational relationships, accountability structures, and decision-making processes. Blockchain, for example, is strongly associated with traceability, transparency, and trust in supply chain networks [5], [6], while Industry 4.0 technologies support automation, integration, and intelligent decision-making across production and logistics systems [8], [21]. This finding confirms that digital technologies are becoming deeply embedded in supply chain governance, particularly in contexts where risk, disruption, and sustainability performance must be continuously monitored.

The results are broadly consistent with previous review-based studies that identified the growing role of blockchain, IoT, digital twins, artificial intelligence, and advanced analytics in supply chain research [4], [5], [6], [11], [15]. These studies have shown that digital technologies improve supply chain visibility, responsiveness, and coordination capability. However, the present bibliometric mapping adds a broader perspective by showing how these technological themes interact with sustainability, risk management, circular economy, and resilience. This is important because digital transformation in SCM should not be understood as a purely technical phenomenon. Its value depends on how digital tools are connected to organizational strategy, stakeholder collaboration, environmental responsibility, and adaptive governance.

The strong presence of sustainability and circular-economy-related keywords further indicates that environmental concerns have moved into the mainstream of e-SCM scholarship. Themes such as resource efficiency, carbon management, circular economy, and sustainable supply chain management show that researchers increasingly frame supply chains as socio-technical systems with environmental consequences [10], [19]. This development aligns with prior studies that emphasize the relationship between digital supply chains and sustainable performance [12], [17], [25]. In this sense, e-SCM is becoming an enabling infrastructure for sustainability-oriented transformation. Digital platforms, analytics, blockchain, and IoT can support more accurate monitoring of material flows, waste reduction, supplier compliance, and circular value creation.

The temporal evolution observed in the overlay visualization also reveals an important pattern. While sustainability and operational optimization appear as relatively mature themes, blockchain, digital transformation, and Industry 4.0-related topics show stronger recent growth, particularly around 2022–2023. This suggests that the field is moving toward a digital–sustainability nexus, where technological innovation and environmental responsibility are increasingly studied together. Such a pattern reflects the changing expectations placed on supply chains after recent global disruptions, including the COVID-19 pandemic, geopolitical instability, and climate-related risks. In this context, resilience is not simply about recovering from disruption; it also involves building adaptive, transparent, and responsible supply networks capable of responding to uncertainty [7], [13], [14].

Compared with previous bibliometric or systematic review studies that focus on narrower subdomains, such as supply chain risk analysis [16], blockchain integration [5], [6], sustainable supply chain management [14], or tourism supply chain research [26], this study provides a more integrated picture of the broader e-SCM knowledge structure. By combining keyword co-occurrence, co-authorship analysis, country collaboration mapping, and temporal visualization, the study captures not only what themes dominate the field, but also how knowledge production is socially and geographically organized. This integrated design helps reveal that e-SCM scholarship is shaped by both technological trajectories and collaborative research networks.

The co-authorship and country collaboration results show that e-SCM has developed into a globally distributed research field. China, India, and the United Kingdom appear as major contributors, while European countries form dense collaboration networks. The United States also plays an important bridging role between Asian and European research clusters. This pattern suggests that e-SCM research is influenced by both manufacturing-intensive economies and countries with strong institutional research capacity. The prominence of Asian countries may reflect the strategic importance of digital supply chains in large-scale manufacturing, logistics, and industrial transformation. Meanwhile, European collaboration patterns may be connected to strong policy and research agendas around sustainability, circular economy, and cross-border innovation.

Another important implication of the findings is that e-SCM research is becoming increasingly interdisciplinary. The field combines concepts from operations management, information systems, environmental management, decision sciences, logistics, and strategic management. This interdisciplinary structure is visible in the coexistence of themes such as profitability, risk management, blockchain, circular economy, artificial intelligence, and stakeholder coordination. Such diversity strengthens the field because it allows researchers to examine supply chains from multiple perspectives. At the same time, it also creates conceptual fragmentation. Without careful synthesis, e-SCM may become divided into separate conversations around technology, sustainability, resilience, and governance. The present study helps reduce this fragmentation by mapping the relationships among these themes.

The findings also suggest several directions for future research. First, future studies should examine how digital technologies generate measurable improvements in supply chain sustainability and resilience, rather than assuming that technology adoption automatically produces positive outcomes. Second, more attention should be given to governance issues, including data ownership, platform dependency, cybersecurity, algorithmic accountability, and trust among supply chain actors. Third, future research should explore the social and institutional dimensions of e-SCM implementation, especially in small and medium-sized enterprises, developing economies, and geographically fragmented regions. These contexts may face different barriers from large multinational firms, including limited infrastructure, financial constraints, low digital readiness, and uneven stakeholder capacity.

At the same time, the scope of this study must be interpreted carefully. The dataset was retrieved using a broad supply chain management query and refined through Scopus filters. Therefore, the analysis captures the wider SCM research stream within which digital coordination, sustainability, risk, and transformation themes are discussed. It should not be interpreted as a dataset limited only to publications that explicitly use the term “electronic supply chain management.” This approach is useful for identifying the broader intellectual environment of e-SCM, but it also means that the interpretation of e-SCM is conceptual rather than purely terminological. As a result, the findings should be understood as mapping digitally enabled SCM scholarship within the broader SCM literature.

The study also does not directly represent ecotourism systems, Eastern Indonesia, or any other specific regional or sectoral application domain. Therefore, such contexts should not be treated as empirically validated outcomes of this bibliometric analysis. However, the identified themes of traceability, stakeholder coordination, sustainability governance, digital transformation, and risk management may provide a useful conceptual foundation for future empirical studies in sustainability-sensitive service networks. For example, tourism-oriented supply chains in geographically fragmented regions may benefit from digital tools that improve coordination among local communities, service providers, government institutions, and logistics actors. Nevertheless, such applications require separate empirical validation through case studies, surveys, interviews, or mixed-method research.

The interpretive synthesis shows that e-SCM is moving toward a more integrated research agenda where digital technologies, sustainability goals, resilience strategies, and governance mechanisms are increasingly interconnected. The field is no longer defined only by efficiency and automation, but by its capacity to support transparent, adaptive, and responsible supply chain systems. This bibliometric evidence provides a consolidated view of the field’s current structure and highlights the importance of studying e-SCM as a socio-technical and governance-oriented phenomenon. Future research should build on this foundation by examining how digital supply chain capabilities are implemented in specific organizational, sectoral, and regional contexts, particularly where sustainability, resilience, and stakeholder coordination are critical.

4. CONCLUSION

This study mapped the global e-SCM research landscape from 2015 to 2025 using a final analytical corpus of 10,491 Scopus-indexed records. The findings show that the field is structured around five thematic concentrations, with sustainability and operational decision support forming the stable core and blockchain, Industry 4.0, and digital transformation representing the most dynamic recent growth areas. The collaboration analysis further demonstrates that global e-SCM scholarship is multicentric, with major hubs in Asia and Europe and strong contributions from China, India, the United Kingdom, and the United States. The study provides a reproducible and evidence-based synthesis of how the e-SCM field is organized, how its major themes have evolved, and how collaborative structures support its continuing scientific development. Future studies may build on this bibliometric foundation through sector-specific mapping or empirical investigation in underrepresented sustainability-oriented contexts; however, such applications remain outside the direct evidentiary scope of the present dataset.

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AUTHORS' DECLARATION

The authors declare the work presented in this paper is original research that I have conducted myself. This paper has not been published, or is under consideration for publication, elsewhere. I also guarantee that there are no financial conflicts of interest or personal relationships that could influence the findings or interpretation of the work reported here.

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