Journal of Scientometric Research, 2026; 15(2):618-634.
https://www.jscires.org

Research Article

Mapping the Future of Digital-Green Logistics: Scientometric Insights and TRIZ-Based Innovation Pathways

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ABSTRACT

The accelerating digitalisation and sustainability trends have reorganised global logistics into a two-way innovation ecosystem. However, the study of the intersection of digital and green logistics remains fragmented and lacks a comprehensive cartography or a prescriptive model. In line with this, this study integrates the scientometric approach with the Theory of Inventive Problem Solving (TRIZ) to systematically examine intellectual progress, thematic structures, and innovative contradictions defining the digital-green logistics realm. The empirical base consisted of a corpus of 508 publications, selected from the Web of Science and Scopus databases between 1998 and 2026. ScientoPy and VOSviewer were used to create bibliometric indicators to diagram research productivity, collaboration, and new knowledge clusters, while TRIZ principles were used to address contradictions between efficiency and sustainability, transparency and privacy, and local adaptability and global collaboration. Results show that academic activity has significantly increased since 2020, with China, the United States, and the United Kingdom leading the way. The thematic breakdown outlined key research directions, including AI-based optimization, blockchain-based traceability, and digital twin implementations, and, at the same time, identified relevant gaps in empirical support and geographical coverage. The TRIZ-informed framework application identified a set of innovation opportunities, including data infrastructure powered by renewable energy, modular sustainability reporting systems, and stratified blockchain infrastructures aimed at achieving a balance in traceability. The study presents a new methodological synthesis that adds value to theoretical discussion and managerial practice and supports the development of fair policies of digital-green transformation.

Keywords: Digital logistics, Green logistics, Scientometric analysis, Sustainable supply chain, TRIZ.

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Received: 13-03-2026;
Revised: 29-05-2026;
Accepted: 02-07-2026.

INTRODUCTION

The logistics industry is undergoing a radical change, which is guided by both the forces of digitalization and sustainability. Digital technologies, including the Internet of Things (IoT), Artificial Intelligence (AI), big-data analytics, and blockchain, are transforming logistics operations through the ability to provide real-time visibility, make decisions anticipatively, and automate them. At the same time, due to the pressure on sustainability, exerted by climate agreements, environmental policies, and social demands, logistics providers are being forced to embrace green initiatives, such as carbon mitigation, reverse logistics, and circular supply chains (Sun *et al.*, 2025). These two trends are becoming more interconnected, with digital technologies used to facilitate more sustainable practices, such as AI-powered route optimisation that uses less fuel or blockchain systems that provide greater sustainable traceability. As a result, convergence between digital and green logistics is turning out to be one of the most active frontiers in supply-chain management. Regardless of this appreciation, there is still fragmented research on digital and green logistics. Digital logistics studies are more inclined toward technology adoption, performance in operations, and integration of the supply chain (Wang *et al.*, 2020), and green logistics studies are more inclined toward regulatory compliance, reduction of emissions, and impact on the environment (Tetteh *et al.*, 2025; McKinnon, 2024). Even though it is becoming increasingly clear that digital technologies can support sustainable practices (Bag *et al.*, 2025), other researchers warn that digitalisation can also lead to rebound measures such as the consumption of more energy or electronic waste (Choi, 2022). This highlights

DOI: 10.5530/jscires.20260155

the importance of discussing the intersection of these two fields as a whole, following the development of research on their intersection, the intellectual frameworks that support it, and the gaps in knowledge that still persist.

There have been limited efforts to consolidate this field in the past. Narrative reviews are helpful in the descriptions but cannot be replicated and are subjective views of authors (Mitchell and Rich, 2022). Systematic reviews are more organized but tend to be limited in scope and scope, and therefore are not able to reflect on the magnitude and disciplinarity of rapidly changing areas of research. As an example, the article by Mangla *et al.* (2024) review of digitalisation in sustainable supply chains focused on empirical case studies but omitted the intellectual field at large Equally, Choi *et al.* (2022) studied the use of blockchain in green logistics and restricted their research to one technology. Therefore, although the previous reviews provide some depth, they do not have the breadth and scalability to map a fast-growing and cross-disciplinary field like digital and green logistics. Scientometrics analysis has a strong and timely methodological solution to these shortcomings and is based on massive bibliographic collections that allow researchers to measure and visualise the intellectual field of whole research areas (Donthu *et al.*, 2021). Although scientometric methods offer a strong framework on which to map the intellectual structure of a discipline, it is essentially descriptive and diagnostic. In order to improve methodological rigor, this study combines TRIZ (Theory of Inventive Problem Solving) as a complementary method. TRIZ is a method of systematic innovation, which was initially created to eliminate technical contradictions and come out with inventive solutions (Altshuller, 1984). Scholars (Ayaou and Cavallucci, 2023; Cavallucci and Rousselot, 2019) applied TRIZ to the study of management and sustainability as a method of analyzing the complex contradiction and finding innovation pathways. As such, the application of TRIZ to digital and green logistics has its own value as the sphere is defined by the contradictions, i.e., the trade-off between efficiency and sustainability, the conflict in the adoption of technology and its ecological cost, and the difficulty in combining the interests of various stakeholders. Using the TRIZ principles on the scientometric results, this research not only determines how the field has developed but also suggests systematic methods of overcoming contradictions and leading to future innovations.

The addition of TRIZ makes this study, beyond a mapping of what has been studied, an indication of how future contradictions can be solved. To illustrate, in case the scientometric analysis shows that thematic clusters are formed around digitalisation efficiency and sustainability around environmental performance, TRIZ can be used to examine innovative principles that connect the two areas instead of considering them as trade-offs. The given integration is new to the sphere of logistics research and supplements both the theoretical and practical contributions. In the case of theory, it assists in conceptualising digital-green logistics as a system of innovation that is defined by contradictions and creative solutions. To practice, it offers systematic advice to managers who want to be efficient in the digital sphere and at the same time be responsible in environmental matters. As such, this study is novel both in its focus and its methodological design. As far as the author's knowledge, no other research has ever systematically integrated scientometric mapping and TRIZ analysis to explore the digital-green logistics nexus. Although bibliometric reviews have investigated digital supply chains (Baziyad *et al.*, 2024; Kamble *et al.*, 2023) or green logistics (Jazairy *et al.*, 2025; Blanco and Sheffi, 2024) individually, and scientometric analyses have been performed in related areas (Chen *et al.*, 2015), none of them has extended the analysis to inventive problem solving. Thus, this study unites existing knowledge by linking these methods and provides a prescriptive research agenda, presenting a more detailed roadmap to scholars and practitioners. Using bibliographic information on the most popular databases and using the best scientometric tools in conjunction with TRIZ methodology, this study seeks to offer a rigorous mapping of the field as well as a prospective innovation model of the field. In particular, it discusses four Research Questions (RQs):

RQ1: How has the body of research on digital and green logistics evolved over time in terms of publication trends, influential authors, institutions, and countries?

RQ2: What are the major intellectual structures, thematic clusters, and knowledge networks that define the intersection of digital and green logistics?

RQ3: What emerging themes, gaps, and future research directions can be identified from the scientometric patterns in digital and green logistics?

RQ4: How can the TRIZ methodology be applied to the identified scientometric patterns in digital and green logistics to resolve contradictions and propose innovative research and practical directions?

By answering these questions, the study makes both scholarly and practical contributions, offering a systematic roadmap for advancing theory, guiding managerial practice, and informing policy in the context of the digital and sustainable transformation of global logistics.

METHODOLOGY

The methodological framework used in this study is a hybrid one, combining bibliometric/scientometric methods with qualitative analysis and innovative problem-solving approaches. The design is not limited to descriptive mapping as it produces prescriptive insights relevant to digital and green logistics. The steps involved in the sequential process were data collection, pre-processing, performance analysis, science mapping, qualitative triangulation, TRIZ contradiction analysis, and translation of inventive

principles into actionable pathways. The data sources were the Web of Science Core Collection (WoS) and Scopus, which are recognized for covering a wide range of peer-reviewed literature and are often used in bibliometric studies (Donthu *et al.*, 2021; Zupic and Cater, 2015). A comprehensive search string was developed to capture the interdisciplinary nature of digital-green logistics research. In addition to the core terms "Digital*," "Green," and "Logistic*," related concepts and synonymous terms such as "Sustainable Logistics," "Smart Logistics," "Green Supply Chain," "Digital Supply Chain," "Intelligent Logistics," "Industry 4.0," and "Sustainable Transportation" were incorporated using Boolean operators. The expanded search strategy improved the breadth and inclusiveness of the retrieved literature while minimising the exclusion of relevant studies employing alternative terminology across logistics, sustainability, and digital transformation domains. The retrieval process was completed on Jan 15th, 2026. The search strategy was complemented with filters for languages, article types, and subject areas, and it covers scholarly works published through January 15, 2026. The process was conducted in accordance with the PRISMA 2020 framework see Figure 1 to ensure transparency and reproducibility (Page *et al.*, 2021).

The methodological procedure followed a sequential multi-stage design. First, bibliographic data were retrieved from the Web of Science Core Collection and Scopus databases using predefined search strings related to digital and green logistics. Second, the retrieved records were screened and filtered in accordance with the PRISMA 2020 framework to ensure transparency and reproducibility. Third, bibliometric data were cleaned, harmonized, and standardized using ScientoPy to eliminate duplicates and unify keyword structures. Fourth, performance analysis and science mapping techniques, including co-authorship, co-citation, bibliographic coupling, and co-word analysis, were conducted using VOSviewer and ScientoPy. Finally, the scientometric findings were translated into contradiction parameters within the TRIZ framework to generate prescriptive innovation pathways for resolving tensions between efficiency, sustainability, transparency, privacy, and adaptability in digital-green logistics systems.

The screening and exclusion procedures followed the PRISMA 2020 guidelines to ensure transparency and reproducibility. Only peer-reviewed journal articles, conference papers, and review articles published in English were included in the final dataset. Documents such as editorials, book chapters, book reviews, notes, errata, dissertations, and non-scholarly publications, as well as non-English-language documents, were excluded to maintain academic consistency and data quality. Duplicate records identified across the Scopus and Web of Science databases were removed during the preprocessing stage. Furthermore, title and abstract screening were conducted to eliminate publications that were not directly related to digital-green logistics, sustainable logistics digitalisation, or associated smart logistics themes.

Pre-processing of data included the export of RIS and CSV files, their conciliation with ScientoPy to reach the harmonization and analyze the trends (Abdullah, 2023), and removing the duplicates see Figure 2. Fragmentation was reduced by standardizing bibliographic fields and lemmatizing and mapping keywords, which has reduced fragmentation. Bibliometric and longitudinal trend analysis was performed with ScientoPy, which made it possible to identify nascent research directions and knowledge gaps.

The analysis of the performance provided macro-level data on the growth of publications, authors, institutions, countries, and most frequently referenced documents, which creates a benchmark in terms of productivity and impact (Donthu *et al.*, 2021). Also, the scientific mapping methods such as co-citation, bibliographic, co-authorship, and co-word analysis were utilized in revealing intellectual underpinnings, collaboration patterns, and theme clusters. VOSviewer (Van and Waltman, 2014) was used to visualise these relationships, and ScientoPy was used to add time dynamics. In order to supplement the quantitative data, NVivo was used to allow qualitative triangulation by importing high-centrality documents of each cluster. NVivo also generated a word cloud that highlighted the most common occurrences of keywords and themes, thus providing deeper conceptualization and a graphical representation of dominant and emerging concepts in digital-green logistics.

Lastly, TRIZ methodology was used as a prescriptive extension in this study (Altshuller, 1984). Sources of contradiction were selected with the help of scientometric clusters (in particular, the trade-off between digital efficiency and sustainability, as well as between transparency and privacy) and formalised with the help of TRIZ parameters. These clusters were subsequently placed in the TRIZ contradiction matrix in order to produce inventive principles (Ayaou and Cavallucci, 2023; Cavallucci and Rousselot, 2019). The resulting TRIZ outputs were contextualised with the help of the relevant literature, thus generating both practice and research-oriented innovation paths. This integrative approach allowed the research to outline the intellectual structure of the field and, at the same time, suggest systemic solutions to the further development of research and practice in digital and green logistics.

RESULTS

The results and findings of this study have been structured according to the RQ designed in the first section.

The Current State of Digital and Green Logistics Research

Figure 3 illustrates the publication trends in digital and green logistics research, comparing the number of documents indexed in the WoS and Scopus databases from 1998 to 2024. The trend in the WoS database, represented by blue circles, shows a steady

increase in publications, which is especially noticeable from 2010 onwards.

Publications indexed in WoS have shown comparatively few and steady growth until 2010 and since then, there has been a gradual but notable growth, with a sharp rise in the past few years, with around 80 publications indexed in the past three years, as of 2023. This flow probably indicates the increased academic interest in the field of digital and green logistics that is driven by the necessity of global sustainability and the introduction of technology into logistics processes. On the other hand, the Scopus database, which is denoted by orange triangles, shows a similar but less significant trend. The documentation indexed in Scopus continued to increase at a small pace and oscillated to a certain extent until approximately 2015. After 2015, a steep rise was observed, but not as high as in the WoS data. The Scopus publications are also highest in the year 2022, but the highest number is significantly less than that of WoS, where it has a peak of about 20 publications. Such a difference between WoS and Scopus could indicate different indexing guidelines or more emphasis on digital and green logistics in the journals of WoS. In general, the graph shows an increasing academic interest in digital and green logistics, but WoS has shown a stronger spike over the last few years.

The Most Productive Authors

Table 1 gives a comprehensive description of the top ten productive researchers in the digital and green logistics study. Hernandez, J.; Li, Y.T.; Wang, H.H.X.; and Wang, Y. are the scholars who have published four documents, which are rather productive. However, their Average Growth Rate (AGR), indicating the relative change in the number of publications with time is either zero (0) or slightly negative (-0.5) in the case of Wang, Y. and Gorsevski, P.V. This means that although their overall production is admirable, there might be a current stagnation or a drop in their research work. Cheng, H., on the other hand, has the biggest AGR with 0.5, and this indicates a growth trend in his publications and further development in this area of research.

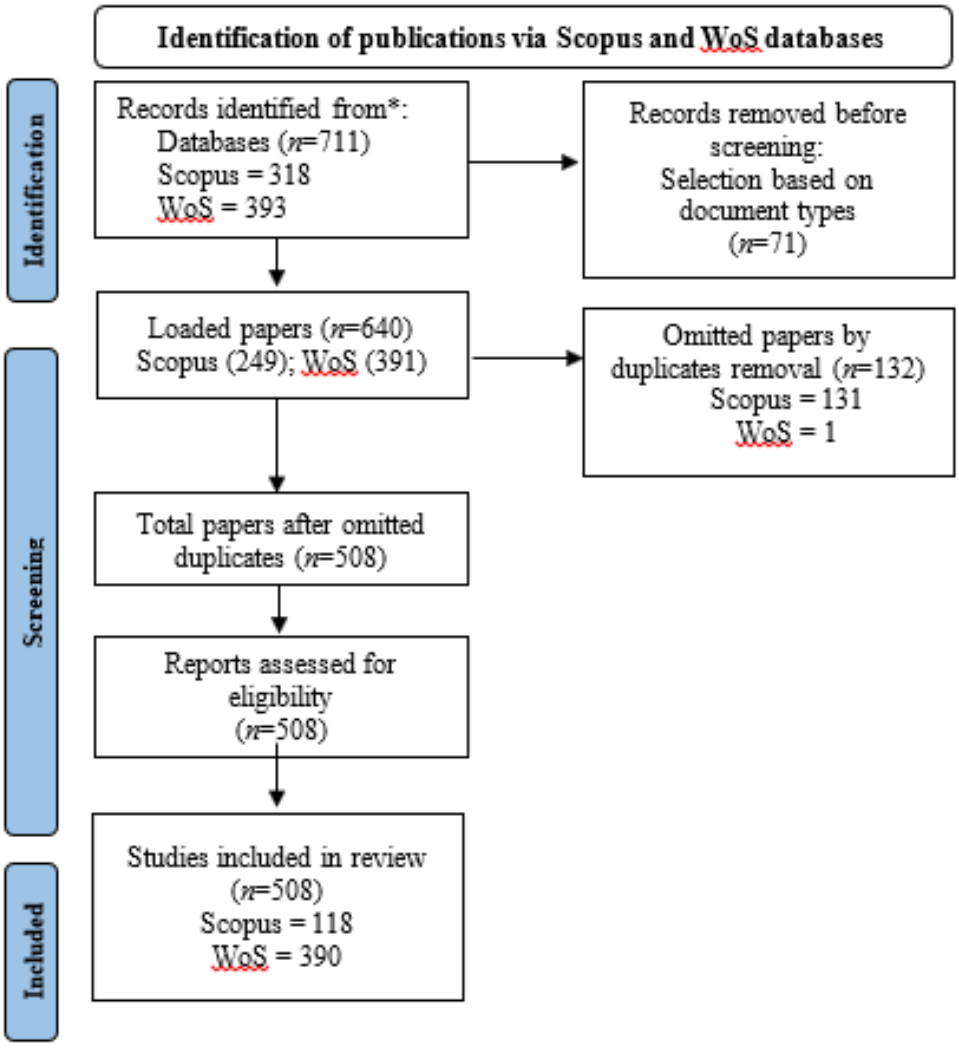

Figure 1: PRISMA Flow Diagram.

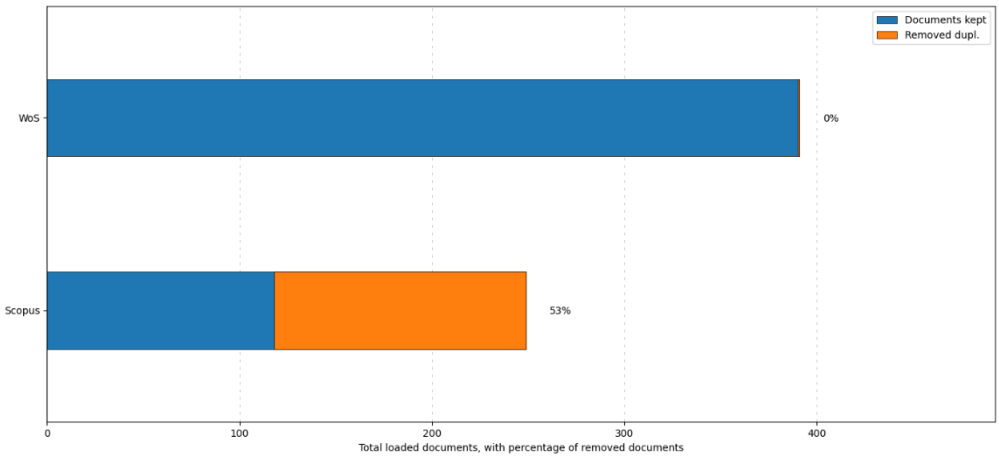

Figure 2: Total Documents with Percentage of Removed Documents.

The ADY metric, which shows the average number of published documents per year, is quite consistent across the majority of authors, and the value of one represents the consistent contribution of documents per year. Nonetheless, McClymont, A.F. and other authors like Pan, S.; Wei, S.; and Xia, L. have an ADY of 0 that indicates that they have not published in the latest year. This can be either a temporary suspension of research activity, or a reorientation to other academic or professional activities. This tendency is also emphasized by the PDLY measure, as Cheng, H. has 66.7% of his publications published in recent years, and McClymont, A.F. has not published any document during the past year. Lastly, the h-index is used to measure the productivity and citation impact. McClymont, A.F. and Wang, Y. are unique with a h-index of 4 which is high in the field since their work is highly referred to. Cheng, H. in his turn has a h-index of 1 that represents a more modest but possibly increasing influence.

The Most Productive Institutions

The top institutions in digital and green logistics research are represented in Figure 4 below. The ranking of each institution is based on the overall number of documents published. The chart is visually indicative of the leading academic and research institutions in the entire world and a noticeable cluster of the best performers in China, the United Kingdom, and other countries that have a strong reputation in the research output in the field of logistics and allied fields.

Chinese Academy of Sciences, China, is the most prolific institution, taking the first place in the chart, having more than ten publications. This leadership highlights the massive investment and emphasis of China on digital and green logistics which is an indication of how the nation is more committed to the development of technology-driven sustainability in logistics activities. The position of the institution as a global leader in the field of research underlines the fact that it probably has access to a wide range of resources, funding, and other lines of cooperation. The Chinese Academy of Sciences is followed by the University of Oxford in the United Kingdom, which has a high presence and numerous publications, which again strengthens the reputation of the UK as an academic country and its strategic orientation on sustainable practices in logistics. The work of the University of Oxford suggests a wider patterns in the UK towards the combination of advanced research with the practice in digital and green logistics, which is reflected by the desire of the institution to respond to the current challenges of the world. Others that are notable are Bowling green state university in United States and Sun yat sen university in China. Together with other organizations like the University of Nottingham in the United Kingdom and the University of Porto in Portugal, these organizations indicate the international scope of digital and green logistics research. The availability of institutions all over the world indicates the universal acknowledgment of the role of sustainability in the field of logistics and the increasing global cooperation in the respective field. Such a dispersion will contribute to the development of diverse sides and views on addressing the issues of digital and green logistics and, therefore, diversify the field and make it innovative.

The Geographical Distribution

In Figure 5 the geographical distribution and development of research contributions in different countries in digital and green logistics is thoroughly analyzed. The left-hand graph shows that the number of documents published by the top countries has been increased over the years, whereas the right-hand graph shows a correlation between the average number of documents published annually (2022-2026) and the percentage of the number of documents published in the same year.

China is the leader in the cumulative publication graph on the left, where its research output growth is huge and growing more

rapidly since 2016. This fast development demonstrates the high and growing focus of China on digital and green logistics, which is probably predetermined by the strategic efforts of the country to sustainability and technological advancement. The United States comes next with a steady and increasing trend in publications albeit with a lower percentage compared to that of China. Also, the United Kingdom is growing steadily, which indicates its long-term investment in the field of research. The growth of other countries like Germany, Canada, Spain and Italy is more moderate but steady and this shows that these countries are also in the field.

The right scatter plot offers some additional information about the recent research activity and shows the average number of documents per year versus the percentage of documents published in the last two years (2022-2026). China has the largest average number of documents per year and a high proportion of recent publications, which also contributes to its leadership role and shows high and steady research impetus. The US, being a prolific as well, has a somewhat lower proportion of recent publications, indicating a more stable but less steeply rising production. The contributions of other countries, including the United Kingdom and Germany, are also significant, and the United Kingdom has a rather high percentage of publications of recent years, which means that research is ongoing. The moderate yet consistent contributions of such countries as Spain, Italy, and the Netherlands point to the global scope of the research in the field of digital and green logistics, and different countries actively take part in the research and contribute significant information and innovations.

The Network Visualisation Map of Co-Authorship by Country

Figure 6 below is a VOSviewer map that shows the geographical distribution of countries and collaborative networks in the digital and green logistics research field. The nodes in the map represent the countries, and the size of the node is proportional to the amount of research output of that country. The connections between the nodes are an indication of collaboration between nations and the connections are made stronger or more common through thicker lines. The color-coding of the nodes represents various groups of the countries that work closely with each other.

The biggest and the most central node is China, which means that it takes the most significant role in the field with the wide range of partnerships, especially with the United States, the United Kingdom, and other European and Asian countries. The US and England also have a high level of research and cooperation, which is the core of their clusters. There are also other prominent countries like Germany, Spain, and Canada which are smaller but interlinked clusters implying active research communities with good international liaisons. The map indicates the international character of digital and green logistics research, as a great number of people cooperate worldwide, which is why global cooperation is crucial in developing such an important domain.

Documents Published by Country

Figure 7 illustrates the bar graph of the geographical distribution of documents related to digital and green logistics across various countries, focusing on comparing documents published before 2022 and those published between 2022 and 2026. The chart categorizes this data into percentages, highlighting the proportion of recent publications compared to older ones for each country. The horizontal bar graph format allows for a clear visual comparison of the number of documents and the percentage of recent publications within each nation.

The data indicate that China has the most publications with a significant percentage (50%) of the documents being published within the past two years. The United States is also a significant contributor to the literature, but a smaller percentage (19%) of them are recent. European nations like the United Kingdom, Germany and Spain have different levels of recent activity with the latter having the highest percentage of recent publications at 56%. The other countries, like Canada, Italy, India, and Netherlands

Table 1: Top Ten Authors.

Author	Total	AGR	ADY	PDLY	h-Index
Hernandez, J.	4	0	1	50	2
Li, Y.T.	4	0	1	50	2
McClymont, A.F.	4	0	0	0	4
Wang, H.H.X.	4	0	1	50	2
Wang, Y.	4	-0.5	1	50	4
Cheng, H.	3	0.5	1	66.7	1
Gorsevski, P.V.	3	-0.5	0	0	3
Pan, S.	3	0	0	0	3
Wei, S.	3	0	0	0	3
Xia, L.	3	0	0	0	3

Note: AGR: Average growth rate; ADY: Average documents per year; PDLY: percentage of documents in the last year.

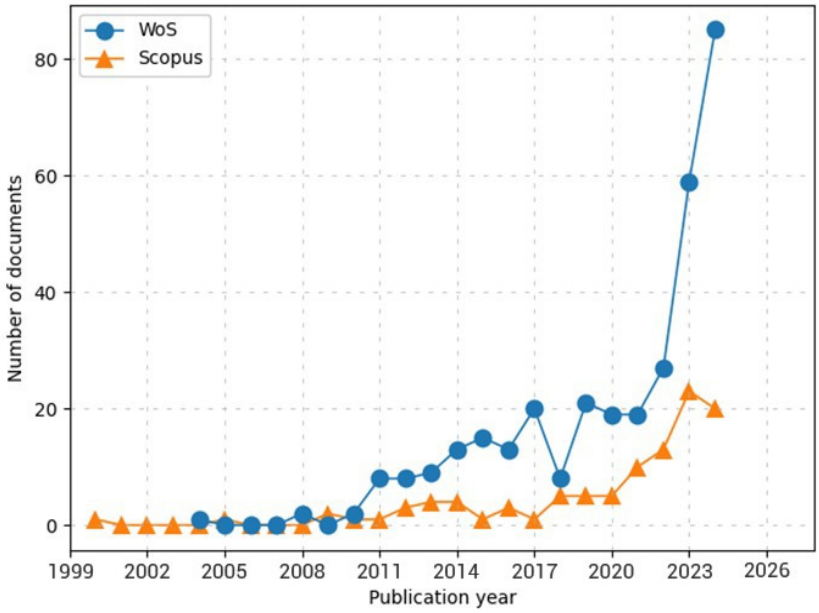

Figure 3: Publication Growth in Scopus and WoS.

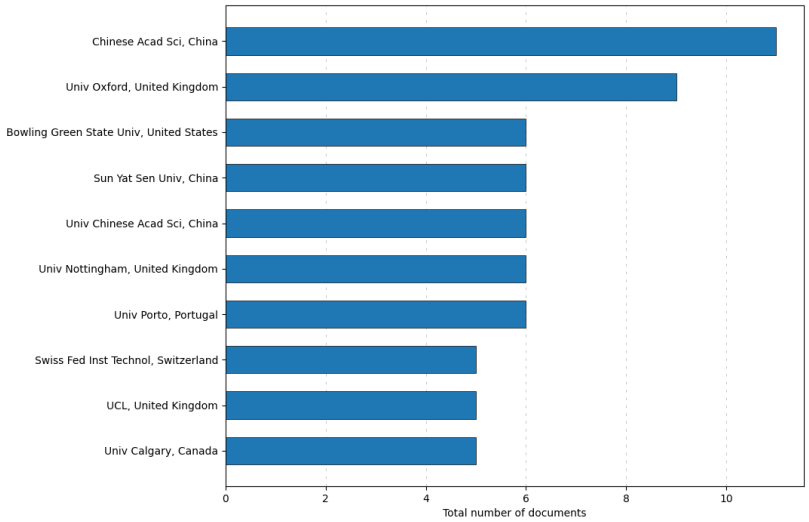

Figure 4: Top 10 Institutions.

are also making significant contributions, although with varying degrees of recent action. The results depict a changing and dynamic environment of the digital and green logistics research discipline where China and the United States seem to be taking the lead. The recent Chinese boom in publications indicates that there is a strategy and investment in this sphere which is probably caused by the national policies and international leadership purpose. In the meantime, the constant input of other nations supports the significance of worldwide cooperation and global applicability of research to attaining sustainable and technologically progressive logistics solutions.

Co-Citation Network Map

Figure 8 presents the co-citation network map of digital-green logistics literature generated using VOSviewer. The primary purpose of co-citation analysis is to uncover the intellectual structure of a research field by identifying authors and publications that are frequently cited together. When two authors are repeatedly co-cited by subsequent studies, it indicates that their work contributes to a common theoretical foundation or research stream. Therefore, the co-citation network reveals the foundational knowledge base, dominant schools of thought, and intellectual relationships that underpin digital-green logistics research. In the network, node size represents an author's relative influence within the citation structure, while the connecting lines

indicate the strength of co-citation relationships. The color-coded clusters represent distinct but interconnected knowledge domains that collectively shape the evolution of the field.

The network reveals three major intellectual clusters. The red cluster represents the largest and most densely connected group, comprising authors such as Liu, Wang, Zhang, Chen, Li, Yang, and Zhao. The high density of connections within this cluster indicates that these authors constitute a core knowledge community focusing on digital transformation, green logistics practices, sustainable supply chain management, and technology-enabled logistics optimisation. Their strong co-citation relationships suggest that they have established many of the foundational concepts concerning the integration of sustainability objectives with logistics digitalisation. The central positions of authors such as Wang Y., Liu Y., Zhang Y., and Li indicate their substantial intellectual influence on subsequent studies. The green cluster forms the second major knowledge domain and includes influential authors such as Kumar, Sarkis, Bag, Gunasekaran, Mangla, Jabbour, and De Sousa Jabbour. This cluster is strongly associated with sustainability management, circular economy principles, green supply chain management, Industry 4.0 technologies, and environmental performance. Particularly notable are Sarkis, Gunasekaran, Kumar, and Jabbour, whose works have become highly influential in linking sustainability theory with technological innovation and operational excellence. The dense connections within this cluster demonstrate the significant role of sustainability-oriented theories in shaping digital-green logistics research.

The blue cluster is centred primarily on Ivanov, who appears as a highly influential bridging author connecting multiple knowledge domains. Ivanov's central position reflects the growing importance of supply chain resilience, digital twins, risk management, and intelligent logistics systems in contemporary logistics research. The strong links between the blue cluster and both the red and green clusters indicate that resilience and digital supply chain capabilities are increasingly integrated with sustainability and digitalisation objectives. Overall, Figure 8 demonstrates that the intellectual structure of digital-green logistics is built upon three interconnected theoretical pillars: (1) digital transformation and logistics optimisation, (2) sustainability and green supply chain management, and (3) supply chain resilience and intelligent logistics systems. The strong inter-cluster connections suggest that the field is evolving toward a holistic digital-green logistics paradigm where environmental sustainability, technological innovation, and operational resilience are viewed as complementary rather than independent research streams. Consequently, the co-citation network identifies the foundational authors and documents that have shaped the field while simultaneously revealing the theoretical convergence that is driving current and future research developments.

Furthermore, the intellectual structure revealed in Figure 8 is underpinned by several dominant theoretical foundations that have guided the evolution of digital-green logistics research. The red cluster is primarily grounded in Digital Transformation Theory, Technology-Organisation-Environment (TOE) Framework, and the Resource-Based View (RBV), which collectively explain how organisations leverage digital technologies, organisational capabilities, and strategic resources to improve logistics performance while achieving sustainability objectives. The green cluster is strongly associated with Sustainable Supply Chain Management (SSCM) Theory, Stakeholder Theory, and Circular Economy Theory (CET), which provide the conceptual basis for understanding environmental responsibility, resource efficiency,

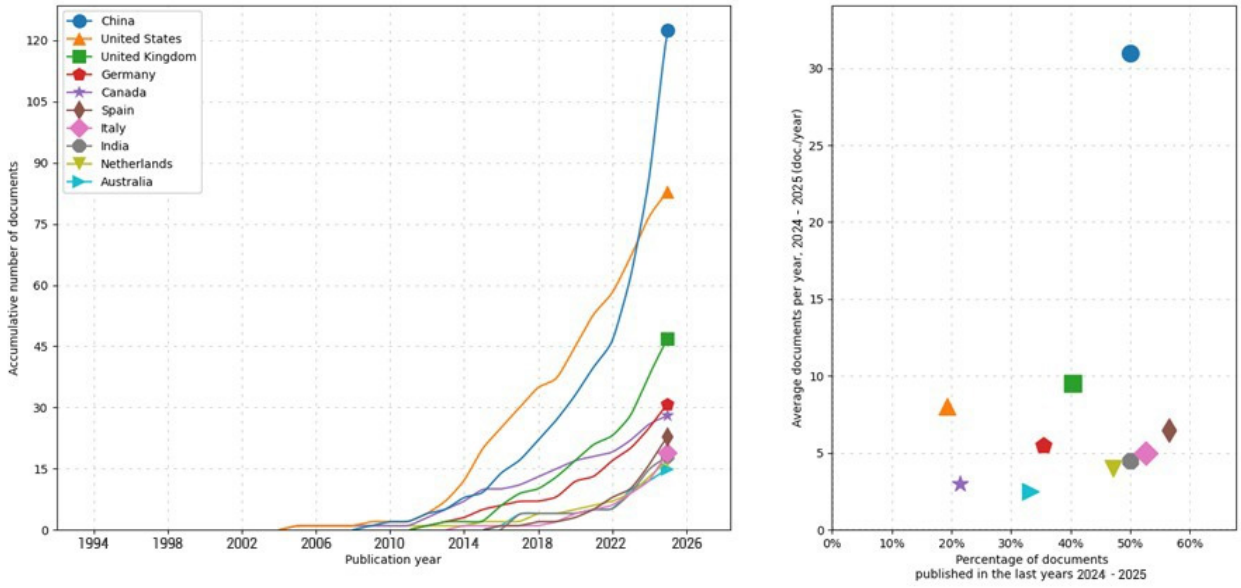

Figure 5: The Geographical Distribution of Digital and Green Logistics Publications.

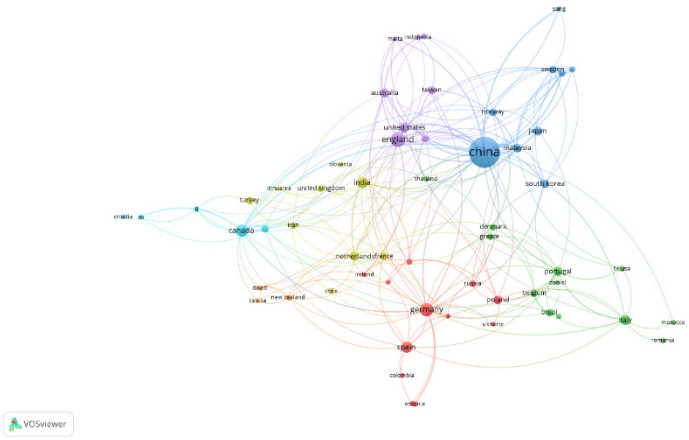

Figure 6: The Network Visualisation Map of Co-Authorship by Country.

green innovation, and long-term sustainability within logistics and supply chain operations. Meanwhile, the blue cluster, represented prominently by Ivanov and related scholars, is closely linked to Supply Chain Resilience Theory (SCRT), Dynamic Capabilities Theory (DCT), and Complex Adaptive Systems Theory (CAST), which explain how logistics systems adapt, recover, and maintain operational continuity amid disruptions and rapidly changing business environments.

The strong interconnections among these clusters demonstrate that digital-green logistics has evolved beyond traditional logistics optimisation and environmental management into a multidisciplinary field integrating technological innovation, sustainability, and resilience. Specifically, the convergence of RBV and DCT highlights the strategic importance of digital capabilities as valuable organisational resources for achieving competitive advantage. Similarly, integrating SSCM and CET perspectives reflects the growing emphasis on balancing economic performance with environmental stewardship. The increasing influence of SCRT further indicates that researchers are recognising the need for intelligent and adaptive logistics systems capable of responding to disruptions while maintaining sustainability objectives.

Bibliographic Coupling Map

Figure 9 presents the bibliographic coupling network of digital-green logistics literature and provides important insights into the current intellectual landscape and emerging research frontiers within the field. Unlike co-citation analysis, which reveals the historical knowledge base by identifying documents that are cited together, bibliographic coupling identifies publications that share common references. Consequently, bibliographic coupling is particularly useful for examining contemporary research streams and identifying emerging themes, as it captures how current studies are connected through shared theoretical foundations and research interests. In the network, node size represents the relative influence of a publication, while the links indicate the strength of shared references between documents. The color-coded clusters represent distinct thematic areas that collectively shape the present and future direction of digital-green logistics research.

The most prominent node in the network is Sonnentag (2012), which occupies a highly central position and serves as a major intellectual bridge connecting multiple thematic clusters. The centrality of this work suggests that it provides an important conceptual foundation for current digital-green logistics research and continues to influence diverse streams of inquiry. Surrounding this central node is a large green cluster comprising studies such as Dani (2017), Fan (2019), and related works that focus on sustainable supply chain management, environmental performance, and green logistics practices. This cluster reflects the continued importance of sustainability-oriented research in addressing environmental challenges, carbon reduction initiatives, and sustainable logistics operations. A second notable cluster, represented by authors such as Tehriani (2014), Ye (2020), and Lan (2020), appears to focus on digitalisation, technology adoption, and smart logistics systems. These studies examine how emerging technologies, including AI, IoT, blockchain, and digital platforms, contribute to operational efficiency and sustainability. The strong connections between this cluster and the sustainability-focused cluster indicate a growing convergence between environmental objectives and technological innovation.

Another cluster includes Grebey (2014), Winters (2009), Leggio (2012), and Wu (2017), which are associated with logistics optimisation, transportation systems, and operational efficiency. This research stream contributes to understanding how logistics networks can be redesigned to achieve both economic and environmental performance improvements. Several smaller clusters, including those centred around Cao (2018), Zhou (2016), Liu (2017), Ma (2018), and Young (2018), represent emerging research fronts that are gaining scholarly attention. These studies explore topics such as digital supply chain resilience, data analytics,

smart transportation, circular economy practices, and sustainable technology integration. The presence of these newer and less densely connected clusters suggests that digital-green logistics is transitioning from traditional sustainability discussions toward more advanced technology-enabled sustainability solutions.

The bibliographic coupling analysis further reveals several important current and emerging research fronts that are shaping the future direction of digital-green logistics scholarship. The first major research stream centres on sustainable supply chain management and green logistics, where studies focus on environmental performance, carbon emission reduction, sustainable transportation systems, and green operational strategies. This cluster reflects the growing emphasis on achieving environmental sustainability while maintaining supply chain competitiveness and operational efficiency. A second and increasingly influential research front is digital transformation and smart logistics, encompassing technologies such as AI, IoT, blockchain, cloud computing, and Industry 4.0 applications. Research within this cluster explores how digital technologies can optimise logistics operations, improve decision-making, enhance visibility, and support sustainability objectives simultaneously.

Another prominent research stream focuses on supply chain resilience and risk management. Studies in this area investigate how digital capabilities can enhance organisational adaptability, improve disruption management, and strengthen logistics resilience in increasingly uncertain business environments. The growing importance of this theme reflects lessons learned from global disruptions, including pandemics, geopolitical instability, and supply chain vulnerabilities. In addition, a rapidly emerging cluster relates to data-driven sustainability innovation, where scholars are examining the role of big data analytics, digital twins, smart transportation systems, and circular economy practices in creating more sustainable and intelligent logistics ecosystems. These studies emphasise the integration of advanced analytical capabilities with environmental objectives to improve resource utilisation, reduce waste, and enhance long-term sustainability performance.

Collectively, these emerging research fronts demonstrate that digital-green logistics is evolving beyond conventional logistics optimisation and environmental management toward a more integrated paradigm characterised by sustainability, digitalisation, resilience, and innovation. The convergence of these themes suggests that future research will increasingly focus on developing intelligent logistics systems that balance operational efficiency with environmental responsibility, leveraging advanced digital technologies to address complex sustainability challenges. Furthermore, these emerging directions provide strong empirical support for the subsequent TRIZ analysis, as they highlight critical tensions and contradictions within the field, including efficiency versus sustainability, transparency versus privacy, and global integration versus local adaptability.

Keyword Co-occurrence Network

Figure 10 presents the keyword co-occurrence network of digital-green logistics literature generated using VOSviewer. The purpose of keyword co-occurrence analysis is to identify the conceptual structure of a research field by examining how frequently keywords appear together within publications. Keywords that frequently co-occur are grouped into clusters, indicating closely related research themes and areas of scholarly interest. In the network, node size represents the frequency of keyword occurrence, while the links between nodes indicate the strength of relationships among concepts. Larger nodes therefore represent dominant research topics, whereas clusters reveal the

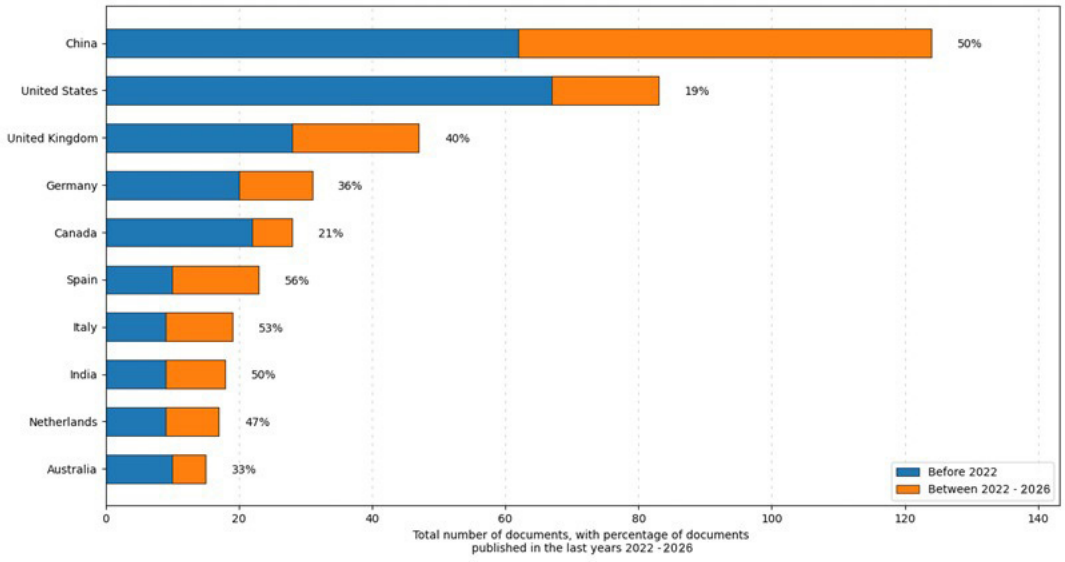

Figure 7: Documents Published by Country.

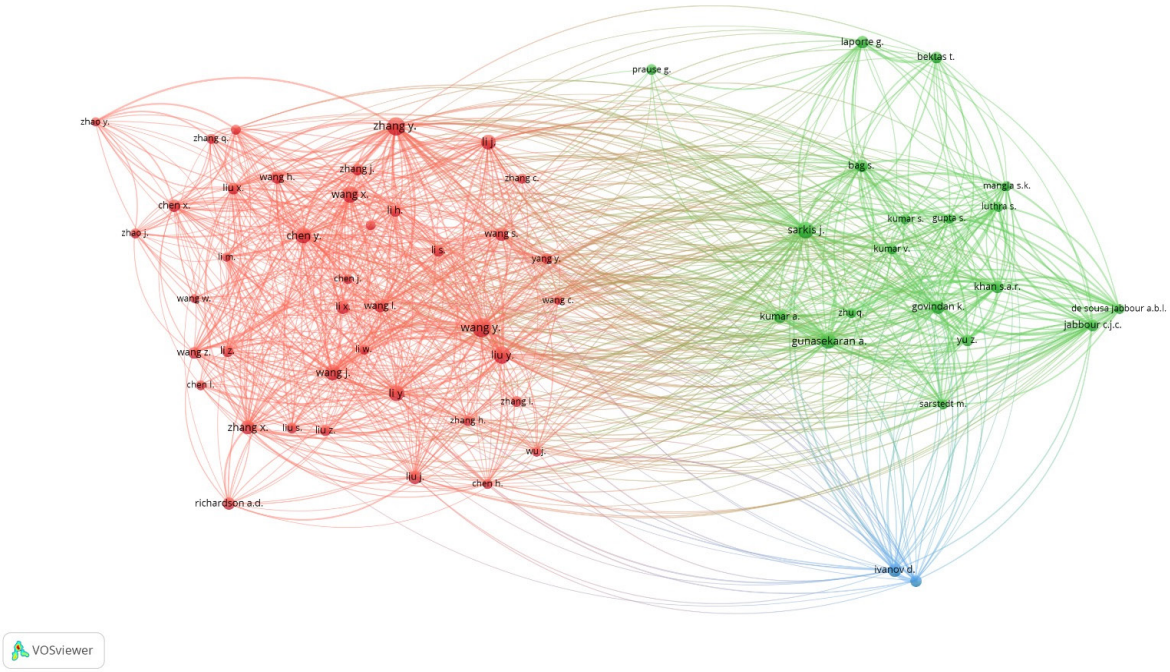

Figure 8: Co-Citation Network of Digital-Green Logistics Literature.

major thematic domains that collectively define the evolution of digital-green logistics research.

The network reveals four major thematic clusters. The red cluster represents the core sustainability and green logistics domain and contains highly prominent keywords such as *green logistics, sustainability, sustainable development, digital storage, carbon footprint, green computing, machine learning*, and *supply chain*. The centrality of "green logistics" and "sustainability" indicates that environmental responsibility remains the field's primary foundation. The presence of digital-related terms within this cluster demonstrates the increasing integration of technological solutions into sustainability-oriented logistics practices. This cluster reflects research focusing on carbon reduction, green transportation, sustainable supply chains, and environmentally responsible logistics operations.

The blue cluster is primarily associated with advanced digital technologies and analytical methods. Keywords such as *algorithms, cryptography, image processing, blockchain, remote sensing, logistic regression*, and *regression analysis* dominate this cluster. These terms indicate a growing emphasis on data analytics, AI, security technologies, and digital decision-support systems. The cluster highlights how digital transformation technologies are being utilised to improve operational efficiency, information management, and logistics optimisation while supporting sustainability objectives. The yellow cluster represents an emerging domain of innovation and economic sustainability. Keywords including *digitalisation, innovation, digital economy, renewable energy, carbon emission, economic analysis*, and *industrial economics* suggest growing scholarly interest in the economic implications of sustainability transitions and the role of digital technologies in facilitating low-carbon logistics ecosystems. This cluster reflects the increasing alignment between sustainability goals, technological innovation, and economic performance. The green cluster appears as a specialised application-oriented domain containing terms such as *human, male, female, adult, controlled study, survey*, and *retrospective study*. While this cluster is less directly related to logistics management, it reflects the multidisciplinary nature of the retrieved literature and demonstrates how digital-green logistics concepts have increasingly intersected with healthcare logistics, public-sector operations, and human-centred service systems.

Overall, the keyword co-occurrence network demonstrates that digital-green logistics research is evolving around four interconnected thematic pillars: sustainability and green logistics, digital technologies and analytics, innovation-driven low-carbon transformation, and multidisciplinary application domains. The strong connections among these clusters suggest that future research will likely focus on integrating AI, blockchain, renewable energy technologies, and data-driven decision-making into sustainable logistics practices.

Identified TRIZ inventive principles pattern through the Scientometric findings

In the Theory of Inventive Problem Solving (TRIZ), a collection of forty engineering parameters, expressed in the Contradiction Matrix, is taken as a representation of the contradictions. All of the contradictions are formalized into a conflict between something that needs to be improved and something that is worsened as

a result. The parameters are numbered (between 1 and 39 (in the original formulation by Altshuller) and sometimes 40). The application of TRIZ inventive principles to scientometric patterns of digital and green logistics provides a well-organized avenue for developing the descriptive clustering into a prescriptive strategy. Table 2 points out three main contradictions: (1) efficiency versus sustainability, which is marked by an increase in Productivity (parameter 39) and Speed (parameter 9) at the cost of an increase in Energy consumption (parameter 19) and Harmful factors (parameter 31); (2) global collaboration versus local adaptability, i.e. the improvement of Adaptability/Universality (parameter 35) and the increase of Complexity (parameter 36); and (3) transparency versus privacy, i.e. higher Measurement Accuracy/ Information Each of these tensions can be mitigated by the specific levers of the TRIZ inventive principles of Segmentation and Parameter Change, Dynamization, and Nested Doll.

The TRIZ contradiction analysis was derived directly from the scientometric findings and thematic clustering results generated through co-word, bibliographic coupling, and keyword co-occurrence analyses. Dominant thematic clusters identified in the bibliometric mapping, including "digital efficiency optimization", "sustainability performance", "blockchain-enabled transparency", and "global logistics integration", were systematically examined to identify underlying operational and strategic tensions. These tensions were subsequently translated into TRIZ engineering contradiction parameters based on the nature of the improvement objective and the associated negative consequence. The selected parameters were then mapped within the TRIZ contradiction matrix to identify relevant inventive principles capable of generating innovation-oriented solutions and future research pathways for digital-green logistics systems.

These inconsistencies are not a hindrance to development but are healthy drivers of innovation. The conflict of efficiency and sustainability emerged as a major issue in the clusters of digital technologies, operational performance, and environmental sustainability practices. Digital technology, such as AI, the IoT, and blockchain, increases the efficiency of logistics by automating and tracking in real time, but also raises sustainability issues, as it contributes to an increase in energy consumption and the growth of electronic waste. The principle of parameter change, which is part of the TRIZ framework, will find solutions to the problems, including switching logistics data centers to renewable power sources. In addition, the concept of segmentation implies the creation of modular sustainability reporting frameworks that would involve the reduction of resource intensity but maintain operational effectiveness. Second, the opposition

Table 2: TRIZ-Informed Contradictions and Innovation Pathways in Digital-Green Logistics.

Scientometric Cluster	Identified Contradiction	TRIZ Parameters	Inventive Principles	Proposed Innovation Pathway
AI-driven logistics optimisation	Efficiency vs Sustainability	Productivity (39) vs Energy Consumption (19)	Segmentation; Parameter Change	Renewable-powered logistics data centers
Blockchain traceability	Transparency vs Privacy	Information Transparency (28) vs Loss of Information (24)	Nested Doll	Layered blockchain systems
Global digital logistics integration	Global Collaboration vs Local Adaptability	Adaptability (35) vs Complexity (36)	Dynamization	Flexible modular logistics platforms

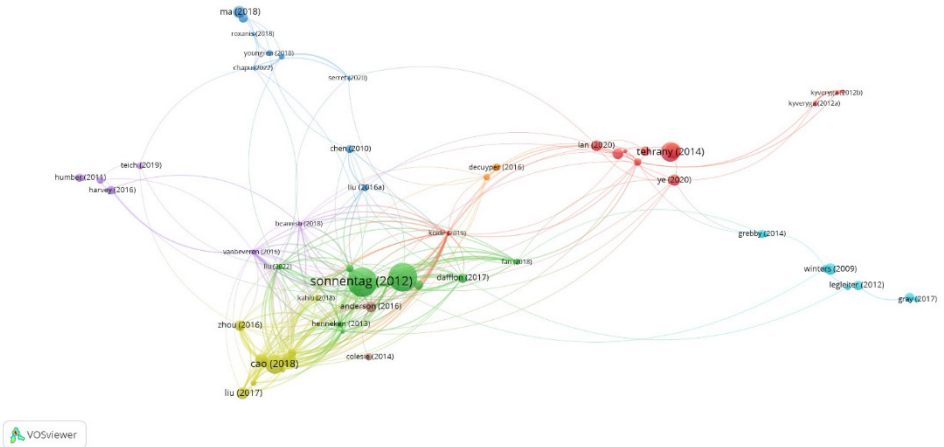

Figure 9: Bibliographic Coupling Analysis of Research Themes.

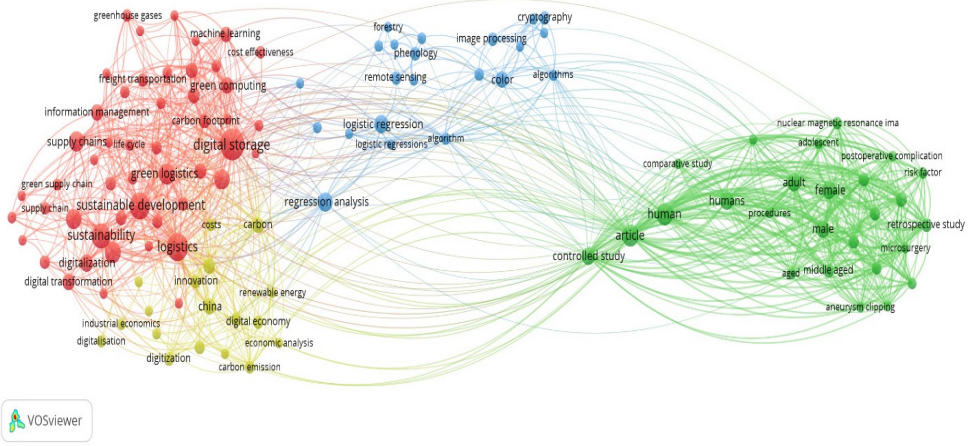

Figure 10: Keyword Co-occurrence

between international cooperation and local flexibility arises within the group dealing with international cooperation and regulation systems. The scientometric depicts that cross-border collaborations and multinational studies represent a focal point of the disciplinary development; however, local regulations and environmental circumstances also present certain restrictions to the standardized systems. A solution is offered by the TRIZ principle of dynamization, which recommends flexible logistics solutions that support international interoperability and evolve dynamically to meet regional divergent sustainability requirements. Third, in the blockchain and traceability cluster, the transparency privacy contradiction is the most apparent. Digital tracing technologies enhance the transparency of the supply chain but simultaneously increase the threat of sharing sensitive commercial or consumer information. The pressure is reduced through the nested doll principle of TRIZ, which supports the use of layered blockchain architectures, where an outer layer provides open traceability to sustainability goals, and an inner layer protects protected data by selective access control and cryptographic protection.

DISCUSSION

The discussion on RQ1 on the trends in publication shows a significant growth in the scholarship on digital and green logistics, especially since 2010. Such an upward trend shows that digitalisation and sustainability are becoming strategic demands in logistics research and practice, more and more accepted by the academic community (Ren *et al.*, 2020). The rapid rise in the number of publications over the last twenty years is an indicator of a greater concern about the issues of climate change, resource effectiveness, and technological upheaval. It is worth noting that bibliometric data show that the increase in the number of publications in the WoS-indexed is more significant than in Scopus, where WoS counted about 80 papers as of 2023, and Scopus counted about 20 in the same timeframe. This gap implies a growing academic interest, as well as a focus on high-quality research in the main journals that deal with digital and green logistics (Benatiya, 2024). The high increase in research since 2020 is also consistent with increased global decarbonisation commitments, heightened sustainability requirements, the circular economy, and environmental, social, and ESG demands at both national and organisational levels (Luu *et al.*, 2023; Nicoletti, 2024). At the same time, Industry 4.0 to Industry 5.0 has increased the pace of AI, automation, Internet of Things (IoT), and data-driven system adoption as essential facilitators of green logistics (Sun *et al.*, 2022; Morella *et al.*, 2023). This change is an indicator of a paradigm shift where digitalisation is already being seen not only as a means of operational efficiency but also as a strategic process of realising environmental goals and moving towards carbon-neutral logistics corridors assumed by numerous countries in the world.

It is also indicated in the data that there is a distinct geographical and institutional hierarchy. The three countries, China, the USA, and the UK become the potent contributors to the field, with China having nearly half of the publications in 2022-2023 alone. This trend is enhanced by the impact of such institutions as the Chinese Academy of Sciences, the University of Oxford, Bowling Green State University, and Sun Yat-sen University, which can be discussed as the high level of consistency between academic research investment and the country's low-carbon innovation policies (Ren *et al.*, 2020). Similarly, such prominent researchers as Hernandez, Li, Wang, and McClymont have made a significant contribution to the discourse formation, but their rates of recent publications are rather stable than increasing. Conversely, new authors like Cheng H. are showing a growing publication trend, which suggests the introduction of new players to the industry. All these tendencies indicate that digital-green logistics is no longer merely a niche scholarly subject, but it has become a pillar of mainstream research in the logistics and sustainability academic community of developed countries, where the availability of resources, institutional capacity, and policy support drive a faster

maturity of research and diffusion of innovation (Sun *et al.*, 2022; Nicoletti and Appolloni, 2024).

Although this has been achieved, the geographical distribution of research is still skewed towards developed economies like China, the United States, and others like the United Kingdom, and the contribution of the developing countries is low. This disparity underscores a severe knowledge gap connected to institutional capacity, digital readiness, regulatory frameworks, and infrastructural limitations in new logistics economies, specifically in the areas of Asia, Africa, and Latin America. The future research should then focus on comparative cross-regional research and empirical research in the resource-constrained settings to comprehend the barriers to adoption and to formulate all-inclusive frameworks of digital-green transformation of logistics (Luu *et al.*, 2023).

The findings associated with RQ2 provide insights into the intellectual structure and thematic evolution of digital-green logistics research. The co-citation network analysis suggests that the field has developed around several interconnected knowledge domains rather than a single dominant theoretical perspective. Three prominent intellectual clusters were identified, reflecting research streams associated with digital transformation and logistics optimisation, sustainable supply chain management, and supply chain resilience. The strong connections observed among these clusters may indicate increasing scholarly efforts to integrate technological innovation, environmental sustainability, and operational adaptability within logistics systems. Rather than existing as separate areas of inquiry, these themes appear to be converging into a broader interdisciplinary research agenda focused on sustainable digital transformation. The co-citation patterns further highlight the influence of authors such as Sarkis, Gunasekaran, Kumar, Jabbour, Ivanov, Wang, and Liu, whose works are frequently cited together across multiple studies. This pattern suggests that contemporary digital-green logistics research continues to draw upon established foundations in SSCM, RBV, DCT, CET, and SCRT. However, the co-citation evidence should be interpreted as indicating intellectual influence rather than direct theoretical dominance, as citation behaviour may also be shaped by disciplinary traditions and publication practices.

The bibliographic coupling analysis complements these findings by revealing active and emerging research fronts. Research themes related to "artificial intelligence", "blockchain-enabled traceability", "digital twins", "smart logistics", and "sustainability-oriented supply chains" appear to be gaining increasing scholarly attention. Similarly, the keyword co-occurrence network demonstrates strong associations among concepts such as "sustainability", "green logistics", "digitalisation", "Industry 4.0", "blockchain", and "carbon emissions". Collectively, these findings suggest that the field is gradually moving towards a more integrated understanding of how digital technologies may support sustainability objectives within logistics systems. Nevertheless, the diversity of clusters also indicates that the field remains intellectually heterogeneous, with opportunities for greater theoretical integration and empirical validation across different research streams.

The findings for RQ3 highlight several emerging themes and potential future directions in the digital-green logistics literature. The bibliographic coupling and keyword co-occurrence analyses suggest increasing scholarly interest in technologies such as "artificial intelligence", "blockchain", "digital twins", "big data analytics", and "smart transportation systems". These technologies are frequently associated with sustainability-related concepts, including "carbon reduction", "resource efficiency", "supply chain transparency", and "environmental performance". The growing interconnectedness of these themes may indicate that researchers increasingly view digitalisation and sustainability as complementary rather than independent strategic priorities. Despite this growing body of research, scientometric evidence also reveals several areas that appear underexplored.

First, much of the existing literature remains conceptual, review-based, or simulation-oriented, with comparatively fewer studies providing large-scale empirical validation of digital-green logistics initiatives in real operational environments. Consequently, while digital technologies are often presented as enablers of sustainability outcomes, further empirical evidence may be required to assess their actual environmental, economic, and social impacts across different logistics contexts. Second, the analysis suggests that relatively limited attention has been devoted to the unintended consequences of digitalization. Topics such as the energy consumption of digital infrastructures, cybersecurity challenges, data governance, privacy concerns, and electronic waste management appear less prominent than discussions of technological benefits. This imbalance may indicate opportunities for future studies to adopt a more holistic perspective on the sustainability implications of digital transformation. Third, the geographical distribution of publications remains concentrated in a relatively small number of technologically advanced economies. Although this pattern may partly reflect differences in research capacity and database coverage, it suggests that experiences from developing and emerging economies remain comparatively underrepresented. Future research could therefore benefit from comparative cross-regional studies, longitudinal investigations, and context-specific analyses that explore how digital-green logistics practices are implemented under varying institutional, infrastructural, and regulatory conditions. Such efforts may contribute to a more inclusive and nuanced understanding of sustainable digital transformation within global logistics systems.

Finally, the empirical evidence on RQ4 shows that the use of TRIZ in the concept of scientometric patterns provides a systematic method of solving contradictions emerging in the intersection point of digital and green logistics. The existing digital logistics literature (Kasap, 2025; Guan *et al.*, 2025; Sajadieh and Noh, 2025) focuses on performance, speed, and integration while

also highlighting growing concerns about energy consumption, emissions, and ecological trade-offs. This rigidity is unveiled by co-word and key word groups, and the studies mentioned IoT, blockchain, AI, and optimization are used in combination with the ones that refer to the carbon footprint, emissions, or sustainability. The global/local paradox exists due to the fact that numerous models suggest general digital platforms, and regional environmental regulations, infrastructure inequalities, and local stakeholder needs require adaptation to the environment. Furthermore, the blockchain/traceability cluster shows that, although transparency is proclaimed to be the key to green logistics, researchers warn against disclosing proprietary or personal information, which creates a tension between transparency and privacy.

On one hand, such observations matched with new supportive digital and green logistics studies. For example, Winkelmann *et al.* (2024) perform a systematic review and find that blockchain is the most commonly used digital tool in sustainable supply chains, but also has trade-offs in terms of energy consumption. Mutambik (2024) shows that digital transformation enhances sustainability by increasing resource efficiency and strategic alignment in the supply chains. Likewise, Bo and Yi (2024) demonstrate that the concept of multi-agent digital twins can be used to balance collaboration and flexibility with the help of flexible architectures. On the other hand, the skeptical provisions warn that digital technologies are likely to increase environmental loads unintentionally. According to Kromes *et al.* (2024), blockchain applications in the logistics industry are still rare and face practical issues of scalability and energy overhead. Khan *et al.* (2023) list technical complexity, trust problems, and information-sharing risks relating to the adoption of blockchain, which highlight the privacy-transparency contradiction. These criticisms help to realize the importance of a TRIZ-based resolution model instead of blind enthusiasm. To sum up, RQ4 findings confirm that TRIZ is capable of transforming scientometric contradictions into strategic innovation opportunities in a systematic manner.

Implication of the Study

This study is valuable in theoretical, practical, and policy development of the new sphere of digital-green logistics. Theoretically, it is an extension of the logistics and sustainability literature, as it conceptualises digital-green logistics as an ecosystem of innovation that has multidimensional contradictions: efficiency versus. sustainability, transparency versus. privacy, and global collaboration versus. local adaptability. By combining scientometric mapping with TRIZ, the study goes beyond the traditional descriptive bibliometric research, providing a prescriptive model that actively addresses innovation tightness in logistics systems. The dual approach, which combines both methods, is theoretically enriching as it shows that trade-offs can be used to create an opportunity to achieve technological-environmental synergy by using creative principles (e.g., segmentation, dynamisation, and parameter change) (Altshuller, 1984; Donthu *et al.*, 2021). Thus, the study reinforces the conceptual connections between sustainable operations, digital transformation, and innovation management, and thus enhances the theoretical discussion on sustainable digitalisation in logistics (Nicoletti and Appolloni, 2024; Mutambik, 2024).

In practice, the study offers definite strategic directions to logistics managers who want to operationalise the digital transformation at the same time as ensuring sustainability performance. The TRIZ-based models of innovation suggest the renewable-powered data infrastructure, scalable sustainability reporting systems, and flexible logistics platforms that can match the global efficiency level with the local ecological requirements. These lessons provide managers with a practical rationale on how to make sustainability a part of digital decision-making, balancing between performance optimisation and carbon reduction, cybersecurity, and trust by stakeholders and the results are consistent with the modern trends in managerial literature that can facilitate real-time efficiency benefits and promote ESG agendas using digital technologies like AI, IoT, and blockchain (Wang *et al.*, 2020; Luu *et al.*, 2023). As a result, the study provides a systematic way for companies to achieve the so-called twin transformation of digital and green, which is based on unceasing innovation and competitiveness driven by sustainability.

Policy-wise, the study indicates that the world has imbalanced digital-green logistics, which are clustered in the technologically advanced economies. To close this digital divide, policymakers ought to focus on inclusive policies on digitalisation, capacity-building initiatives, and financial incentives to motivate SMEs and the developing regions to use sustainable technologies. The creation of policies that encourage open innovation ecosystems, data-sharing standards, and the use of renewable-powered digital infrastructures can encourage fair sustainability transitions throughout the global logistics networks (Ren *et al.*, 2020; Lema and Rabellotti, 2023). All these implications offer an all-encompassing roadmap into the incorporation of digital intelligence, ecological responsibility, and innovation-driven governance, which will lead to the implementation of resilient, low-carbon, and intelligent logistics systems globally.

Limitation and Future Study

Despite the fact that the research presents a thorough scientometric and TRIZ-based analysis of digital green logistics, there are some limitations that deserve to be mentioned. To start with, the study solely utilises the Scopus and WoS databases that, although they are considered to be the most reputable academic repositories, are likely to omit any relevant industry research, patents, and non-indexed journal entries. Future research ought thus to include wider datasets, e.g., Google Scholar, IEEE Xplore, or industry-specific repositories, to include emergent

technological knowledge. Second, the search is limited to papers published until September 2025. Due to the fast rate of digital innovation, the search will have to be periodically updated to track the progress of generative AI, autonomous logistics, and quantum-enabled optimisation. Third, the research has a macro-level scientometric direction, which restricts the empirical evaluation of the environmental and operational performance results in digital applications in logistics. This gap would be filled with the augmentation of bibliometric mapping with empirical case studies, cross-regional benchmarking, and experimental assessments of digital-green solutions. Lastly, the fact that geographical evidence was mostly concentrated in developed economies highlights a knowledge gap; future studies must focus on new markets to clarify situational adoption obstacles, infrastructural limitations, and domestic innovation processes, and hence promote a more inclusive and globally applicable perspective of digital-green logistics change.

CONCLUSION

The study presents a systemized exploration of the cognitive development, conceptual frameworks, and innovation paradox of the digital and green logistics landscape. The study combines scientometric and TRIZ approaches to outline the way the scholarly focus has increased significantly over the years, but with an increased growth rate after 2020 due to the global decarbonisation efforts, technological change, and sustainability policies. It singles out three main areas of knowledge around digital optimisation, environmental sustainability, and global dynamics of collaboration, and also points to areas that are emerging, like blockchain traceability, AI-based carbon efficiency, and digital twin logistics architectures. Regardless of this powerful momentum, structural barriers, such as the lack of empirical validation of the results of digital-green integration, the sustainability trade-offs of digital systems, and the high level of geographical concentration of research in developed economies, can be observed in the field. Application of TRIZ also provides a systematic logic of innovation that can be used to balance these tensions, offer solutions to the achievement of efficiency and environmental ambitions, transparency and privacy, and local implementation and global standards. On the whole, the research can improve the conceptual knowledge, introduce a new methodological synthesis, and establish a research and practice agenda. With industries and governments increasingly moving towards more intelligent and sustainable logistics, the knowledge acquired in this paper provides a solid base for strategic decision-making and research creation in digital-green logistics.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Cite this article: Peter D, Shollunayagam R, Yacob P. Mapping the Future of Digital-Green Logistics: Scientometric Insights and TRIZ-Based Innovation Pathways. J Scientometric Res. 2026;15(2):618-34.