Smart strategies: Bibliometric insights into technology applications and innovation performance in supply chain management

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A B S T R A C T

This study conducts a comprehensive bibliometric analysis to explore the nexus of technology applications and innovation performance within the realm of supply chain management (SCM). Despite the increasing importance of smart supply chain management in modern organizations, there is a paucity of research dedicated to this intersection. The primary objective is to identify trends, research gaps, and emerging themes in the literature concerning SSCM, technology applications, and innovation performance. Leveraging the Web of Science database, bibliometric analysis is employed to analyze existing literature, revealing insights into strategies for harnessing technology-driven innovations in SCM. By embracing sustainability principles, companies can position themselves as leaders in an increasingly interconnected and environmentally conscious world, generating long-term value for both them and society.

1. Introduction

In today's dynamic and interconnected business environment, effective supply chain management (SCM) plays a critical role in determining the success and competitiveness of organizations across various industries (MacCarthy et al., 2016; Das, 2018; Zimmermann et al., 2020). As globalization, technological advancements, and market complexities continue to reshape the landscape of supply chains, businesses are increasingly turning to innovative technologies to enhance their SCM processes and achieve sustainable competitive advantages (Saberi et al., 2019; Sanders, 2020). The concept of supply chain management encompasses the coordination and integration of various activities involved in the flow of goods, services, information, and finances from the point of origin to the point of consumption (Mukhamedjanova, 2020). Traditionally, SCM focused on optimizing these processes to minimize costs, reduce lead times, and improve efficiency (Kovács, & Illés, 2019; Varriale et al., 2023). However, with the advent of digitalization and the proliferation of disruptive technologies such as artificial intelligence, blockchain, internet of things, and data analytics, the scope of SCM has expanded beyond mere optimization to include capabilities such as real-time visibility, predictive analytics, and agile responsiveness (Aljohani, 2023; Calatayud et al., 2019; Huson et al., 2024; Alomari, 2020; Alomari et al., 2020). Understanding the relationship between technology applications and innovation performance in SCM is crucial for businesses seeking to leverage these advancements to gain a competitive edge (Chang et al., 2019; Collins et al., 2010). By harnessing the power of data-driven insights, automation, and digital connectivity, organizations can streamline their supply chain operations, mitigate risks, and capitalize on emerging opportunities (Müller & Schmidt, 2024; Kumar et al., 2023). Moreover, as sustainability and ethical considerations increasingly shape consumer preferences and regulatory requirements, the integration of responsible and environmentally

conscious practices into SCM has become imperative for long-term viability (Panigrahi et al., 2019; Markman & Krause, 2016; Alomari, 2010).

The primary objective of this paper is to conduct a bibliometric analysis of the existing literature on technology applications and innovation performance in supply chain management. By systematically reviewing and synthesizing relevant research articles, we aim to identify key trends, research gaps, and emerging themes in this domain. Additionally, we seek to provide insights into the smart strategies adopted by organizations to harness the potential of technology-driven innovations in optimizing their supply chain processes and enhancing overall performance. Therefore, we explicitly designed this paper to address the following research questions:

1. What are the relevant themes defining value relevance research in technology applications and innovation performance in supply chain management fields, and how are they characterized?

2. What are the emerging research directions for value-relevant research in technology applications and innovation performance in supply chain management fields?

The subsequent sections of this paper are structured as follows: Section 2 outlines the methodology utilized for the bibliometric analysis, encompassing data collection, selection criteria, and analytical methodologies. Section 3 delves into the outcomes of the bibliometric analysis, highlighting patterns, trends, and potential avenues for additional research. Section 4 engages in discussion, exploring both theoretical and practical implications. Finally, Section 5 furnishes conclusions, addressing the study's limitations and suggesting future research avenues.

2. Methodology

In dissecting the nuanced evolution of technology applications and innovation performance in supply chain management, our study employs a meticulous bibliometric analysis methodology. This quantitative approach delves into publication patterns, citation dynamics, and collaborations among authors, journals, and countries (Albalawee et al., 2024; Goyal & Kumar, 2021; Wang et al., 2019). By leveraging bibliometric techniques, we identify influential authors and reputable journals shaping the discourse (Abu Huson et al., 2024; Janik et al., 2020).

A distinctive aspect of our research lies in the amalgamation of the science mapping approach, domain analysis, and visualization techniques (Kastrin & Hristovski, 2021). This method, particularly effective for handling a vast volume of scientific documents, visually portrays the intellectual structure of technology applications and innovation performance in supply chain management research. It acts as a guide, revealing research trends, pinpointing gaps, and highlighting influential contributors (Lafuente-Ruiz-de-Sabando et al., 2018).

The fusion of bibliometric analysis and the science mapping approach forms a robust methodology, furnishing researchers with valuable quantitative insights (Abu Orabi et al., 2023). This synergistic approach enhances their capacity to make informed decisions, identify research gaps, and actively contribute to scholarly discourse (Qudah et al., 2024). The subsequent paragraphs delineate our research strategy across two interconnected sections.

2.1 Data compilation

In the academic sphere, the pivotal task of identifying research gaps and trends plays a pivotal role in advancing knowledge. Despite numerous studies on technology applications and innovation performance in supply chain management, there is a notable dearth of comprehensive and targeted research guiding future investigations (Wang et al., 2019; Chen et al., 2017). This study addresses this gap through meticulous scientometric analysis, aiming to unearth key research topics and illuminate literature gaps in technology applications and innovation performance in supply chain management.

Our investigation concentrates on research papers from the Web of Science (WoS) core collection. Employing carefully crafted keyword-based search queries, we sifted through article titles and keywords from 2008 to 2024, ensuring our analysis encompasses the latest research advancements in technology applications and innovation performance in supply chain management. The deliberate selection of this timeframe ensures the contemporary, accessible, and reliable nature of the literature, enhancing the scholarly rigor of our study.

During data collection, we applied a discerning filtration process, focusing on specialized publications in accounting, finance, economics, and management. This methodical filtering resulted in the meticulous selection of **352** research papers, each subjected to thorough scrutiny of titles and keywords using a hybrid of theoretical and experimental methodologies. This rigorous approach ensures the precision and relevance of the chosen literature, contributing to the robustness of our study and enriching the scholarly discourse (Goyal & Kumar, 2021).

2.2 Science mapping tool

Effectively exploring any scientific field necessitates adept utilization of a suitable science mapping method (He et al., 2020). Various tools, such as VOSviewer, Gephi, CiteSpace, Sci2, and HistCite, serve this purpose (Li et al., 2021). Gephi, an open-source program, visualizes graphs and networks, while CiteSpace analyzes trends in academic literature (Abu Huson et al., 2024).

In our research, we employed VOSviewer to create maps from data extracted from the Web of Science (WOS) Database. VOSviewer is versatile, constructing networks across scientific publications, journals, researchers, institutions, countries, and keywords (Sustacha et al., 2022; Albalawee et al., 2024). It employs various links, including co-authorship, co-occurrence, citation, bibliographic coupling, and co-citation (Chen et al., 2017). The tool offers three-fold visualization capabilities: network, density, and overlay visualization, enhancing map exploration. Its features, such as scrolling and zooming, are advantageous for navigating expansive maps (Abu Orabi et al., 2023).

We utilized VOSviewer to identify current trends, literature gaps, potential research areas, significant countries, sources, and authors within the study's keywords. Scientometric techniques, including bibliographic data studies, were applied (Kastrin & Hristovski, 2021). Co-occurrence analysis scrutinized recurrent words in titles, keywords, and abstracts, while bibliographic coupling pinpointed contributing authors and countries (Sustacha et al., 2022).

Scientometrics, the quantitative investigation of scientific communication, impact, and policy, plays a pivotal role in evaluating the field-specific impacts of academic research (Abu Orabi et al., 2023). It provides insights into influential research studies in technology applications and innovation performance in supply chain management. Using reproducible statistical techniques, researchers can quantify research output, citation rates, influential journals, scientists, countries, and regions driving advancements in the field (Albalawee et al., 2024; Baas et al., 2020). It also identifies areas warranting increased or decreased research activity by mapping evolving trends (Qudah et al., 2024; Wang et al., 2019).

3.   Findings and Discussions

3.1 Output Analysis and Growth Trends

The evaluation of scholarly output hinges upon the calculation of publication activity within a specified timeframe and from particular entities such as journals, institutions, or nations. Metrics associated with publication activity provide a quantitative overview of a field, aiding in the identification of influential journals, organizations, and countries. Additionally, these metrics assist in pinpointing key themes addressed during the study period. This research, conducted utilizing Microsoft Excel® spreadsheets, focused on qualitative attributes such as sector of activity, study dimension, and research methodologies.

The bibliometric analysis scrutinized the evolution of literature on technology applications and innovation performance in supply chain management from 2008 to 2024. The study delved into significant institutions, countries, and authors, revealing substantial growth in literature on this subject in recent years. Figure 1 illustrates the increase in publication activity, with a notable surge in 2022 (63 publications and 1983 citations). By 2023, there was a slight decrease with 53 publications; however, it had the highest citations (2545). As for 2024, while there is a slight decrease, the year is ongoing, and the total is anticipated to be higher due to the significance of the supply chain, particularly amidst political tensions and maritime traffic in the Middle East, the Red Sea, and the Gulf of Yemen, which motivates researchers to conduct further investigations. The 352 publications have accumulated 8,247 citations, averaging 549.8 citations per year.

Fig. 1 illustrates the exponential growth in citations alongside the increasing number of published papers. Given the extensive history and evolution of these subjects, pinpointing the exact year of their conceptual introduction remains challenging.
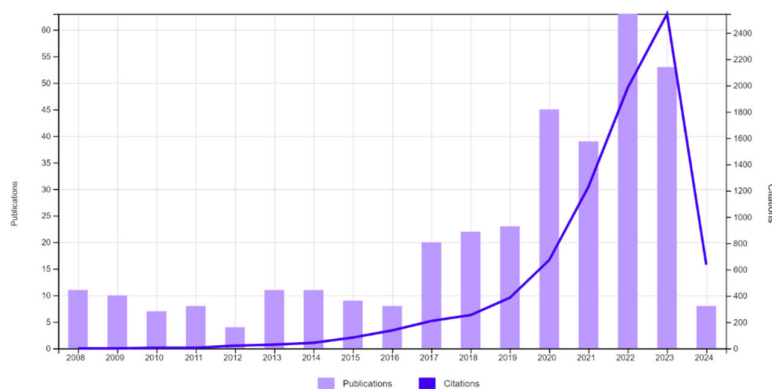
Fig. 1. Publication years from 2008 to 2024

Research in technology applications and innovation performance in supply chain management holds paramount importance in today's rapidly evolving business landscape. As supply chains become increasingly complex and interconnected, organizations face mounting pressure to adapt to technological advancements and innovate their processes to remain competitive (Wu et al., 2016). Research in this field enables businesses to gain insights into emerging technologies such as artificial intelligence, blockchain, internet of things, and data analytics, and explore their potential applications in optimizing supply chain operations (Rejeb et al., 2020). By leveraging innovative technologies, organizations can enhance visibility, efficiency, and agility across their supply chains, leading to improved responsiveness to customer demands, reduced costs, and increased sustainability (Gunasekaran et al., 2008; Chen, 2019; Albdareen et al., 2024). Furthermore, research in technology applications and innovation performance fosters collaboration and knowledge sharing among academia, industry, and policymakers, driving continuous improvement and evolution in supply chain practices. Ultimately, by investing in research in this domain, businesses can gain a strategic advantage, driving innovation and shaping the future of supply chain management.

3.2 Key Contributions from Top Journals and Publishers

This section aims to underscore the significant contributions made by journals and publishers within the realm of technology applications and innovation performance in supply chain management.

Fig. 2 presents a compilation of journals with a substantial number of publications in the aforementioned fields. Leading the list is "SUSTAINABILITY," occupying the top position with 32 record counts. Following closely is the "INTERNATIONAL JOURNAL OF OPERATIONS PRODUCTION MANAGEMENT" in the second position with 14 record count, followed by "SUPPLY CHAIN MANAGEMENT AN INTERNATIONAL JOURNAL" in the third position with 12 record counts, accounting for 3.409% of the 352 publications.
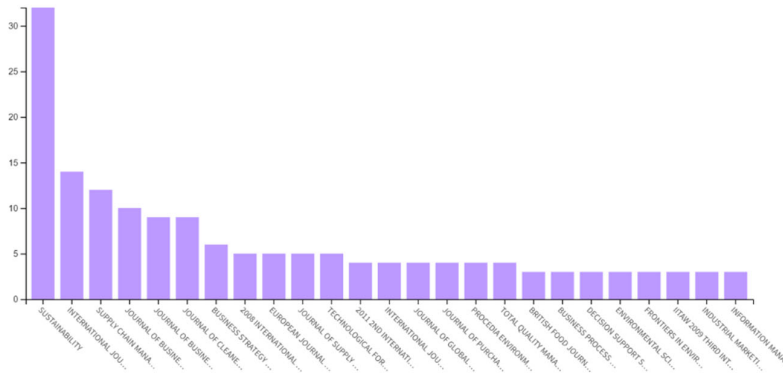

Fig. 2. The most contributed journals

Fig. 3 presents a compilation of publishers exhibiting the highest record counts in these domains. Leading the list is "Emerald Group Publishing", boasting notable 90 record counts, which represents 25.568% of the total 352 publications. Following closely is "Elsevier", with 62 record counts, while "Mdpi" secures the third position with 40 record counts. Also notable is "Springer Nature," with 31 record counts. Together, these four prominent publishers contribute significantly, encompassing 63.36% of the total record counts documented across all publishers, according to the WoS database.
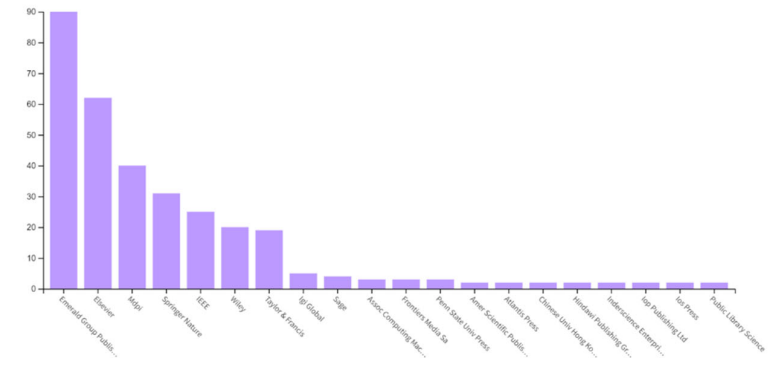

Fig. 3. The most contributed publishers

3.3 Bibliometric mapping: revealing patterns and trends

The following sections delve into the diverse maps generated by VOSviewer, starting with a meticulous examination of keyword co-occurrence and progressing to a comprehensive bibliographic coupling of countries and authors.

3.3.1 Keyword co-occurrence analysis

A potent method for identifying patterns and emerging research domains in a specific field is co-occurrence analysis, which scrutinizes joint appearances of two terms in text, revealing the conceptual and thematic structure of a scientific topic (Lee et al., 2021; Abu Huson et al., 2024). Co-word analysis, a crucial component, examines occurrences of keywords in titles, abstracts, and keywords, offering insights into their prevalence in scholarly articles (Albalawee et al., 2024). Utilizing VOSviewer for keyword co-occurrence analysis in this study generated a network representation depicting the strength and quantity of connections. Each circle's size, linked to an item, indicates the relevance of associated terms (Abu Orabi et al., 2023). Cluster analysis unveiled established areas in technology applications and innovation performance in supply chain management research, shedding light on potential future trends.

Fig. 4 illustrates keyword co-occurrences and network visualization within the semantic structure of management, technology applications, and supply chains. This visualization tool assists in gauging keyword frequency and relationship robustness. Circles denote keyword clusters, with connecting lines representing relationships; shorter distances signify stronger relationships. Cluster analysis, grounded in the co-occurrence of phrases, revealed four major clusters denoting significant research trends, classified based on quantity and strength, resulting in four distinct clusters, 519 links, and total link strength of 787.
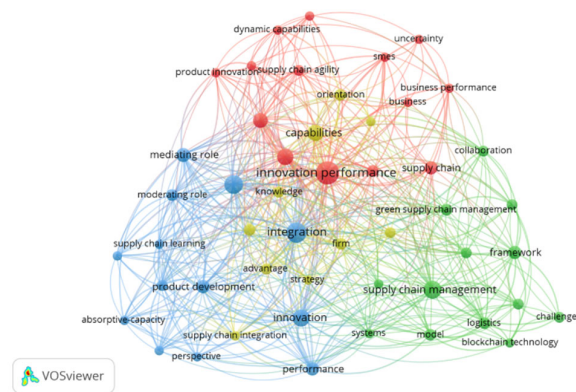
Fig. 4. Keyword co-occurrence analysis

Cluster 1 (Red) emerges as highly significant and warrants comprehensive investigation in the future. It prominently occupies the central and upper regions of the map, extending from the central point. Importantly, it establishes direct connections with other clusters. These findings underscore the necessity for in-depth research on this specific cluster to gain a deeper understanding of its implications and consequences. It addresses themes such as building competitive advantage and exploring innovation performance and firm success through supply chain sustainability.

Building a competitive advantage through sustainable practices within the supply chain is a multifaceted endeavor aimed at generating value for both companies and their stakeholders (Caylan & Mızrak, 2024; Svensson et al., 2018). Sustainable supply chain management (SSCM) is pivotal for organizations striving to meet sustainability performance expectations. It involves effectively managing material, information, and capital flows, fostering cooperation, and striving to achieve sustainable development goals (Cao et al., 2023; Sajjad et al., 2015). Sustainability performance relies on efficient operations, resource optimization, waste reduction, the adoption of eco-friendly products, and innovative capabilities (Salim et al., 2019). Balancing short-term economic pressures with long-term sustainability initiatives is central to SSCM, incorporating environmental and social values alongside the traditional focus on economic-financial value, often referred to as the triple bottom line (Hazen et al., 2021). This necessitates understanding the impact of supply chain strategies on sustainability performance, enhancing both efficiency and innovation, and underlining the significance of a firm's internal environment and external relationships as crucial factors for sustainability (Lim et al., 2022).

Optimizing resource utilization and minimizing waste throughout the supply chain is a key aspect. Through the implementation of efficient processes and the adoption of renewable energy sources, companies can reduce their environmental footprint while simultaneously cutting costs and enhancing operational efficiency (Javaid et al., 2022). Furthermore, embracing supply chain sustainability provides companies with opportunities to differentiate themselves in the

marketplace and bolster their brand reputation (Carter & Rogers, 2008; Ferreira et al., 2016). With consumers increasingly prioritizing sustainability and ethical practices in their purchasing decisions, it becomes essential for companies to align their values with those of their target audience (Carrington et al., 2014). By transparently communicating their commitment to sustainability and responsibly sourcing materials, companies can cultivate trust and loyalty among environmentally conscious consumers (Khurana & Ricchetti, 2016).

Exploring innovation performance within the realm of supply chain sustainability entails leveraging technology and creativity to drive positive change (Bhatti et al., 2024). This can involve the development of new eco-friendly products, the implementation of recycling programs, or the redesigning of packaging to minimize waste. Additionally, innovation in supply chain management practices, such as the adoption of just-in-time inventory systems or the implementation of circular economy principles, can further enhance sustainability efforts while simultaneously improving operational efficiency and reducing costs (Hazen et al., 2021).

Achieving firm success within the context of supply chain sustainability requires a holistic approach that considers the interconnectedness of environmental, social, and economic factors (Carter & Rogers, 2008). Companies must engage with stakeholders across the supply chain, including suppliers, employees, customers, and communities, to ensure alignment of interests and maximize positive impact. Collaboration and partnership are key drivers of success, enabling companies to collectively address shared challenges and drive innovation in sustainable practices (Svensson et al., 2018).

Overall, fostering competitive advantage and exploring innovation performance through supply chain sustainability are crucial components of a successful business strategy in today's interconnected and environmentally conscious world (Moshood et al., 2021). By embracing sustainability principles, companies can reduce costs, mitigate risks, and enhance their brand reputation while driving positive change across the supply chain (Caylan & Mızrak, 2024). Through continuous innovation and collaboration, firms can position themselves as leaders in sustainability, creating long-term value for both themselves and society as a whole (Sajjad et al., 2015).

Cluster 2 (Green) discusses the convergence of information technology and Green Supply Chain Management (GSCM). Managing the fusion of information technology and GSCM poses various challenges and prospects for enterprises aiming to meet sustainability objectives (Khan et al., 2022). IT assumes a vital role in facilitating the adoption of eco-friendly supply chain practices by furnishing tools and frameworks for gathering, analyzing, and acting upon data (John, 2018). Such technologies encompass sophisticated analytics, cloud computing, the internet of things, and blockchain, all of which can optimize resource utilization, monitor environmental impact, and promote collaboration among supply chain stakeholders (Rejeb et al., 2019; Javaid et al., 2022).

One key aspect of leveraging information technology in green supply chain management is enhancing supply chain visibility and transparency (Ebinger & Omondi, 2020). Through the use of IoT sensors and real-time monitoring systems, companies can track the movement of goods, monitor environmental conditions, and identify areas for improvement (Moreira et al., 2018; Al-Raggad et al., 2024). This enhanced visibility enables proactive decision-making and risk management, allowing businesses to respond quickly to disruptions and minimize their environmental impact (Fang et al., 2014).

Another important application of information technology in green supply chain management is the implementation of data analytics for predictive modeling and optimization (Zhao et al., 2017). By analyzing large volumes of data from various sources, including suppliers, customers, and external stakeholders, companies can identify patterns, forecast demand, and optimize transportation routes to minimize emissions and reduce costs (De Gennaro et al., 2016). Additionally, advanced analytics can help identify opportunities for waste reduction, energy efficiency improvements, and sustainable product design (Ren et al., 2019).

Furthermore, information technology enables collaboration and communication among supply chain partners, fostering a culture of transparency and accountability. Cloud-based platforms and digital collaboration tools facilitate information sharing, document management, and decision support across geographically dispersed teams (McGrath et al., 2021). This collaboration is essential for driving collective action on sustainability initiatives, such as supplier engagement, product lifecycle assessment, and stakeholder engagement (Mishra et al., 2022).

Despite the potential benefits, navigating the integration of information technology and green supply chain management poses several challenges for businesses (Ahmed et al., 2024). These include data privacy and security concerns, interoperability issues between different IT systems, and the need for skilled personnel to manage and interpret data effectively (Habibzadeh et al., 2019). Additionally, there may be resistance to change from stakeholders accustomed to traditional supply chain practices, requiring strong leadership and change management strategies to drive adoption (Nejati et al., 2017).

In conclusion, effectively navigating the intersection of information technology and green supply chain management requires a strategic approach that leverages technology to drive sustainable practices and create value for both businesses and society. By embracing innovation, collaboration, and continuous improvement, companies can harness the power of IT to optimize their supply chains, reduce environmental impact, and achieve their sustainability goals.

Cluster 3 (Blue) discusses innovative performance by leveraging knowledge transfer (KT) and Supply Chain Learning (SCL). Scholars are increasingly focusing on supply chain innovation in response to fierce competition and complex business environments (Agyabeng-Mensah et al., 2023). According to dynamic capabilities theory, enhancing learning capabilities can provide organizations with a competitive advantage (Irfan et al., 2023). Innovation takes various forms, including technical, managerial, revolutionary, product/service, and process innovations (Abdelaziz et al., 2023). To boost competitiveness, companies must tap into external sources for knowledge acquisition, which can come from within or outside the organization, with supply chain partners playing a crucial role (Kumar et al., 2020).

Supply chain knowledge is a vital asset for companies seeking competitive advantages by assimilating experiences, values, and expertise from suppliers, customers, and the supply chain infrastructure. This knowledge enhancement improves customer value, resource utilization, and helps in anticipating environmental changes (Agyabeng-Mensah et al., 2023). Furthermore, it facilitates innovation and information dissemination. The knowledge-based view emphasizes strategically managing diverse knowledge resources to gain a competitive edge. Dynamic capabilities enable firms to establish new knowledge configurations, enabling adaptation to uncertain business environments and anticipation of future changes (Teece, 2007; Abdelaziz et al., 2023).

Effective knowledge management within supply chain management is essential for sharing information, capitalizing on experiences, facilitating knowledge access, and improving communication (Samuel et al., 2011; Yan et al., 2023). The SECI model outlines the process of knowledge creation, conversion, and transmission within organizations, comprising socialization, externalization, combination, and internalization stages. Its aim is to convert tacit knowledge into explicit knowledge and share it with others (Hashim et al., 2017).

The knowledge-based view suggests that organizations can leverage the diverse knowledge of their supply chain members to tackle competition and innovation challenges (Alguezaui & Filieri, 2014). Effective knowledge management at the supply chain level can reduce variability and disruptions, enhance integration and collaboration, and serve as a leverage mechanism, requiring a robust knowledge management system encompassing both internal and external mechanisms (Ali et al., 2023; Moreira et al., 2018). Internal mechanisms, such as knowledge sharing, acquisition, and retention, are crucial for supporting the supply chain's adaptation to post-disaster operations, while external mechanisms involve knowledge management activities between supply chain partners, including supplier development initiatives and joint product development (Zighan et al., 2023).

KT is vital for a firm's competitiveness and efficient supply chain management. Efficient KT can differentiate a company, enhance performance, and manage customer responses proactively and reactively (Zaid et al., 2023). Innovation arises from the exchange of information and technology, particularly if an organization possesses technological capabilities. KT fosters innovation in supply chains by enabling knowledge sharing and enhancing innovation performance through cross-organizational collaboration (Choi et al., 2020).

Organizational learning is crucial for firms to succeed in the rapidly evolving business environment, especially within the supply chain context. It involves the learning process to seize opportunities and gain a competitive edge (Santos-Vijande et al., 2012; Yan et al., 2023; Albdareen, 2020). SCL emerges from inter-organizational learning, where multiple supply chain partners interact to learn about supply chain issues and solutions, with the supply chain acting as a knowledge gathering and creation vehicle (Liu et al., 2023; Zighan et al., 2023).

Previous studies highlight a firm's knowledge base and learning-related capacities as crucial components of inter-organizational learning. SCL literature examines the effects of internal resources and capabilities, including human capital assets, managerial quality, competencies, and trust-building within firms (Yang et al., 2023). Absorptive capacity, gauging a firm's potential to recognize, absorb, and utilize external knowledge, is an important antecedent of SCL. Effective utilization and investment in internal resources and social and human capital significantly impact a company's SCL, further enhanced by strategic traits such as utilizing inter-organizational learning and being open to partners (Aid et al., 2017; Zighan et al., 2023; Albalawee et al., 2024). These elements can be integrated into supply chain orchestration on multiple levels. Maintaining current relationships and establishing trustworthy collaboration channels are crucial for effective learning between external supply chain partners (Yan et al., 2023; Zighan et al., 2023).

SCL research is gaining momentum, focusing on its benefits, dimensions, and conceptual framework. The benefits include innovation diffusion, performance enhancement, and dynamic supply chain capability cultivation (Liu et al., 2023). However, some perspectives suggest that SCL, involving multiple partners with conflicting goals, may lead to trade-offs and potential negative impacts on supply chain performance (Silva et al., 2023). The relationship between SCL and supply chain performance may not always be positive, as outdated knowledge can misguide the supply chain (Silvestre et al., 2023). Various dimensions influence SCL, such as knowledge content, learning process, and knowledge source (Silvestre et al., 2023). SCL encompasses three stages: setting up, operating, and maintaining continuous learning (Liu et al., 2023). To foster SCL, open communication, integrative mechanisms, trust-building, participative decision-making styles, a positive learning culture, transformational leadership, information sharing, and IT applications adoption are crucial (Liu et al., 2023).

Cluster 4 (Yellow) delves into the essential role of strategic capabilities in achieving seamless supply chain integration. Through the lens of the Resource-Based View, this approach emphasizes the strategic management of organizational resources and capabilities to gain a competitive advantage (Pertusa-Ortega et al., 2010). In the context of supply chains, strategic capabilities encompass a range of tangible and intangible assets, including physical infrastructure, technology, human capital, and relationships with suppliers and partners (Schoenherr et al., 2014). By leveraging these resources effectively, companies can enhance coordination, collaboration, and alignment across the entire supply chain network (Zimmermann et al., 2016).

One key aspect of achieving supply chain integration through a resource-based view is the identification and development of core competencies that contribute to competitive advantage (Xu et al., 2014). These core competencies represent unique strengths and capabilities that set a company apart from its competitors and enable it to deliver superior value to customers. For example, a company may excel in logistics management, technology innovation, or customer service, allowing it to differentiate its offerings and capture market share. By investing in and leveraging these core competencies, companies can enhance supply chain integration and drive overall business success (Collins et al., 2010). Furthermore, strategic capabilities enable companies to adapt to changing market dynamics and customer demands effectively. In today's rapidly evolving business landscape, supply chain agility and flexibility are critical for responding to disruptions, seizing opportunities, and staying ahead of competitors (Kalubanga & Gudergan, 2022). Strategic capabilities such as agile manufacturing processes, responsive logistics systems, and robust information technology infrastructure enable companies to sense and respond to changes in real-time, ensuring smooth operations and customer satisfaction (Carvalho et al., 2012; Gunasekaran et al., 2019; Abualoush et al., 2018; Al- Bdareen & Khasawneh, 2019). Moreover, a resource-based view of supply chain integration emphasizes the importance of building and nurturing relationships with suppliers and partners (Xu et al., 2014; Yang et al., 2019). Collaboration and trust are essential for achieving seamless coordination and alignment across the supply chain network (Panahifar et al., 2018). Companies that invest in building long-term partnerships, sharing knowledge and resources, and jointly pursuing innovation and improvement initiatives are better positioned to achieve supply chain integration and create sustainable competitive advantage (Neutzling et al., 2018; Soosay et al., 2008; Abualoush et al., 2022; AL-Badareen & Al-Ghazzawi, 2018).

In conclusion, strategic capabilities: achieving supply chain integration through a Resource-Based View underscores the significance of strategic management of organizational resources and capabilities in driving supply chain integration and success. By identifying and leveraging core competencies, adapting to market dynamics, and fostering collaboration with suppliers and partners, companies can achieve seamless coordination and alignment across the supply chain network, ultimately delivering superior value to customers and gaining a competitive edge in the marketplace.

3.3.2 Bibliographic coupling among authors

The concept of author bibliographic coupling expands upon the notion of bibliographic coupling, which occurs when two authors cite the same articles in their respective published papers (Abu Huson et al., 2024). Author bibliographic coupling operates on the principle that the more references shared by two authors in their collective body of work, the greater the similarity in their research (Albalawee et al., 2024; Qudah et al., 2024). The efficacy of utilizing document bibliographic coupling for mining research frontiers and creating science maps has been extensively studied and validated (Abu Orabi et al., 2023).
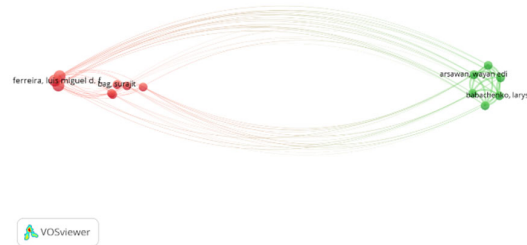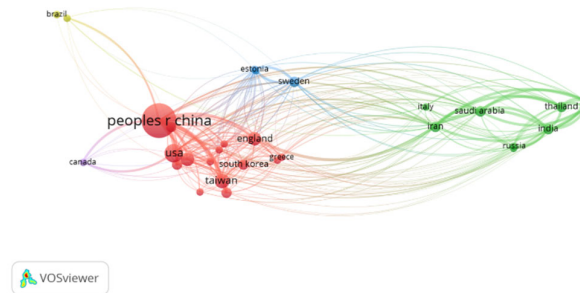

Fig. 5. Bibliographic coupling of authors

In Fig. 6, prominent authors are ranked based on the number of papers they have cited. Notably, Luis Miguel DF Ferreira emerges as the most frequently cited author in the field of technology applications and innovation performance in supply chain management during the study period from 2008 to 2024. Ferreira's name is highlighted on the left side of the figure, with 19 documents and 760 citations attributed to him, resulting in total link strength of 752 of the cluster. Following closely behind is Ricardo Zimmermann in the second rank and António Carrizo Moreira in the third rank.

3.3.3 Bibliographic coupling of nations

Fig. 6 illustrates the collaborative network among various countries and territories within this specific context. The data is generated by applying a threshold that requires at least one document for inclusion, showcasing over fifty of the most significant bibliographic connections. Each element is labeled and typically represented as a default circle (Boyack & Klavans, 2010). The size of both the label and circle indicates the element's significance, with the largest label and circle denoting the most pertinent element. Lines connecting these elements represent their connections, and the distance between them indicates the degree of relatedness among countries in this particular research field (Abu Huson et al., 2024). One notable advantage of this map is its ability to highlight countries or territories with similar characteristics, often resulting in the clustering of countries from the same continent (Albalawee et al., 2024).

Fig. 6. Bibliographic coupling of nations

As depicted in Figure 6, the largest circle in the visualization represents China with 63 publications and 3050 citations, closely linked to other nations like the USA, England, Taiwan, and Canada. This indicates China's significant interest in import and export, given its status as one of the largest economies globally and its substantial contribution to the global trade balance, especially with its significant consumption of oil and widespread export of various products worldwide. Consequently, we observe considerable interest among Chinese researchers and academics in the field of technology applications and innovation performance in supply chain management.

4. Discussion

The findings of this study provide both theoretical and practical implications for understanding and enhancing technology applications and innovation performance in SCM. By employing robust bibliometric analysis and science mapping techniques, this study contributes to the advancement of knowledge in the field of SCM. It identifies key research themes, prominent authors, influential journals, and significant collaborations, providing a comprehensive overview of the current state of research in technology applications and innovation performance within SCM.

The analysis reveals areas within the literature that have received significant attention as well as those that remain underexplored. For instance, the identification of prominent clusters highlights topics such as building competitive advantage through supply chain sustainability, the convergence of information technology and green SCM, and the role of strategic capabilities in achieving seamless supply chain integration. These insights can guide future research efforts by identifying gaps in the existing literature and areas that warrant further exploration.

The findings of this study validate several theoretical frameworks within the field of SCM. For example, the concept of dynamic capabilities theory is supported by the emphasis on learning capabilities as a source of competitive advantage. Similarly, the resource-based view is affirmed by the significance of strategic capabilities in achieving supply chain integration and success. By corroborating these theoretical frameworks, this study enhances our understanding of the underlying mechanisms driving innovation and performance within SCM.

The insights generated from this study offer valuable guidance for practitioners involved in SCM. For instance, the identification of emerging trends and research clusters can inform strategic decision-making within organizations. Practitioners can leverage this knowledge to align their initiatives with the latest developments in technology applications and innovation performance, thereby gaining a competitive edge in the marketplace. Policymakers can also benefit from the findings of this study by gaining insights into the key challenges and opportunities within the SCM domain. For example, the emphasis on supply chain sustainability highlights the growing importance of environmental considerations in SCM practices. Policymakers can use this information to formulate regulations and incentives that promote sustainable practices and innovation within supply chains, thereby contributing to broader societal goals such as environmental conservation and economic development.

The analysis of bibliographic coupling among authors and nations underscores the importance of collaboration in advancing research and innovation within SCM. Practitioners and policymakers can leverage this insight to foster collaboration among stakeholders, both within and across organizational boundaries. By facilitating knowledge sharing and collaboration, organizations can accelerate the pace of innovation and drive positive change within the SCM ecosystem.

5. Conclusion

This study has conducted a thorough bibliometric analysis of the existing literature concerning technology applications and innovation performance in supply chain management. Through a meticulous review and synthesis of pertinent research articles, we've delineated key trends, identified research gaps, and shed light on emerging themes within this realm. Our findings underscore the pivotal role of sustainable practices within the supply chain, not only in fostering competitive advantage but also in driving innovation and ensuring long-term success.

The analysis highlights the multifaceted nature of supply chain sustainability and its significance in generating value for companies and their stakeholders. By optimizing resource utilization, minimizing waste, and embracing eco-friendly practices, organizations stand to not only trim costs but also bolster operational efficiency and enhance brand reputation. Moreover, our findings underscore the mounting importance of aligning with consumer preferences for sustainability and ethical practices, emphasizing the need for transparent communication and responsible sourcing.

Exploring innovation performance within the context of supply chain sustainability reveals avenues for leveraging technology and creativity to effect positive change. Whether through the development of new eco-friendly products or the adoption of circular economy principles, innovation in supply chain management practices has the potential to augment sustainability endeavors while concurrently boosting overall performance. Achieving success in supply chain sustainability necessitates a holistic approach that factors in environmental, social, and economic considerations. Companies must actively engage with stakeholders across the supply chain to ensure alignment of interests and maximize positive impact. Collaboration and partnership emerge as pivotal drivers of success, enabling firms to collectively address challenges and foster innovation in sustainable practices. Despite the valuable insights gleaned from this study, several limitations warrant acknowledgment. Primarily, the analysis is predicated on data sourced from the Web of Science (WoS) database, which may not encompass all pertinent publications in the field. Additionally, the study predominantly focuses on academic literature, overlooking potentially illuminating industry reports, white papers, and other informative sources. Moreover, the study's temporal scope is confined to the period spanning from 2008 to 2024, suggesting future research could benefit from incorporating more recent publications and trends. Additionally, while the study predominantly employs quantitative analysis, future research could supplement these findings with qualitative methods to yield a deeper comprehension of the underlying mechanisms steering innovation and performance within supply chain management. Despite these limitations, this study lays a robust foundation for subsequent research in the domain of technology applications and innovation performance in supply chain management. Future investigations could delve into emerging trends like the integration of artificial intelligence, blockchain, and sustainability practices into supply chain management. Furthermore, comparative studies spanning different industries and regions could furnish valuable insights into the factors influencing innovation and performance within supply chain management.

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