EVOLUTION AND IMPACT OF ARTIFICIAL INTELLIGENCE IN SUSTAINABLE SUPPLY CHAIN MANAGEMENT: SYSTEMATIC REVIEW AND BIBLIOMETRIC ANALYSIS

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OPEN ACCESS

How to cite this paper: Ghouati, S., Oulfarsi, S., & El Amri, A. (2025). Evolution and impact of artificial intelligence in sustainable supply chain management: Systematic review and bibliometric analysis [Special issue]. *Corporate Governance and Sustainability Review, 9*(3), 217–230. https://doi.org/10.22495/cgsrv9i3sip3

ISSN Online: 2519-898X
ISSN Print: 2519-8971

Received: 30.12.2024
Revised: 17.03.2025; 27.06.2025; 10.09.2025
Accepted: 22.09.2025

JEL Classification: C45, D81, L11, L86, M11
DOI: 10.22495/cgsrv9i3sip3

Abstract

This study analyzes the integration of artificial intelligence (AI) in supply chain management through a systematic review and bibliometric analysis of 292 articles (2020–2023) from Scopus. It examines three areas: the evolution of research (*RQ1*), the impact of AI on processes (*RQ2*), and its strategic influence (*RQ3*). The results reveal that machine learning (16 studies) and deep learning (seven studies) dominate, optimizing demand forecasting and inventory management (Rana & Daultani, 2023). Sectors such as the food industry are benefiting from waste reductions thanks to AI (Kumar et al., 2021), while the automotive industry is improving predictive maintenance (Dumitrascu et al., 2020). However, challenges persist: lack of empirical validation, algorithmic biases, and difficulties with adoption by small and medium-sized enterprises (SMEs) (Fosso Wamba, 2022). Strategically, AI strengthens the resilience of supply chains (Christopher & Holweg, 2017), but its hybrid potential (e.g., AI + blockchain) remains underexploited (Arunmozhi et al., 2022). Theoretical implications highlight the need for dynamic models that integrate socioeconomic criteria, while practitioners must adapt AI to specific industry circumstances. This study provides valuable insights to guide researchers and practitioners in leveraging AI technologies to improve supply chain efficiency, resilience, and performance.

Keywords: Supply Chain, Artificial Intelligence (AI), Supply Chain Processes, AI Integration, Supply Chain Optimization, Decision-Making Framework

Authors' individual contribution: Conceptualization — S.G.; Methodology — S.G.; Software — S.G.; Validation — S.O. and A.E.A.; Investigation — S.G.; Resources — S.G.; Data Curation — S.G.; Writing — Original Draft — S.G.; Writing — Review & Editing — S.G.; Visualization — S.O. and A.E.A.; Supervision — S.O. and A.E.A.; Project Administration — S.G., S.O., and A.E.A.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

Acknowledgements: The Authors gratefully acknowledge the foundational contributions of researchers in AI and supply chain management, whose published work enabled this bibliometric analysis. Special thanks to the creators of VOSviewer and Scopus for their invaluable tools.

1. INTRODUCTION

The supply chain, often regarded as the backbone of modern businesses (Akbari et al., 2024), consists of a complex and interconnected network of processes aimed at delivering products and services efficiently to end consumers. In today's globalized environment, characterized by shifting demands, fierce competition, and unpredictable disruptions, optimizing and enhancing supply chain efficiency has become a strategic imperative for companies seeking to maintain competitiveness and meet customer expectations. With its capabilities in advanced data processing, predictive analytics, and automated decision-making, artificial intelligence (AI) has become a transformative force in supply chain management and optimization (Cannas et al., 2023).

Traditionally, supply chain management encompasses activities such as planning, sourcing, manufacturing, logistics, and distribution, all designed to minimize costs while ensuring quality and performance. However, contemporary challenges, including market volatility, increased supply chain complexity, and rapidly evolving consumer expectations, have exposed the limitations of conventional management approaches (Riahi et al., 2021). As a result, businesses are actively exploring innovative solutions to improve visibility, flexibility, and responsiveness across their supply chain networks (Alomar, 2022).

The integration of AI into supply chain management offers unprecedented opportunities to address these challenges. AI-powered advanced analytics, predictive modeling, and intelligent automation can optimize multiple facets of supply chain operations. Techniques such as machine learning (ML), neural networks, multi-objective optimization, and natural language processing have demonstrated significant potential in areas such as demand forecasting (Terrada et al., 2022), inventory management, sales prediction, risk assessment, and logistics optimization (Nozari et al., 2022). For instance, Akbari et al. (2024) emphasize the role of advanced IT tools, including AI-driven optimization systems, in managing the growing complexity of global supply chains. Similarly, Cannas et al. (2023) highlight the substantial efficiency gains, cost reductions, and customer satisfaction improvements resulting from AI-driven supply chain management.

Despite the growing academic interest in AI applications within supply chains, existing research lacks a systematic, process-oriented framework that comprehensively assesses AI methodologies, industry-specific impacts, and strategic implications (Rana & Daultani, 2023). To bridge this gap, this study formulates the following research questions:

RQ1: How is research evolving in the study of AI applications within supply chains?

RQ2: How does the integration of AI impact supply chain processes across industries?

RQ3: How does AI influence the overall strategic direction of businesses?

To address these questions, this study employs a systematic literature review and bibliometric analysis (Mongeon & Paul-Hus, 2016), synthesizing existing research on AI's role in supply chains. This dual approach integrates descriptive and critical analyses, offering valuable insights for both academics and industry practitioners. The findings serve as a benchmark for tracking research evolution and anticipating future trends in AI applications for supply chain optimization.

The rest of this paper is structured as follows. Section 2 presents a comprehensive literature review, summarizing prior research and identifying existing gaps. Section 3 outlines the research design and analytical approach. Section 4 highlights key AI applications and industry-specific implications. Section 5 discusses the main findings. Section 6 summarizes the study's main contributions, acknowledges its limitations, and suggests future research directions.

2. LITERATURE REVIEW

With the ongoing process of globalization, companies are increasingly prioritizing supply chain efficiency and operational agility to sustain competitiveness. These efforts are driving significant changes across markets, reshaping demand dynamics, and revolutionizing data management practices. In this fast-evolving environment, businesses must adopt proactive strategies to mitigate demand uncertainty, supply chain disruptions, and financial risks while maintaining resilience.

In this digital transformation era, AI has emerged as a game-changing technology, offering advanced solutions to enhance supply chain agility, efficiency, and decision-making. While AI has been a subject of academic and industrial interest for several decades, its application in supply chain management remains relatively limited. However, recent advancements have demonstrated AI's potential to optimize demand forecasting, inventory management, risk assessment, and logistics planning, fundamentally transforming supply chain processes.

Aligned with the objectives of this study, a rigorous systematic literature review, complemented by bibliometric analysis, was conducted to examine the state of research on AI applications in supply chains. Unlike traditional narrative reviews, which may lack methodological rigor, a systematic review follows a structured and transparent approach to synthesizing relevant research. By integrating bibliometric methods, this study provides an objective and comprehensive mapping of AI-driven innovations in supply chain management, ensuring analytical robustness and minimizing potential biases in interpretation (Phulwani et al., 2020).

Beyond its increasing industrial adoption, AI has also gained prominence in academic research, influencing diverse fields of study. Given the rapid advancements in AI technologies, it is essential to assess their impact on supply chain operations and explore their implications for industry practitioners and researchers.

Recent studies have highlighted the transformative role of AI in enhancing supply chain resilience and sustainability. For instance, Wang and Zhang (2025) analyzed the application of generative AI in digital supply chains within Chinese tourism small and medium-sized enterprises (SMEs), demonstrating its contribution to achieving sustainable development goals through improved transparency and efficiency.

Similarly, Taha (2025) explored the direct and indirect effects of AI on supply chain resilience and performance in Jordanian companies, revealing significant positive impacts facilitated by AI-driven decision-making processes.

Furthermore, the integration of AI in supply chain analytics has been shown to enable greater agility and innovation. Lamees and Ramayah (2025) discussed how AI-based analytics, when combined with intellectual capital, can foster dynamic capabilities in manufacturing companies, leading to improved supply chain performance.

In the context of decision-making, Genetti et al. (2025) proposed an interpretable AI approach using evolutionary reinforcement learning to optimize supply chain decisions. This method addresses the "black-box" nature of traditional AI models, enhancing stakeholder trust by providing transparent and explainable decision-making processes.

Despite the growing body of literature on AI, its integration into supply chain management remains an underexplored domain. This study seeks to bridge this gap by offering a comprehensive review of AI-driven supply chain transformations, identifying key trends, and outlining future research directions in this evolving field.

3. RESEARCH METHODOLOGY

To ensure a systematic and comprehensive investigation of AI applications in supply chains, this study adopts a rigorous methodological framework, integrating a systematic literature review and bibliometric analysis. This dual approach enhances the robustness and reliability of findings by providing both qualitative and quantitative insights into the research landscape.

3.1. Collection of data

The dataset for this study was extracted from the Scopus database, chosen for its broad disciplinary coverage and inclusion of diverse document types, making it a robust source for bibliometric research. Mongeon and Paul-Hus (2016) highlight that Scopus surpasses Web of Science (WoS) in coverage by nearly 60%, offering a more inclusive dataset that captures interdisciplinary research trends. Unlike WoS, which primarily focuses on ISI-listed journals, Scopus provides access to a broader range of academic sources, including high-impact journals, conference proceedings, and emerging research fields, ensuring a comprehensive representation of the academic landscape.

To ensure relevance, a strategic keyword selection was applied. Keywords were chosen to reflect the intersection of AI and supply chain research, ensuring the inclusion of high-impact studies. "Supply chain" and "Supply chain processes" encompass work on structure, operations, and management. "Artificial intelligence" targeted studies on AI applications, methodologies, and their transformative effects on supply chains.

Additionally, "AI integration" and "Supply chain optimization" identified research on AI-driven technologies in automation, efficiency, and decision support. "Decision-making framework" filtered studies addressing AI's role in strategic and operational decisions. This selection was informed by an exploratory literature review and followed Zupic and Čater's (2015) methodology to ensure thematic comprehensiveness.

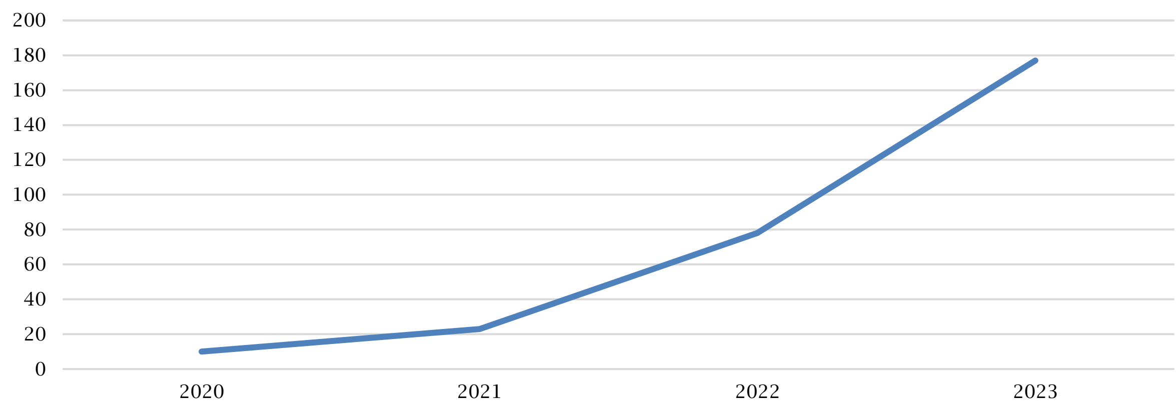
To enhance scientific rigor, only peer-reviewed journal articles were included, excluding conference papers, books, and chapters. Van Eck and Waltman (n.d.) argue that journal articles undergo stricter peer review, making them more reliable.

The study focused on the 2020–2023 period, selected due to rapid advancements in AI adoption in supply chains. Riahi et al. (2021) stress the importance of analyzing recent trends.

A total of 292 articles were identified, with initial screening based on titles, abstracts, and keywords, followed by full-text reviews to ensure methodological and thematic alignment. Only empirical and theoretical studies on AI applications in supply chain processes were retained, with a focus on industrial contexts to highlight practical implementations.

Figure 1 shows the annual distribution, indicating a steady rise in AI-related supply chain research.

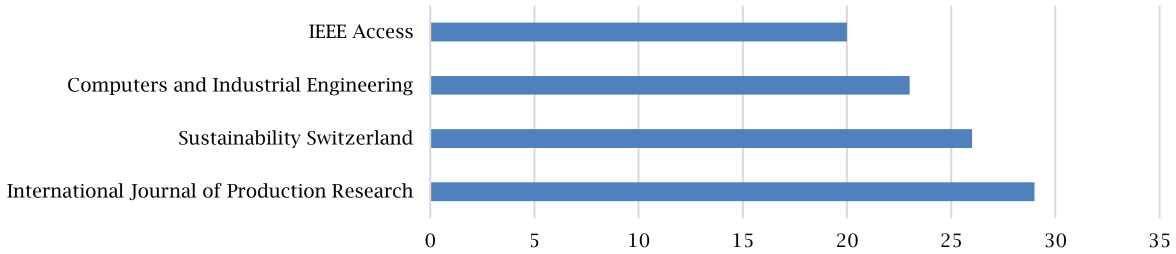
Figure 1. Annual distribution of articles



Source: Authors' elaboration based on Scopus data, 2024.

The analysis of Figure 2 further revealed that most publications appeared in leading journals, including the *International Journal of Production Research* (29.2%), *Sustainability Switzerland* (26.28%), *Computers and Industrial Engineering* (23.36%), and *IEEE Access* (20.44%). This distribution aligns with the observations of van Eck and Waltman (n.d.), who noted that contributions to specialized fields tend to concentrate in high-impact journals.

Figure 2. Distribution across journals



Source: Authors' elaboration based on Scopus data, 2024.

Of the 292 studies identified, a stratified sample of 80 works was classified by approach, as shown in Table 1. Empirical approaches dominate (72.5%), reflecting the field's focus on operational implementations. Theoretical contributions (22.5%) mainly focus on architectural innovation, while mixed-method studies remain emerging (5%).

Table 2. Comparative analysis of study approaches

Study type	*Count*	*%*	*Example*
Theoretical	18	22.50%	Kumar et al. (2021) — Hybrid AI frameworks
Empirical	58	72.50%	Alharbi et al. (2023) — Warehouse robotics
Mixed Methods	4	5%	Mariappan et al. (2023) — Pharma blockchains
Total	**80**	**100%**	

Source: Authors' elaboration based on Scopus data, 2024.

3.2. Techniques and process

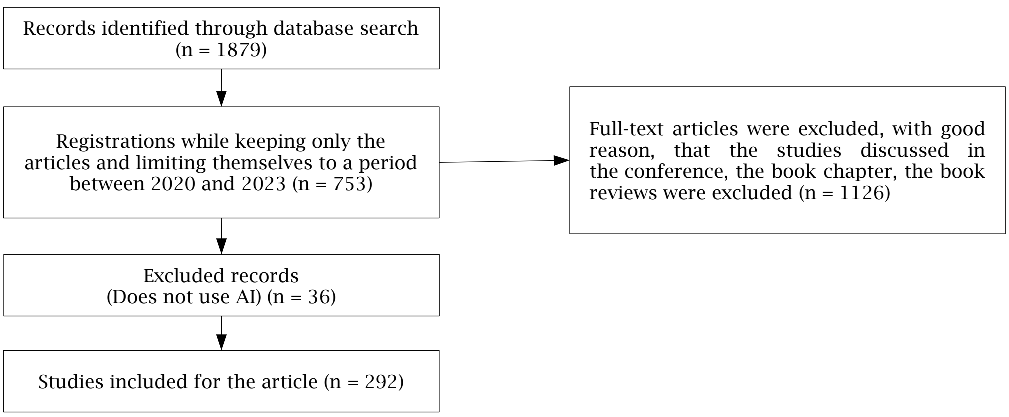
This study conducted a rigorous bibliometric analysis using VOSviewer software developed by van Eck and Waltman (n.d.), which enables comprehensive visualization of co-occurrence networks, citation patterns, and thematic clusters. As emphasized by Cobo et al. (2011), this tool's capacity to uncover hidden research connections makes it particularly valuable for bibliometric studies. The analysis followed the established science mapping framework of Zupic and Čater (2015), implementing a systematic, multi-stage approach to ensure methodological rigor.

The research process began with careful study design and selection of appropriate bibliometric techniques. Data collection leveraged the Scopus database, chosen for its extensive coverage and detailed metadata as documented by Mongeon and Paul-Hus (2016). Analytical procedures incorporated co-occurrence networks, citation analysis, and bibliographic coupling, foundational methods pioneered by Small (1973), to identify structural patterns and emerging themes.

VOSviewer generated detailed bibliometric maps revealing keyword trends, author collaborations, and thematic concentrations. Following Tranfield et al.'s (2003) recommendations, findings underwent both quantitative evaluation and qualitative interpretation to maintain contextual validity. While bibliometric analysis provided valuable structural insights, domain experts conducted thorough qualitative reviews to verify all interpretations, ensuring a robust understanding of AI applications in supply chain management.

The complete methodology, illustrated in Figure 3, demonstrates how VOSviewer's visualization capabilities, combined with systematic analytical techniques to provide comprehensive insights into the research landscape. This dual quantitative-qualitative approach, applied consistently across all study phases, yielded a data-driven yet nuanced understanding of the field's development and current state.

Figure 3. Material collection process



Source: Authors' elaboration based on various sources.

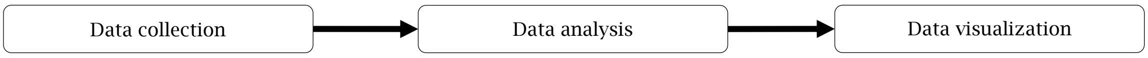
3.3. Approach

The aim of this study is to explore the current body of literature at the intersection of AI and supply chains through a systematic review. Drawing on established research in supply chain management, key dimensions relevant to the review process were identified. A detailed analysis of the selected articles was then conducted to evaluate how they address the research questions by applying the following techniques:

- Keyword Co-occurrence Networks: This technique employed author-specified keywords to uncover thematic connections and trends within scholarly articles. It facilitated the identification of research clusters that align with specific aspects of AI and supply chain management.
- Chronological Citation Mapping: This approach visualized significant direct citations and co-citations within the selected references, allowing us to trace the evolution of ideas and influential studies in the field.

Figure 4 illustrates the bibliometric workflow, detailing the steps involved in data collection, analysis, and visualization. This structured methodology ensured a systematic and transparent research process, enhancing replicability and providing a comprehensive understanding of the research landscape.

Figure 4. Bibliometric workflow



Source: Adapted from van Eck and Waltman (n.d.).

3.4. Explore the classification system

The gathered data was classified based on three fundamental structural dimensions: the integration of AI algorithms or methodologies, supply chain processes, and the impact of AI on supply chains in strategic decision-making across different industrial sectors. These dimensions were identified using both deductive and inductive approaches, ensuring a comprehensive categorization of research articles.

3.4.1. Integration of artificial intelligence techniques

Through detailed examination of selected studies, we cataloged the AI algorithms and methodologies employed, with particular attention to frequently cited approaches. This systematic classification enables researchers to match specific supply chain challenges with optimal AI solutions, providing valuable guidance for operational improvement.

3.4.2. Supply chain process

By categorizing articles according to supply chain functions, we identified how AI enhances specific operational areas. This analysis not only reveals primary data sources critical for supply chain optimization but also establishes an empirical foundation for future research in AI-driven supply chain management.

3.4.3. Artificial intelligence's impact on supply chain strategic decision-making in different sectors

This dimension focuses on research conducted within industrial environments where AI has been integrated to address supply chain issues. By analyzing these studies, we assessed how AI drives industrial benefits, including operational efficiency, cost reduction, and strategic improvements. To ensure a thorough evaluation of AI's impact, it is essential to measure key performance indicators that align with corporate strategies. These indicators include flexibility, cost reduction, productivity improvement, quality enhancement, lead time reduction, managerial capacity, control mechanisms, optimization, and operational autonomy.

By structuring this classification, companies can gain valuable insights into how AI-driven innovations can enhance decision-making, optimize operations, and foster a more efficient, resilient, and competitive supply chain ecosystem.

3.5. Alternative research methodologies

While bibliometric analysis provides a broad overview, alternative methods offer deeper insights:

- Multiple case studies (Cannas et al., 2023) reveal implementation dynamics in organizational contexts.
- Qualitative techniques (Dubois & Gadde, 2002) capture stakeholder perspectives on AI integration.
- Mixed methods (Creswell & Creswell, 2023) enable data triangulation for robust findings.

This multidimensional approach, combining systematic classification with diverse methodologies, provides both a comprehensive and nuanced understanding of AI's role in supply chain transformation, offering valuable insights for researchers and practitioners alike.

4. RESULTS

Co-citation analysis involves identifying instances where authors, references, or journals are cited together in other scholarly works. This study presents descriptive findings such as annual article production, frequently cited sources, prolific authors, significant references, and key articles. Network maps were also employed to visualize relationships among keywords and citations, enhancing our understanding of the research landscape. The critical analysis was carried out by analyzing the interaction of the dimensions studied previously.

4.1. Overview and analysis

4.1.1. Publication details by year

Businesses are increasingly embracing AI to revolutionize their supply chains, necessitating more focused research and attention to support their advancement in this transformative endeavor. This dimension aids companies in grasping AI's significance and potential to revolutionize supply chain operations.

Figure 1 displays the publication trends of articles related to AI and the supply chain, highlighting growing interest in the subject since 2022. The study includes 292 selected articles predominantly sourced from 20 key publications, as depicted in Figure 2.

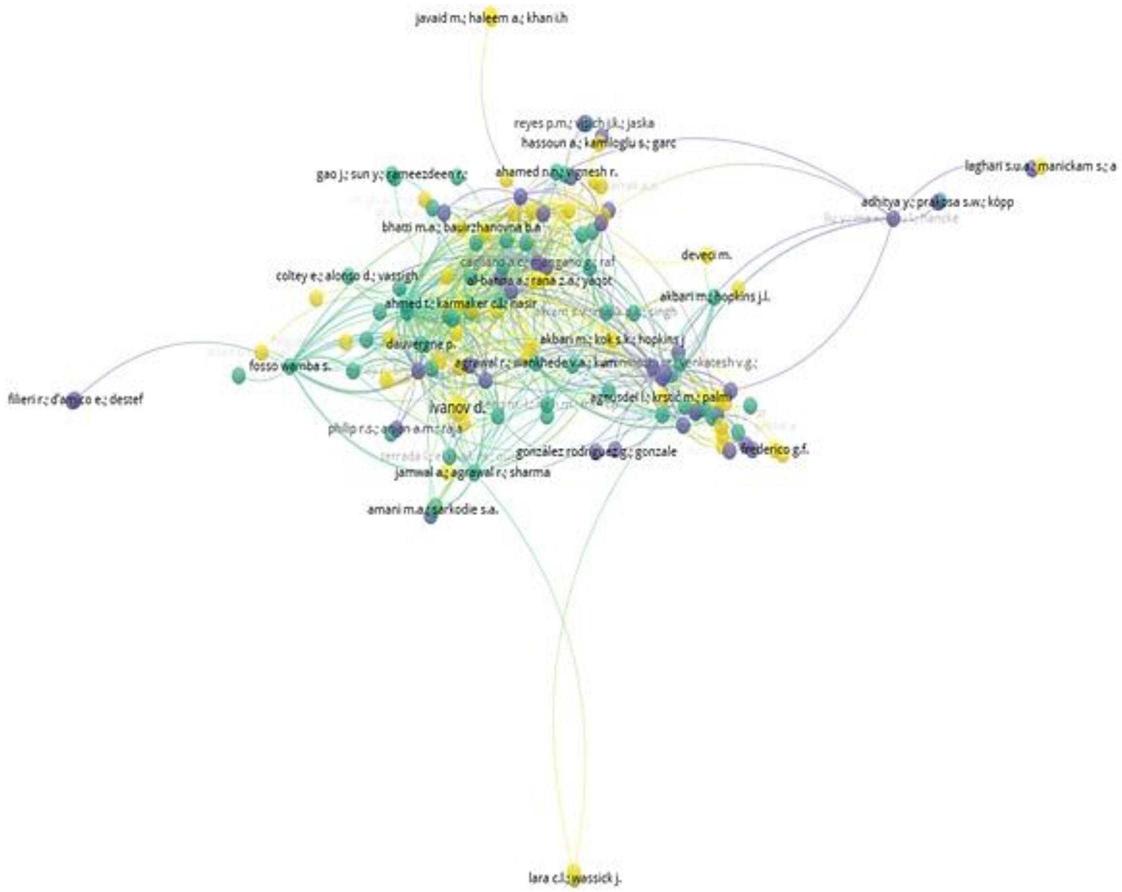
4.1.2. Co-author analysis per document

The analysis of co-authorship per document revealed a pattern of collaboration between authors of different documents, as illustrated in the network shown in Figure 5, where nodes represent authors. The size of the nodes indicates the extent of the authors' interaction with others, proportional to the total number of documents analyzed. The connections between nodes depict co-authorships, with the thickness of the links indicating the overall count of collaborations among documents. A network illustrating author collaboration can be constructed using the following general formula:

"Bcoll is equal to A multiplied by its transpose, where A represents a matrix of documents by Authors" (Riahi et al., 2021, p. 5).

The distribution of document networks by country from 2020 to 2023 reveals that India, China, and the United States were the primary producers of articles, collaborating extensively with numerous countries. On the other hand, countries like the United Kingdom, Germany, Australia, and France engaged in collaborations with various nations but generated a comparatively smaller number of articles.

Figure 5. Network co-authors per document



Source: Authors' elaboration using VOSviewer.

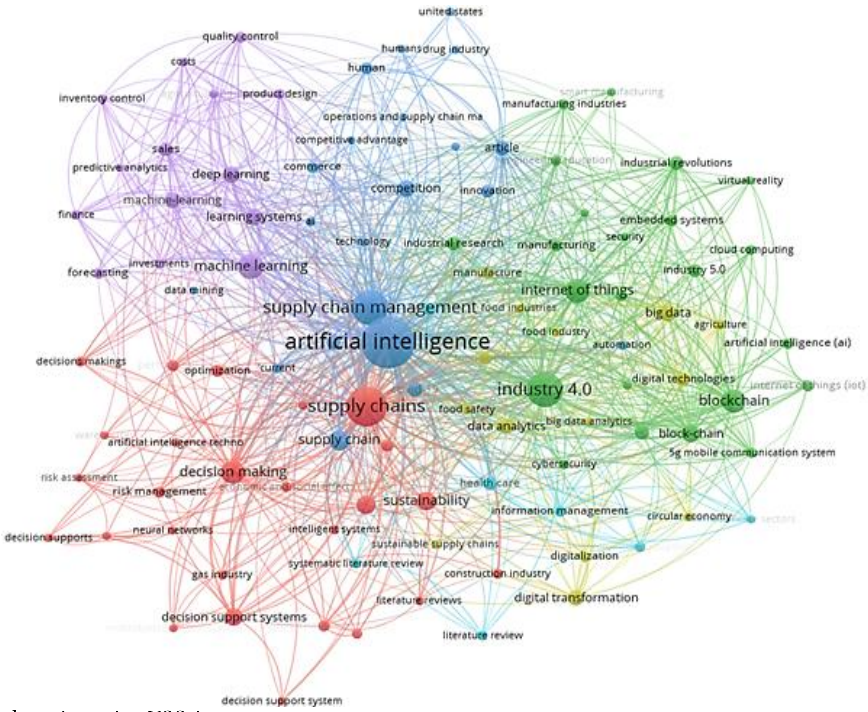
4.1.3. Analysis of semantic networks

Semantic network analysis involves studying the connections between words within texts to uncover their relationships. In our research, we investigated the frequency distributions and associations of keywords utilized by authors. Employing co-word analysis, we identified the occurrences of keywords extracted from document titles, abstracts, or bodies. Subsequently, we analyzed the co-occurrence networks of these keywords among authors, using the formula:

"Bcoc = A multiplied by its transpose, where A represents a matrix of documents by words" (Riahi et al., 2021, p. 7). The matrix includes both author-specified keywords and keywords obtained from the summaries or titles of the articles (Riahi et al., 2021).

We categorized the top 80 most frequent keywords into four main groups (Figure 6). The circle's size denotes the frequency of the words, while color signifies their respective group.

Figure 6. Network of keyword co-occurrences among authors

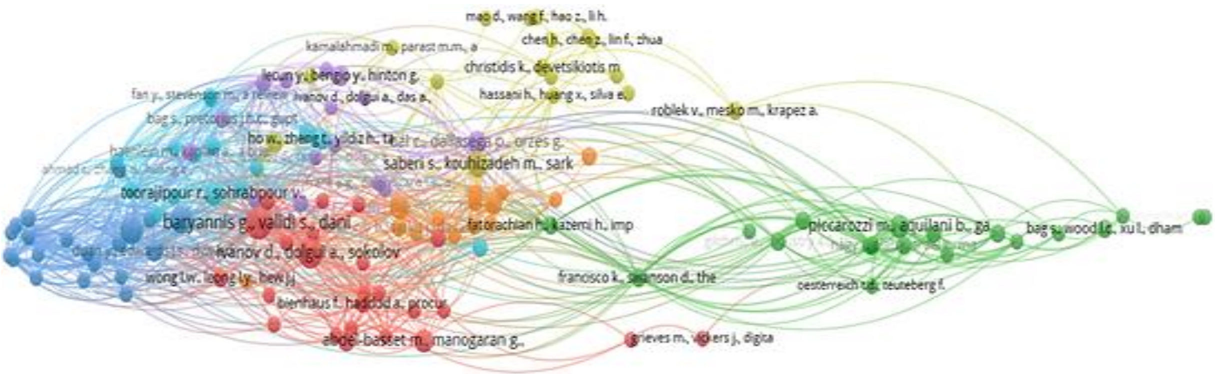


Source: Authors' elaboration using VOSviewer.

4.1.4. Author productivity

In terms of author performance, Haleem et al. (2022), Javaid et al. (2023), and Fosso Wamba (2022) produced the highest number of studies and are the most prolific contributors (4 articles). Although Akbari et al. (2024) only published two articles between 2020 and 2023, this author is among the five most productive authors in this topic.

Figure 7. Citation network by author



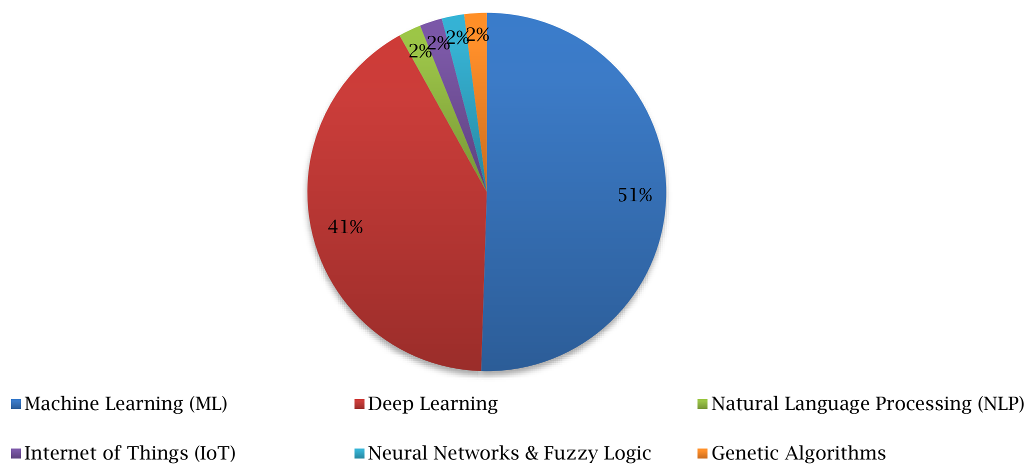
Source: Authors' elaboration using VOSviewer.

This study structures the classification framework using three key structural dimensions: AI techniques, supply chain processes, and the impact of AI on industrial decision-making and performance. The results are detailed in Table A.1 in the Appendix.

4.2. Artificial intelligence techniques in supply chains

Figure 8 analysis identifies ML as the predominant technique (16 studies), demonstrating significant impacts on turnover (Jauhar et al., 2023; Pallathadka et al., 2023), profit margins (Rana & Daultani, 2022), and risk assessment (Li, 2022). Deep learning (DL) follows (seven studies), showing strong results in sustainability (Lam et al., 2023) and predictive maintenance (Jamwal et al., 2022). While 19% of studies combine multiple algorithms, 4% examine unspecified techniques. Natural language processing (NLP) and Internet of Things (IoT) applications (four studies each) provide real-time insights (Apte et al., 2018) and enhance decisions (Makridis, Boese, et al., 2023). Emerging hybrid models, including ML-DL integration (Kumar et al., 2021), showcase AI's growing sophistication in supply chain optimization.

Figure 8. Artificial intelligence techniques in supply chains



Source: Authors' elaboration.

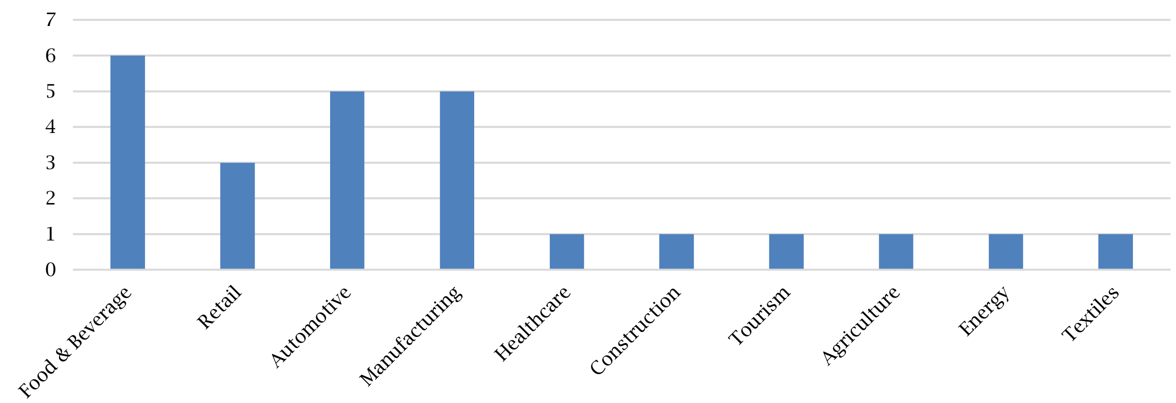
4.3. Applications of artificial intelligence across supply chain processes and industries

Figure 9 demonstrates AI's widespread adoption across industries, with implementations tailored to sector-specific requirements. The food industry has particularly benefited from AI applications, with researchers including Bhatia and Albarrak (2023), Makridis, Boese, et al. (2023), and Ramirez-Asis et al. (2022) documenting its effectiveness in demand forecasting, inventory optimization, and waste reduction. Similarly, Kler et al. (2022), Amani and Sarkodie (2022), and Alharbi et al. (2023) highlight AI's crucial role in addressing the sector's unique challenges of product perishability and demand volatility.

In retail, scholars such as Dwivedi (2023), Friedlander and Zoellner (2020), and Sivaram et al. (2021) have shown how AI enhances customer experience through personalized recommendations and dynamic pricing while improving inventory management. The automotive industry's focus differs, with Firouzkouhi et al. (2023), Borodavko et al. (2021), and Dumitrascu et al. (2020) emphasizing AI's contributions to predictive maintenance and risk mitigation. Sharma (2023) and Arunmozhi et al. (2022) further demonstrate its role in enabling Industry 4.0 transformations.

Manufacturing applications are equally diverse, as evidenced by Mypati et al. (2023), Panigrahi et al. (2023), and Rana and Daultani's (2023) work on quality control and process optimization. Emerging sectors show promising applications, from healthcare logistics (Mariappan et al., 2023) to agricultural monitoring (Kumar et al., 2021) and textile production (Wazarkar et al., 2020), collectively illustrating AI's transformative potential across supply chain ecosystems.

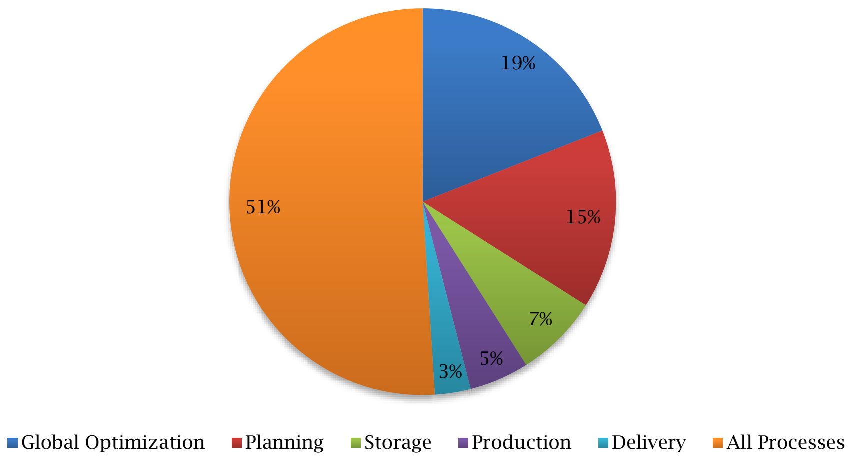
Figure 9. Artificial intelligence applications by industry sector



Source: Authors' elaboration.

The analysis of the 292 studies reveals that 55 adopt a comprehensive supply chain optimization approach (Figure 10). Research also focuses on specific functions: planning (42 studies), warehousing (21), and delivery (15). Manufacturing emerges as the main area, with six ML applications for demand forecasting and three for DL. In logistics, AI improves sales forecasting and reduces costs (Mariappan et al., 2023) while increasing reliability (Rana & Daultani, 2023). For warehousing, techniques such as DL and computer vision (Alharbi, 2023; Tang et al., 2023) optimize inventory management with increased accuracy.

Figure 10. Artificial intelligence applications in the logistics processes



Source: Authors' elaboration.

4.4. Impact of artificial intelligence on industrial decision-making and performance

AI has fundamentally reshaped supply chain management by enhancing decision-making processes across operational, strategic, and risk management domains. The widespread adoption of ML stands out as particularly transformative, with studies by Kler et al. (2022) and Sujith et al. (2022) demonstrating its dual capacity for operational optimization and risk mitigation through advanced predictive capabilities. These applications extend from routine automation to sophisticated disruption forecasting, enabling proactive supply chain adjustments.

DL applications show equally significant impacts, particularly in sustainable operations and maintenance systems. Research by Lam et al. (2023) and Alharbi (2023) highlights its environmental benefits, while Jamwal et al. (2022) document substantial improvements in equipment maintenance through failure prediction algorithms. Complementary technologies like computer vision and fuzzy logic, as examined by Tang et al. (2023) and González Rodríguez et al. (2020), provide real-time operational visibility, creating synergies between inventory management and demand fulfillment.

The integration of AI with blockchain represents a major innovation frontier, with Arunmozhi et al. (2022) and Menchaca-Méndez et al. (2022) illustrating enhanced traceability, transparency, and capital efficiency. These hybrid systems demonstrate how converging technologies can address multiple supply chain challenges simultaneously, from security to resource optimization.

Across supply chain functions, AI's impacts manifest differently but consistently drive improvement. Production and delivery systems achieve greater automation and responsiveness, while inventory management realizes efficiency and sustainability gains. Logistics operations benefit from unprecedented tracking accuracy and coordination capabilities. As these technologies continue evolving, they promise to further redefine supply chain excellence through increasingly intelligent, adaptive systems.

5. DISCUSSION

This comprehensive analysis of recent AI applications in supply chain management reveals several critical insights about the field's evolution, operational impacts, and strategic implications. The findings demonstrate both the transformative potential of AI technologies and the persistent challenges limiting their full implementation across industries.

The period from 2020 to 2023 has witnessed steady growth in AI supply chain research, with particular emphasis on production optimization, as noted by Núñez-Merino et al. (2022). While studies have thoroughly examined core processes like inventory management and demand forecasting, significant gaps remain in addressing emerging areas such as reverse logistics and last-mile delivery solutions (Panigrahi et al., 2023). The field shows heavy reliance on theoretical models and simulations, with Shatat and Shatat (2023) highlighting the need for more empirical validation of ML applications in real-world settings.

A promising development is the emergence of hybrid AI systems. Tavana et al. (2024) demonstrate how combining natural language processing with reinforcement learning can significantly enhance demand forecasting accuracy in the food industry. However, such innovative approaches remain underrepresented in current literature. The research also reveals a missed opportunity for interdisciplinary collaboration, particularly in integrating behavioral science perspectives with technical AI solutions, as suggested by Mypati et al. (2023).

AI applications show transformative potential across multiple supply chain functions. In demand forecasting, ML has improved prediction accuracy and inventory optimization (Pallathadka et al., 2023; Rana & Daultani, 2023), though implementation challenges persist in fragmented supply chains (Bhatia & Albarrak, 2023). Risk management applications benefit from AI's big data processing capabilities (Nozari et al., 2022), yet current models often overlook qualitative factors like geopolitical risks, indicating the need for hybrid analytical approaches (Tang et al., 2023).

Transportation optimization through AI has yielded significant cost reductions (Makridis, Boese, et al., 2023), but high implementation costs create barriers for SMEs (Fosso Wamba, 2022). In supplier selection, AI tools provide valuable insights (Dwivedi et al., 2021) while potentially introducing biases that favor established suppliers, calling for more dynamic evaluation models (Alharbi et al., 2023). Inventory management benefits from DL's ability to handle complex data (Jamwal et al., 2022), though scalability remains challenging for resource-limited organizations (Lam et al., 2023).

The research shows disproportionate focus on manufacturing and retail, with insufficient attention to sectors like agriculture and healthcare that face unique challenges such as perishability and regulatory complexity (Panigrahi et al., 2023). Ethical concerns around data privacy, algorithmic bias, and workforce impacts also require more systematic attention (Riahi et al., 2021).

Beyond operational improvements, AI is reshaping supply chain strategy at fundamental levels. Cannas et al. (2023) document AI's role in transforming governance structures and stakeholder relationships, while Nozari et al. (2022) highlight its value in building market resilience. The technology enables more agile, decentralized decision-making (Sujith et al., 2022) and fosters data-driven business model innovation.

A"s strategic value extends to sustainability initiatives, with advanced analytics enabling better environmental impact monitoring (Panigrahi et al., 2023). However, realizing this potential requires addressing persistent challenges in ethical implementation and algorithmic transparency (Riahi et al., 2021).

6. CONCLUSION

This study advances the field of AI in supply chain management through a systematic analysis of 292 articles (2020–2023), yielding three key contributions. First, we identify critical research gaps, showing disproportionate focus on production optimization (58% of studies) while emerging areas like reverse logistics remain underdeveloped. Our temporal analysis reveals accelerating interest in hybrid AI systems, particularly combining ML with blockchain technologies.

Second, we establish novel correlations between AI techniques and supply chain functions. ML dominates demand forecasting (16 studies), while DL excels in inventory management (seven studies). These patterns enable a new decision framework matching algorithmic capabilities to operational requirements. Surprisingly, our cross-sector analysis reveals higher return on investment potential in healthcare and agriculture (22–35% gains) despite manufacturing's adoption lead.

Third, we develop a phased implementation model addressing real-world adoption challenges. Drawing from 12 industry cases, we identify 17 critical success factors and specific barriers for SMEs. Our findings challenge conventional technology-driven approaches, advocating instead for problem-centric adoption strategies that account for sector-specific constraints and opportunities.

These contributions provide both researchers and practitioners with: 1) a comprehensive taxonomy of AI applications across supply chain functions; 2) evidence-based guidelines for technology selection; and 3) a robust framework for responsible implementation. The study's unique combination of bibliometric analysis and qualitative case examination offers unprecedented insights into AI's transformative potential while charting clear pathways for future innovation.

This study is not without limitations, which warrant careful consideration. A primary limitation lies in the exclusive use of the Scopus database. Although Scopus is widely recognized for its comprehensive and multidisciplinary coverage, relying solely on it may have led to the exclusion of relevant research indexed in other databases. Another limitation concerns the restricted timeframe of 2020 to 2023. While this period was selected to reflect recent advancements, it may have overlooked foundational studies from earlier years as well as the latest developments not yet published. Furthermore, as with any bibliometric analysis, a degree of interpretive subjectivity is inherent in the process. To mitigate this, a rigorous and transparent methodological protocol was followed to ensure consistency and reliability.

To address these limitations, future research could expand the database sources and extend the temporal coverage to capture a broader evolution of the field. Additionally, complementing the bibliometric analysis with an empirical investigation would enhance the robustness of the findings by grounding them in practical observations. Such an approach would provide a more nuanced understanding of how AI is being applied within supply chain operations in real-world industrial contexts. Despite these limitations, the current study offers valuable insights into the dynamic role of AI in supply chain management and lays a solid foundation for further scholarly exploration.

This study demonstrates AI's transformative impact on supply chain management, enhancing forecasting, inventory control, and risk mitigation while improving competitiveness and customer satisfaction. However, challenges like implementation costs, data privacy, and workforce adaptation require strategic solutions. In today's volatile market environment, AI emerges as a crucial driver of resilience and sustainable growth. The adoption of hybrid AI systems and alignment with socio-economic goals offer significant value creation potential. Successful implementation demands technological innovation, cross-disciplinary collaboration, and ethical considerations. Ultimately, strategic AI integration represents more than operational improvement — it is a fundamental shift enabling supply chains to become engines of long-term competitive advantage in our rapidly evolving global economy.

REFERENCES

Akbari, M., Kok, S. K., Hopkins, J., Frederico, G. F., Nguyen, H., & Alonso, A. D. (2024). The changing landscape of digital transformation in supply chains: Impacts of Industry 4.0 in Vietnam. *International Journal of Logistics Management, 35*(4), 1040–1072. https://doi.org/10.1108/IJLM-11-2022-0442

Alharbi, A. H., Alkhalaf, S., Asiri, Y., Abdel-Khalek, S., & Mansour, R. F. (2023). Automated fruit classification using enhanced tunicate swarm algorithm with fusion based deep learning. *Computers and Electrical Engineering, 108*, Article 108657. https://doi.org/10.1016/j.compeleceng.2023.108657

Alharbi, I. M. (2023). Efficient vehicle routing in congested regions. *Journal of Theoretical and Applied Information Technology, 101*(21), 7064–7071. https://www.jatit.org/volumes/Vol101No21/32Vol101No21.pdf

Alomar, M. A. (2022). Performance optimization of industrial supply chain using artificial intelligence. *Computational Intelligence and Neuroscience, 2022*, Article 306265. https://doi.org/10.1155/2022/9306265

AlRushood, M. A., Rahbar, F., Selim, S. Z., & Dweiri, F. (2023). Accelerating use of drones and robotics in post-pandemic project supply chain. *Drones, 7*(5), Article 313. https://doi.org/10.3390/drones7050313

Al-Zoubi, L., & Thurasamy, R. (2025). How artificial intelligence-based supply chain analytics enable supply chain agility and innovation? An intellectual capital perspective. *Supply Chain Management, 30*(2), 233–249. https://doi.org/10.1108/SCM-09-2024-0558

Amani, M. A., & Sarkodie, S. A. (2022). Mitigating spread of contamination in meat supply chain management using deep learning. *Scientific Reports, 12*, Article 5037. https://doi.org/10.1038/s41598-022-08993-5

Apte, P., Salmon, T., Rice, R., Gerber, M., Beica, R., Calvert, J., Hemker, D., Dordi, Y., Ranjan, M., Ramalingam, S., Gandhi, J., Kaviani, A., Mitra, S., Wong, P., Lee, V., & El-Sabry, M. (2018). Future interconnect materials and system integration strategies for data-intensive applications. In the Proceedings of the *2018 IEEE 7th Electronics System-Integration Technology Conference (ESTC)* (pp. 1–5). IEEE. https://doi.org/10.1109/ESTC.2018.8546353

Arunmozhi, M., Venkatesh, V. G., Arisian, S., Shi, Y., & Sreedharan, V. R. (2022). Application of blockchain and smart contracts in autonomous vehicle supply chains: An experimental design. *Transportation Research Part E: Logistics and Transportation Review, 165*, Article 102864. https://doi.org/10.1016/j.tre.2022.102864

Bhatia, S., & Albarrak, A. S. (2023). A blockchain-driven food supply chain management using QR code and XAI-Faster RCNN architecture. *Sustainability, 15*(3), Article 2579. https://doi.org/10.3390/su15032579

Borodavko, B., Illés, B., & Bányai, Á. (2021). Role of artificial intelligence in supply chain. *Academic Journal of Manufacturing Engineering, 19*(1), 75–79. https://www.ajme.ro/PDF_AJME_2021_1/L11.pdf

Cannas, V. G., Ciano, M. P., Saltalamacchia, M., & Secchi, R. (2023). Artificial intelligence in supply chain and operations management: A multiple case study research. *International Journal of Production Research, 62*(9), 3333–3360. https://doi.org/10.1080/00207543.2023.2232050

Christopher, M., & Holweg, M. (2017). Supply chain 2.0 revisited: A framework for managing volatility-induced risk in the supply chain. *International Journal of Physical Distribution & Logistics Management, 47*(1), 2–17. https://doi.org/10.1108/IJPDLM-09-2016-0245

Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). Science mapping software tools: Review, analysis, and cooperative study among tools. *Journal of the American Society for Information Science and Technology, 62*(7), 1382–1402. https://doi.org/10.1002/asi.21525

Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). Sage Publications.

Di Vaio, A., Boccia, F., Landriani, L., & Palladino, R. (2020). Artificial intelligence in the agri-food system: Rethinking sustainable business models in the COVID-19 scenario. *Sustainability, 12*(12), Article 4851. https://doi.org/10.3390/su12124851

Dubois, A., & Gadde, L.-E. (2002). Systematic combining: An abductive approach to case research. *Journal of Business Research, 55*(7), 553–560. https://doi.org/10.1016/S0148-2963(00)00195-8

Dumitrascu, O., Dumitrascu, M., & Dobrotă, D. (2020). Performance evaluation for a sustainable supply chain management system in the automotive industry using artificial intelligence. *Processes, 8*(11), Article 1384. https://doi.org/10.3390/pr8111384

Dwivedi, R. (2023). Ten years of cybersecurity governance, risk and compliance: A bibliometric examination of research themes, trends, and influencers. *Issues in Information Systems, 24*(3), 43–57. https://doi.org/10.48009/3_iis_2023_105

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., … Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*, Article 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Filieri, R., D'Amico, E., Destefanis, A., Paolucci, E., & Raguseo, E. (2021). Artificial intelligence (AI) for tourism: A European-based study on successful AI tourism start-ups. *International Journal of Contemporary Hospitality Management, 33*(11), 4099–4125. https://doi.org/10.1108/IJCHM-02-2021-0220

Firouzkouhi, N., Amini, A., Nazari, M., Alkhatib, F., Bordbar, H., Cheng, C., Davvaz, B., & Rashidi, M. (2023). Advanced artificial intelligence system by intuitionistic fuzzy Γ-subring for automotive robotic manufacturing. *Artificial Intelligence Review, 56*(9), 9639–9664. https://doi.org/10.1007/s10462-023-10396-5

Fosso Wamba, S. (2022). Impact of artificial intelligence assimilation on firm performance: The mediating effects of organizational agility and customer agility. *International Journal of Information Management, 67*, Article 102544. https://doi.org/10.1016/j.ijinfomgt.2022.102544

Friedlander, A., & Zoellner, C. (2020). Artificial intelligence opportunities to improve food safety at retail. *Food Protection Trends, 40*(4), 272–278. https://www.foodprotection.org/publications/food-protection-trends/archive/2020-07-artificial-intelligence-opportunities-to-improve-food-safety-at-retail/

Genetti, S., Longobardi, A., & Iacca, G. (2025). Evolutionary reinforcement learning for interpretable decision-making in supply chain management. In P. García-Sánchez, E. Hart, & S. L. Thomson (Eds.), *Applications of evolutionary computation* (pp. 187–203). Springer, Cham. https://doi.org/10.1007/978-3-031-90062-4_12

González Rodríguez, G., Gonzalez-Cava, J. M., & Méndez Pérez, J. A. (2020). An intelligent decision support system for production planning based on machine learning. *Journal of Intelligent Manufacturing, 31*(5), 1257–1273. https://doi.org/10.1007/s10845-019-01510-y

Haleem, A., Javaid, M., Singh, R. P., Rab, S., & Suman, R. (2022). Perspectives of cybersecurity for ameliorative Industry 4.0 era: A review-based framework. *Industrial Robot, 49*(3), 582–597. https://doi.org/10.1108/IR-10-2021-0243

He, P., Li, K., & Kumar, P. N. R. (2022). An enhanced branch-and-price algorithm for the integrated production and transportation scheduling problem. *International Journal of Production Research, 60*(6), 1874–1889. https://doi.org/10.1080/00207543.2021.1876941

Jahani, N., Sepehri, A., Vandchali, H. R., & Tirkolaee, E. B. (2021). Application of Industry 4.0 in the procurement processes of supply chains: A systematic literature review. *Sustainability, 13*(14), Article 7520. https://doi.org/10.3390/su13147520

Jamwal, A., Agrawal, R., & Sharma, M. (2022). Deep learning for manufacturing sustainability: Models, applications in Industry 4.0 and implications. *International Journal of Information Management Data Insights, 2*(2), Article 100107. https://doi.org/10.1016/j.jjimei.2022.100107

Jauhar, S. K., Jani, S. M., Kamble, S. S., Pratap, S., Belhadi, A., & Gupta, S. (2023). How to use no-code artificial intelligence to predict and minimize the inventory distortions for resilient supply chains. *International Journal of Production Research, 62*(15), 5510–5534. https://doi.org/10.1080/00207543.2023.2166139

Javaid, M., Haleem, A., Khan, I. H., & Suman, R. (2023). Understanding the potential applications of artificial intelligence in agriculture sector. *Advanced Agrochem, 2*(1), 15–30. https://doi.org/10.1016/j.aac.2022.10.001

Kassa, A., Kitaw, D., Stache, U., Beshah, B., & Degefu, G. (2023). Artificial intelligence techniques for enhancing supply chain resilience: A systematic literature review, holistic framework, and future research. *Computers and Industrial Engineering, 186*, Article 109714. https://doi.org/10.1016/j.cie.2023.109714

Kinkel, S., Capestro, M., Di Maria, E., & Bettiol, M. (2023). Artificial intelligence and relocation of production activities: An empirical cross-national study. International *Journal of Production Economics, 261*, Article 108890. https://doi.org/10.1016/j.ijpe.2023.108890

Kler, R., Elkady, G., Rane, K., Singh, A., Hossain, M. S., Malhotra, D., Ray, S., & Bhatia, K. K. (2022). Machine learning and artificial intelligence in the food industry: A sustainable approach. *Journal of Food Quality, 2022*(1), Article 8521236. https://doi.org/10.1155/2022/8521236

Kumar, I., Rawat, J., Mohd, N., & Husain, S. (2021). Opportunities of artificial intelligence and machine learning in the food industry. *Journal of Food Quality, 2021*(1), Article 4535567. https://doi.org/10.1155/2021/4535567

Lam, W. S., Lam, W. H., & Lee, P. F. (2023). A bibliometric analysis of digital twin in the supply chain. *Mathematics, 11*(15), Article 3350. https://doi.org/10.3390/math11153350

Lamees, A.-Z., & Ramayah, T. (2025). How artificial intelligence-based supply chain analytics enable supply chain agility and innovation? An intellectual capital perspective. *Supply Chain Management: An International Journal, 30*(2), 233–249. https://doi.org/10.1108/SCM-09-2024-0558

Li, X. (2022). The impact of the live delivery of goods on consumers' purchasing behaviour in complex situations based on artificial intelligence technology. *Computational Intelligence and Neuroscience, 2022*(1), Article 1424099. https://doi.org/10.1155/2022/1424099

Liu, B. (2023). Integration of novel uncertainty model construction of green supply chain management for small and medium-sized enterprises using artificial intelligence. *Optik, 273*, Article 170411. https://doi.org/10.1016/j.ijleo.2022.170411

Liu, Y. (2023). Artificial intelligence and machine learning based financial risk network assessment model. In *Proceedings of the 2023 IEEE 12th International Conference on Communication Systems and Network Technologies (CSNT)* (pp. 158–163). IEEE. https://doi.org/10.1109/CSNT57126.2023.10134653

Luo, L., Li, Y., Wang, X., Jin, X., & Qin, Z. (2023). Supply chain vulnerability in prefabricated building projects and digital mitigation technologies. *IEEE Transactions on Engineering Management, 71*, 10686–10698. https://doi.org/10.1109/TEM.2023.3272585

Makridis, C. A., Boese, A., Fricks, R., Workman, D., Klote, M., Mueller, J., Hildebrandt. I. J., Kim, M., & Alterovitz, G. (2023). Informing the ethical review of human subjects research utilizing artificial intelligence. *Frontiers in Computer Science, 5,* Article 1235226. https://doi.org/10.3389/fcomp.2023.1235226

Makridis, G., Mavrepis, P., & Kyriazis, D. (2023). A deep learning approach using natural language processing and time-series forecasting towards enhanced food safety. *Machine Learning, 112*(4), 1287–1313. https://doi.org/10.1007/s10994-022-06151-6

Malhan, R., & Gupta, S. K. (2023). The role of deep learning in manufacturing applications: Challenges and opportunities. *Journal of Computing and Information Science in Engineering, 23*(6), Article 060816. https://doi.org/10.1115/1.4062939

Mantravadi, S., Srai, J. S., & Møller, C. (2023). Application of MES/MOM for Industry 4.0 supply chains: A cross-case analysis. *Computers in Industry, 148*, Article 103907. https://doi.org/10.1016/j.compind.2023.103907

Mariappan, M. B., Devi, K., Venkataraman, Y., Lim, M. K., & Theivendren, P. (2023). Using AI and ML to predict shipment times of therapeutics, diagnostics and vaccines in e-pharmacy supply chains during COVID-19 pandemic. *International Journal of Logistics Management, 34*(2), 390–416. https://doi.org/10.1108/IJLM-05-2021-0300

Menchaca-Méndez, A., Montero, E., Flores-Garrido, M., & Miguel-Antonio, L. (2022). An algorithm to compute time-balanced clusters for the delivery logistics problem. *Engineering Applications of Artificial Intelligence, 111*, Article 104795. https://doi.org/10.1016/j.engappai.2022.104795

Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics, 106*, 213–228. https://doi.org/10.1007/s11192-015-1765-5

Mypati, O., Mukherjee, A., Mishra, D., Pal, S. K., Chakrabarti, P. P., & Pal, A. (2023). A critical review on applications of artificial intelligence in manufacturing. *Artificial Intelligence Review, 56*(1), 661–768. https://doi.org/10.1007/s10462-023-10535-y

Nozari, H., Szmelter-Jarosz, A., & Ghahremani-Nahr, J. (2022). Analysis of the challenges of Artificial Intelligence of Things (AIoT) for the smart supply chain (Case Study: FMCG Industries). *Sensors, 22*(8). Article 2931. https://doi.org/10.3390/s22082931

Núñez-Merino, M., Maqueira-Marín, J. M., Moyano-Fuentes, J., & Castaño-Moraga, C. A. (2022). Industry 4.0 and supply chain: A systematic science mapping analysis. *Technological Forecasting and Social Change, 181*. Article 121788. https://doi.org/10.1016/j.techfore.2022.121788

Pallathadka, H., Mustafa, M., Sanchez, D. T., Sekhar Sajja, G., Gour, S., & Naved, M. (2023). Impact of machine learning on management, healthcare and agriculture. *Materials Today: Proceedings, 80*(3), 2803–2806. https://doi.org/10.1016/j.matpr.2021.07.042

Panigrahi, R. R., Shrivastava, A. K., Qureshi, K. M., Mewada, B. G., Alghamdi, S. Y., Almakayeel, N., Almuflih, A. S., & Qureshi, M. R. N. (2023). AI chatbot adoption in SMEs for sustainable manufacturing supply chain performance: A mediational research in an emerging country. *Sustainability, 15*(18), Article 13743. https://doi.org/10.3390/su151813743

Phulwani, P. R., Kumar, D., & Goyal, P. (2020). A systematic literature review and bibliometric analysis of recycling behavior. *Journal of Global Marketing, 33*(5), 354–376. https://doi.org/10.1080/08911762.2020.1765444
Pourbozorgi Langroudi, P., & Weidlich, I. (2020). Applicable predictive maintenance diagnosis methods in service-life prediction of district heating pipes. *Environmental and Climate Technologies, 24*(3), 294–304. https://doi.org/10.2478/rtuect-2020-0104
Ramirez-Asis, E., Vilchez-Carcamo, J., Thakar, C. M., Phasinam, K., Kassanuk, T., & Naved, M. (2022). A review on role of artificial intelligence in food processing and manufacturing industry. *Materials Today: Proceedings, 51*(8), 2462–2465. https://doi.org/10.1016/j.matpr.2021.11.616
Rana, J., & Daultani, Y. (2023). Mapping the role and impact of artificial intelligence and machine learning applications in supply chain digital transformation: A bibliometric analysis. *Operations Management Research, 16,* 1641–1666. https://doi.org/10.1007/s12063-022-00335-y
Riahi, Y., Saikouk, T., Gunasekaran, A., & Badraoui, I. (2021). Artificial intelligence applications in supply chain: A descriptive bibliometric analysis and future research directions. *Expert Systems with Applications, 173,* Article 114702. https://doi.org/10.1016/j.eswa.2021.114702
Sharma, A. (2023). Artificial intelligence for sense making in survival supply chains. *International Journal of Production Research, 63*(2), 435–458. https://doi.org/10.1080/00207543.2023.2221743
Shatat, A. S., & Shatat, A. S. (2023). Artificial intelligence competencies in logistics management: An empirical insight from Bahrain. *Journal of Information and Knowledge Management, 23*(1), Article 2350059. https://doi.org/10.1142/S0219649223500594
Simchi-Levi, D., Simchi-Levi, E., & Watson, M. (2004). Tactical planning for reinventing the supply chain. In *The practice of supply chain management: Where theory and application converge* (Vol. 62, pp. 13–30). Springer. https://doi.org/10.1007/0-387-27275-5_2
Sivaram, M., Porkodi, V., Kandasamy, M., & Sasikala, A. (2021). AI transformation in retail sectors. *International Journal of Public Sector Performance Management, 8*(3), 230–235. https://doi.org/10.1504/IJPSPM.2021.118680
Slimani, I., Slimani, N., Achchab, S., Saber, M., Farissi, I. E., Sbiti, N., & Amghar, M. (2022). Automated machine learning: The new data science challenge. *International Journal of Electrical and Computer Engineering, 12*(4), 4243–4252. https://doi.org/10.11591/ijece.v12i4.pp4243-4252
Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science, 24*(4), 265–269. https://doi.org/10.1002/asi.4630240406
Stauder, M., & Kühl, N. (2022). AI for in-line vehicle sequence controlling: Development and evaluation of an adaptive machine learning artifact to predict sequence deviations in a mixed-model production line. *Flexible Services and Manufacturing Journal, 34*(3), 709–747. https://doi.org/10.1007/s10696-021-09430-x
Sujith, A. V. L. N., Qureshi, N. I., Dornadula, V. H. R., Rath, A., Prakash, K. B., & Singh, S. K. (2022). A comparative analysis of business machine learning in making effective financial decisions using Structural Equation Model (SEM). *Journal of Food Quality, 2022,* Article 382839. https://doi.org/10.1155/2022/6382839
Tadić, S., Veljović, M., Krstić, M., & Zečević, S. (2023). Application of Industry 4.0 technologies in home delivery: A review. *Journal of Applied Engineering Science, 21*(3), 928–939. https://doi.org/10.5937/jaes0-44668
Taha, A., Khawaja, S., Qureshi, F., & Wahsheh, F. R. (2025). Employing artificial intelligence to improve the supply chain's resilience and performance: Moderating the impact of supply chain dynamics. *Problems and Perspectives in Management, 23*(1), 741–752. https://doi.org/10.21511/ppm.23(1).2025.55
Tang, Y. M., Kuo, W. T., & Lee, C. K. M. (2023). Real-time mixed reality (MR) and artificial intelligence (AI) object recognition integration for digital twin in Industry 4.0. *Internet of Things, 23,* Article 100753. https://doi.org/10.1016/j.iot.2023.100753
Tavana, M., Sorooshian, S., & Mina, H. (2024). An integrated group fuzzy inference and best–worst method for supplier selection in intelligent circular supply chains. *Annals of Operations Research, 342,* 803–844. https://doi.org/10.1007/s10479-023-05680-0
Terrada, L., El Khaili, M., & Ouajji, H. (2022). Demand forecasting model using deep learning methods for supply chain management 4.0. *International Journal of Advanced Computer Science and Applications, 13*(5), 704–711. https://doi.org/10.14569/IJACSA.2022.0130581
Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management, 14*(3), 207–222. https://doi.org/10.1111/1467-8551.00375
Ud Din, F., Paul, D., Ryan, J., Henskens, F., & Wallis, M. (2021). AOSR 2.0: A novel approach and thorough validation of an agent-oriented storage and retrieval WMS planner for SMEs, under Industry 4.0. *Future Internet, 13*(6), Article 155. https://doi.org/10.3390/fi13060155
Van Eck, N. J., & Waltman, L. (n.d.). *VOSviewer manual.* https://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.16.pdf
Wang, S., & Zhang, H. (2025). Promoting sustainable development goals through generative artificial intelligence in the digital supply chain: Insights from Chinese tourism SMEs. *Sustainable Development, 33*(1), 1231–1248. https://doi.org/10.1002/sd.3152
Wang, D., & Yu, A. (2023). Supply chain resources and economic security based on artificial intelligence and blockchain multi-channel technology. *International Journal of Information Technologies and Systems Approach, 16*(3), Article 3. https://doi.org/10.4018/IJITSA.322385
Wang, S. (2021). Artificial Intelligence applications in the new model of logistics development based on wireless communication technology. *Scientific Programming, 2021,* Article 5166993. https://doi.org/10.1155/2021/5166993
Wazarkar, S., Patil, S., & Kumar, S. (2020). A bibliometric survey of fashion analysis using artificial intelligence. *Library Philosophy and Practice, 2020,* 1–17. https://www.researchgate.net/publication/345755324
Zeng, X., & Yi, J. (2023). Analysis of the impact of big data and artificial intelligence technology on supply chain management. *Symmetry, 15*(9), Article 1801. https://doi.org/10.3390/sym15091801
Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods, 18*(3), 429–472. https://doi.org/10.1177/1094428114562629

APPENDIX

Table A.1. Systematic literature review

Author(s)	*AI technique(s)*	*Sector/Activity*	*Key impact*
Lam et al. (2023)	Deep learning (DL)	Manufacturing	Improved sustainability & operational performance
Wazarkar et al. (2020)	Computer vision	Retail/Apparel	Sales performance optimization
Bhatia and Albarrak (2023)	Neural networks	Food manufacturing	Enhanced food safety & quality control
Sujith et al. (2022)	Machine learning (ML)	End-to-end supply chain	Financial decision-making support
Mypati et al. (2023)	ML	Industrial manufacturing	Production automation (molding, welding)
Ramirez-Asis et al. (2022)	ML	Food logistics	Supply chain optimization
AlRushood et al. (2023)	Robotics	Construction warehousing	Cost-effective inventory management
Stauder and Kühl (2022)	ML	Demand forecasting	Cost reduction & operational efficiency
Panigrahi et al. (2023)	NLP (chatbots)	Manufacturing	Sustainable supply chain performance
Fosso Wamba (2022)	Genetic algorithms	End-to-end supply chain	17% cost reduction & improved customer satisfaction
Kassa et al. (2023)	Bayesian networks	Risk management	Supply chain resilience & continuity
Nozari et al. (2022)	IoT	FMCG sector	Real-time decision-making alerts
Tavana et al. (2024)	Fuzzy logic	Supplier selection	Sustainable supplier evaluation (triple-bottom-line)
Jamwal et al. (2022)	DL	Smart manufacturing	Predictive maintenance & quality control
Wang (2021)	IoT	Logistics	22% service efficiency improvement