

A Bibliometric Review of Inventory Management in E-Commerce

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Abstract: This bibliometric analysis aims to provide an overview of the field's development and emerging trends in inventory management in e-commerce from an Operations Research point of view. A total of 498 scholarly articles retrieved from Scopus and Crossref databases via Boolean keyword search were screened using PRISMA methodology and analyzed using Biblioshiny (Bibliometrix) to identify key articles, authors, trends, topics, and connections. The results revealed that research on inventory management in e-commerce has been growing steadily, and the topics range from cross-border e-commerce and supply chain management to machine learning, digital transformation, blockchain, and deep learning. Moreover, the field was found to be fragmented into several areas with different trends, including omnichannel inventory decision-making, financing, sustainability, uncertainty, and customer behavior. Accordingly, this study discusses the need for integrated approaches to operational, financial, technological, and customer-focused decision-making in e-commerce and suggests possible future directions, including learning-based control, compound uncertainty, and stakeholder outcome analysis, sustainability, and standardized keywords. Overall, the findings contribute to the understanding of the current state of research in inventory management in e-commerce and highlight the opportunities for integrated approaches to address the field's critical challenges.

Keywords: E-Commerce; Inventory Management; Operations Research; Bibliometric Analysis; Supply Chain Management; Machine Learning; Digital Transformation; Omnichannel Retailing; Cross-Border E-commerce.

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I. INTRODUCTION

Over the past few years, there has been a growing concern of many online retailers about how they handle their stock. Every online sale is underpinned by a central dilemma – maintaining sufficient stock to get products to their customers in a timely manner while minimizing the cost of inventory – the money spent on warehouses (Mohammed et al., 2026). It is an important topic in the global economy because getting it wrong has costs for businesses of billions of dollars and costs valuable resources. Apart from reducing corporate profits, substandard inventory management seriously impacts society. For example, in times of major crises such as epidemics, public health and economic security are maintained through ensuring the continuity of goods (D. Liu et al., 2026). Research indicates that businesses have moved towards data-driven, real-time inventory strategies to thrive in this rapidly changing landscape.

Companies use operations research (OR) extensively as an effective decision making and problem-solving tool to

help with these complex choices. With a mathematical model OR methods can assist businesses to determine exactly how and when to order stock. This is particularly significant in the e-commerce context, where businesses must deal with unpredictable customer behavior and complex delivery routes. In particular, if the distribution network is large, it is more suitable for optimizing the distribution of cross-border online sales through multiple channels (Hui et al., 2025). Furthermore, companies can learn from the constantly changing pattern of customer demands using data-driven OR policies (Ren et al., 2023). Finally, modern OR exploits deep reinforcement learning techniques to ensure the smooth management of stock in independent computer agents in different retail supply chains (S. Ma, 2026)(Zhou et al., 2026).

The impetus for doing this study is the fast-paced digitalization of retail. Legacy redundant stock counts are being phased out by companies, and they are actively seeking automated systems. Its importance is growing rapidly in the recent times, for instance, the number of published research papers increased from 13 in 2020 to 149 in 2026. Recent

trends indicate that researchers are much interested in digital transformation, cross-border trade and machine learning to make more accurate forecasts of demand.

An overview of the literature shows that there is not a single study that synthesizes the existing research from these three areas of operations research, information systems, and marketing. We identified 6 key themes from our review: cross-channel inventory decisions, data-driven control, dealing with unplanned supply shocks, funding and warehouse financing, green sustainability practices and customer substitution behaviours. There is, however, a significant lack of literature as these topics are studied independently and are very fragmented. There are some reviews that have focused on some aspects of this area, but no reviews have focused on e-commerce stock management specifically using a bibliometric approach.

For this expanding territory, we have adopted a bibliometric design, which is based on the period 2011-2027. The initial results from both Scopus and Crossref databases were 2200 records, obtained with an appropriate Boolean keyword search. These records were then filtered for duplicates and irrelevant titles with the help of a PRISMA protocol. After all, we ended up with a final list of 498 peer-reviewed articles that we analysed using the software Biblioshiny to identify the most relevant authors, sources and trend topics.

➤ Summary of Existing Reviews

Table 1 Summarises the Five Existing Reviews; None Combines a Bibliometric Method with An Explicit E-Commerce Focus.

Study	Year	Review type	Sub-problem examined	Contribution / limitation
Puttemans et al.	2025	Literature review	Location & inventory integration	Not e-commerce specific
De Souza et al.	2025	Literature review	Dynamic programming	Limited e-commerce coverage
Salas-Navarro et al.	2026	Literature review	Vendor managed inventory	Sustainability as extension
Maia et al.	2026	Literature review	Stochastic inventory routing	No financing or customer link
Bergsma et al.	2025	Systematic review	Machine learning for inventory control	Not bibliometric or e-commerce centred

➤ Key Terms

Omnichannel retailing: selling through connected channels (website, app, store) with inventory treated as one shared pool (B. Ma et al., 2024).

Cross border e-commerce: sales across countries, adding exchange rate risk, customs delays, and bonded warehouse financing (Song et al., 2024).

➤ Key Themes in the Literature

Table 2 Lists the Ten Most Frequent Keywords; Technology Themes Such as Machine Learning, Digital Transformation, and Blockchain Each Appear in Over Ten Papers.

Theme / Keyword	Frequency (n = 498)	Focus
E-commerce	142	Core term
Cross border e-commerce	27	Trade & currency risk
E-commerce platform	23	Platform level decisions
Supply chain management	21	Integration with SCM
Machine learning	17	Demand forecasting

We found that the field is developing rapidly but there is a need for an agenda for future research where isolated operational and financial decisions are linked together. To narrow our study, we briefly examine academic articles that have been peer-reviewed and published that focus on operations research methods employed to manage online retail inventory.

II. LITERATURE REVIEW

➤ Background and Rationale

Online retailers must hold enough stock to ship quickly and absorb surges from promotions or live-stream events without overspending on storage, while processing returns from several channels. Firms have therefore shifted from periodic stock checks to data-driven, real-time inventory strategies (Mohammed et al., 2026).

This research is scattered across operations research, information systems, and marketing. A bibliometric approach suits such fragmented, fast-growing literature, so this review maps 498 peer reviewed papers.

➤ Existing Reviews and Positioning of This Study

Existing reviews cover parts of this area, but none is bibliometric. We found no bibliometric review of inventory management within e-commerce, so this review is an early attempt to map that intersection.

Blockchain enabled systems: a shared, tamper resistant record tracking stock through the supply chain (S. Liu & Yu, 2023).

Machine learning based forecasting: algorithms trained on past sales instead of standard statistical forecasting (Ren et al., 2023).

Digital transformation	14	Technology adoption
Inventory management	13	Topical core
Logistics	12	Fulfilment & distribution
Game theory / Blockchain	11 each	Pricing / traceability
Deep learning	11	Advanced forecasting

➤ Thematic Strands in the Literature

Six common themes appear throughout the research:

Cross-channel inventory decisions ((B. Ma et al., 2024); (Hui et al., 2025); (Qiu et al., 2025)) are typically handled in isolation by channel, place, and restocking.

Data-driven control, reviewed by (Bergsma et al., 2025), now uses deep reinforcement learning ((S. Ma, 2026); (Zhou et al., 2026)). Unexpected issues and supply shocks are handled with robust planning ((Qiu et al., 2022); (D. Liu et al., 2026)), usually one type at a time. Funding links stock to secure warehouses and collateral loans ((Song et al., 2024); (Leng et al., 2025)), but rarely to routine tasks. Green practices ((San-José et al., 2025); (Zemzami et al., 2026)) are mostly viewed as extra options. Buyer actions, like shortages and product switching ((Schiffels & Jost, 2026); (Müller et al., 2026)), are analyzed on their own.

➤ Strengths and Limitations of Prior Research

Research has moved past deterministic models, applying deep reinforcement learning, blockchain, and robust optimisation to e-commerce. Limitations include:

- Fragmented sub streams: strands develop in isolation.
- Sustainability as an add on: layered onto standard models.
- Single source uncertainty: one shock modelled at a time.
- Narrow omnichannel integration: channel, location, and replenishment solved separately.

➤ Evidence Gaps in Prior Studies

Structural gaps in the evidence base:

- No bibliometric account: existing reviews are narrative or systematic.
- No unified account: no study links the strands.
- Keyword ambiguity: broad supply chain papers dilute counts.
- Limited real-world validation: many models use historical or synthetic data.
- Weak comparability: definitions differ across studies.

➤ Identifying the Gap

Publications rose from 13 in 2020 to 71 in 2024, 104 in 2025, and 149 in 2026. Classic subjects like logistics and stock management now show up next to machine learning, digital tech, and blockchain (Table 2). These topics are seldom examined together, and no study explains how they link to main daily tasks; this paper solves that problem.

➤ Research Objectives

RQ1: How has the volume of published research on stock control and online selling expanded over time? RQ2: What are the key subjects and central terms? RQ3: What

missing areas remain, and what can upcoming studies examine deeper?

III. RESEARCH METHODOLOGY

➤ Research Design

This bibliometric study examines the evolution and emerging themes of e-commerce inventory management within Operations Research, covering demand forecasting, omnichannel fulfillment, cross-border logistics, blockchain traceability, and inventory financing, over 2011 to 2027.

➤ Data Collection

Data came from Scopus and Crossref, accessed through EBSCO and Harzing's Publish or Perish, using three Boolean keyword sets:

"Inventory Optimization" AND "Online Retail"
"Inventory Management" AND "E-commerce"
"Inventory Control" AND "E-commerce"
These returned 2,200 records.

➤ Screening and Selection of Publications

We followed the PRISMA protocol, summarised below.

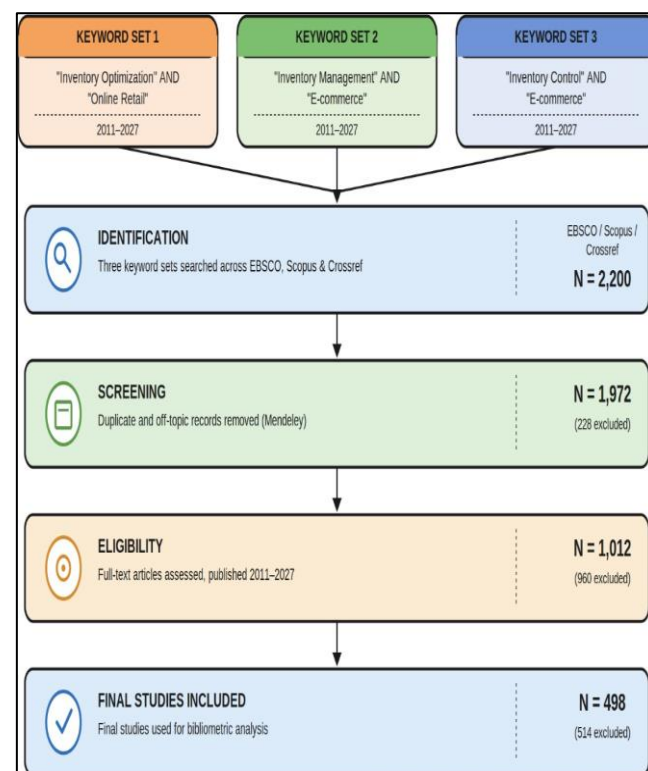


Fig 1 Screening and Selection of Publications

After clearing out duplicate copies and irrelevant titles and reading full papers, we retained peer-reviewed, listed

articles focused on online shop stock management, leaving 498 studies.

➤ Data Processing

Files were combined and cleaned of copies in Mendeley, then imported into Biblioshiny (Bibliometrix) within RStudio for review and study.

➤ Bibliometric Analysis

We examined annual research output, leading journals and scholars, common keyword pairs, emerging subjects, and

➤ Most Relevant Sources

a three-field chart linking authors, topics, and key terms.

IV. DATA ANALYTICS

Biblioshiny has been used to analyze and review the literature that contains the most significant articles and authors related to the topic, along with the evolution of the research themes over time and the connections between authors, themes and concepts.

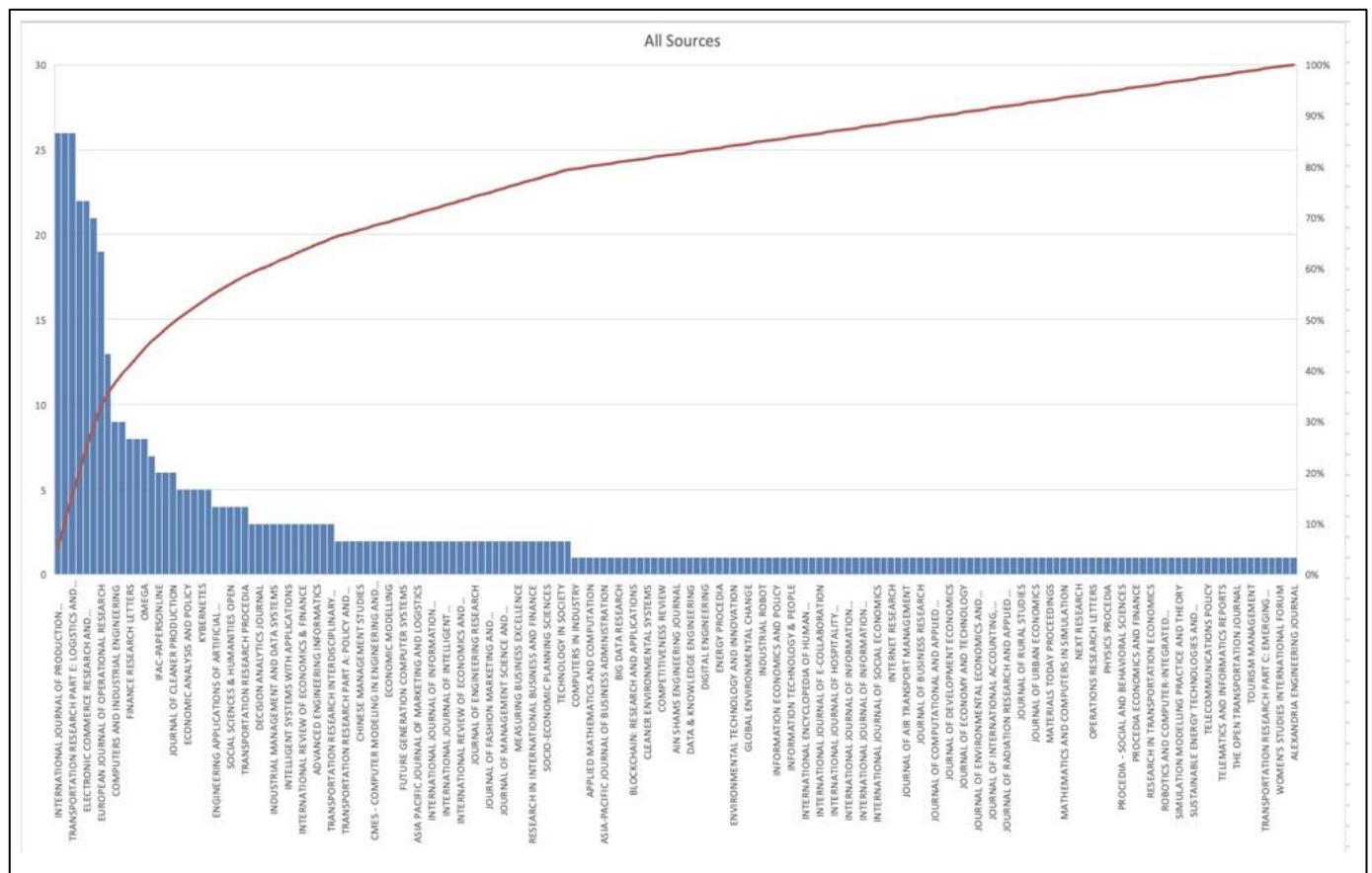


Fig 1 Most Relevant Sources

The distribution of the literature across the field shows a large amount of fragmentation, as opposed to concentration in a flagship publication. Leading the pack are the International Journal of Production Economics, Transportation Research Part E: Logistics and Transportation Review, and Electronic Commerce Research and Applications, each of which published 26 publications – the

highest count for a single journal in the field. Together, the journals cover a large interdisciplinary space, ranging from production management, logistics, and retail operations to decision science. This demonstrates that e-commerce research has several fields that cut across the traditional specialism, and is a confluence of operations management, logistics, and information technology.

➤ *Most Relevant Authors*

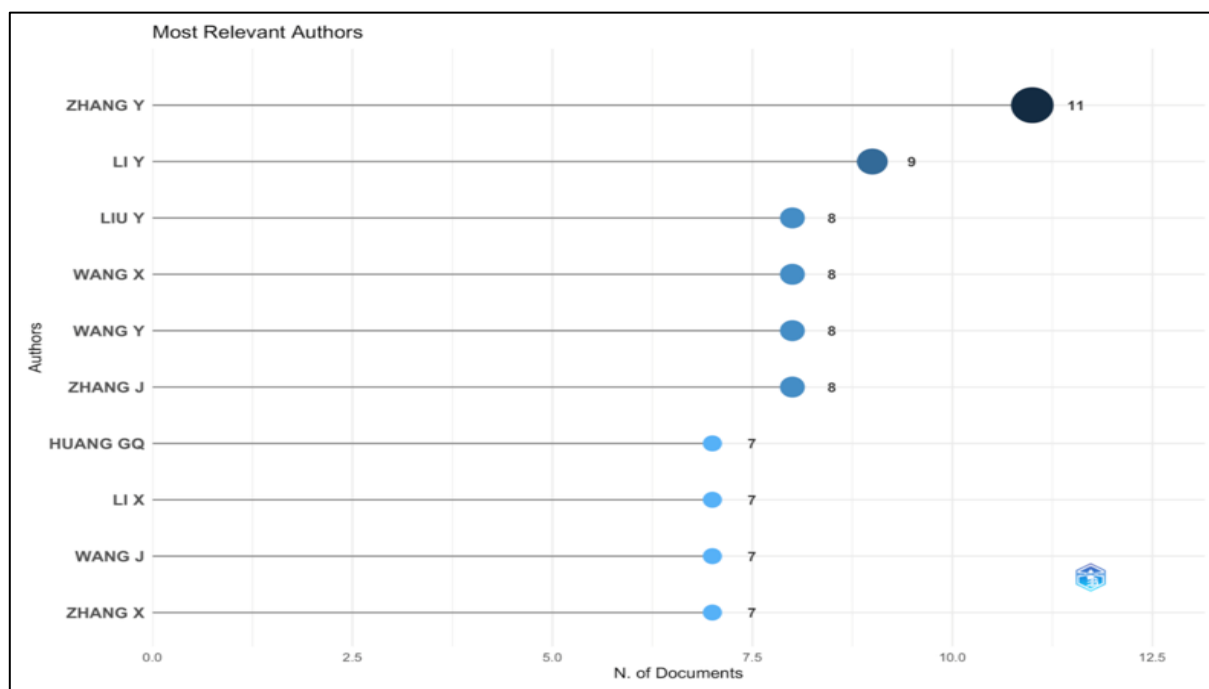


Fig 2 Most Relevant Authors

The distribution of publications is also relatively even across the academic community, with Y. Zhang publishing 11 papers, Y. Li publishing 9, and four more primary contributors tying at 8 publications apiece. The relative lack of a dominant contributor suggests that the field is reasonably

mature and has a broad base of contributors who are all relatively equal in their impact. The slight edge given to the most prolific contributors probably reflects the collaborative nature of the work done in this field.

➤ *Trend Topics*

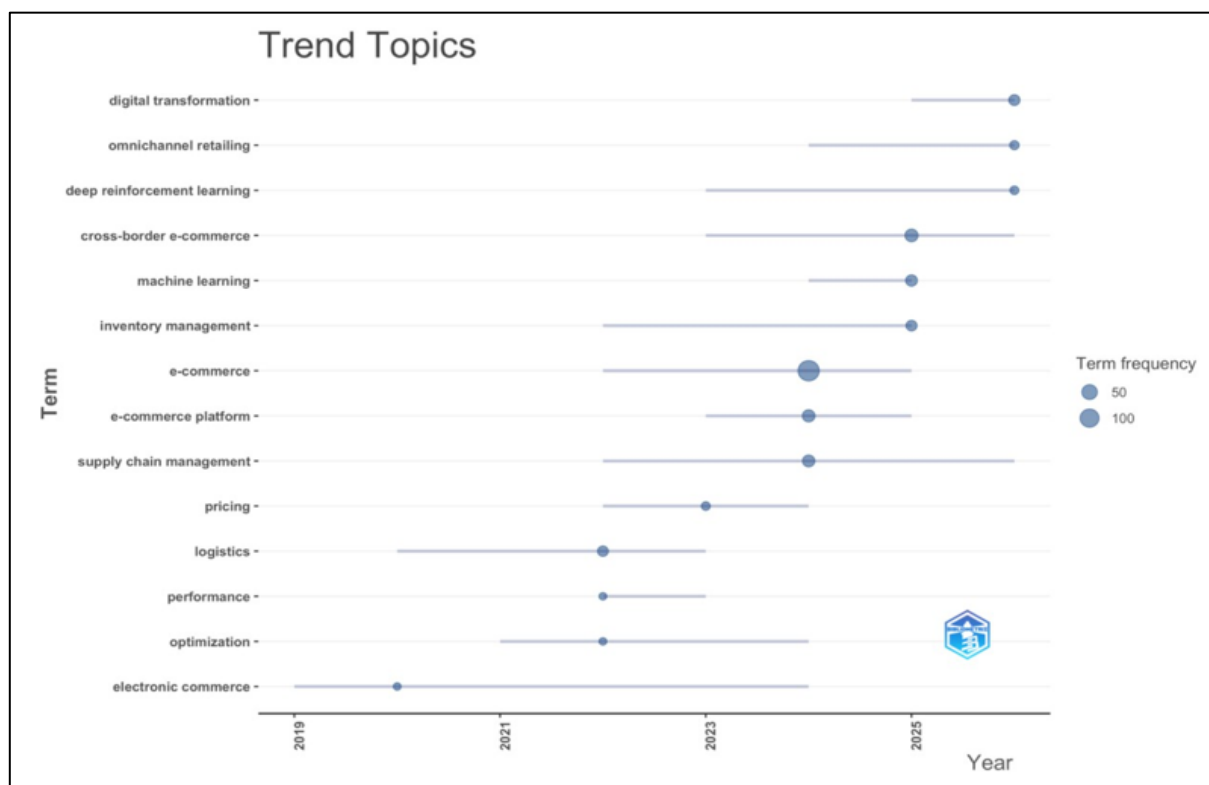


Fig 3 Trend Topics

The research agenda in the field has evolved substantially over time, going through a number of phases that reflect changes in priorities for the field. The early studies focused primarily on building up the fundamentals of the electronic commerce, including general logistics, mathematical formulations, and performance indicators. The middle of the time range (2022-2023) saw an increased focus

on mechanisms of e-commerce, supply chain and inventory management, and pricing algorithms. The current state of the art trends toward digital transformation, omnichannel retailing, cross-border e-commerce, and innovative applications of artificial intelligence like machine learning and reinforcement learning.

➤ Three-Field Analysis

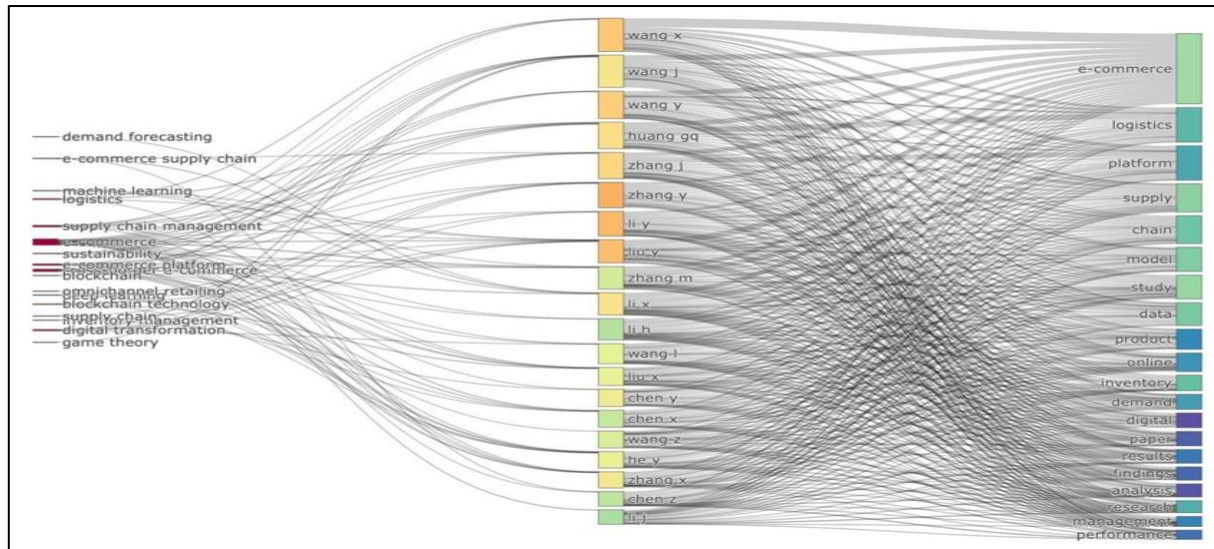


Fig 4 Three-Field Plot

The three-field plot depicts the relationships between authors, themes, and keywords in the literature across the field of e-commerce. In this particular field, the analysis demonstrates that the field has a core group of researchers who contribute to e-commerce and supply chain management in general, and a number of other authors who explore a

particular theme. For instance, apart from the core group of researchers, demand forecasting, blockchain technology, sustainable operations, and omnichannel retailing act as thematic hubs around which studies are grouped. This suggests that the field has evolved toward a multifaceted state, as opposed to a single specialty.

➤ Thematic Map

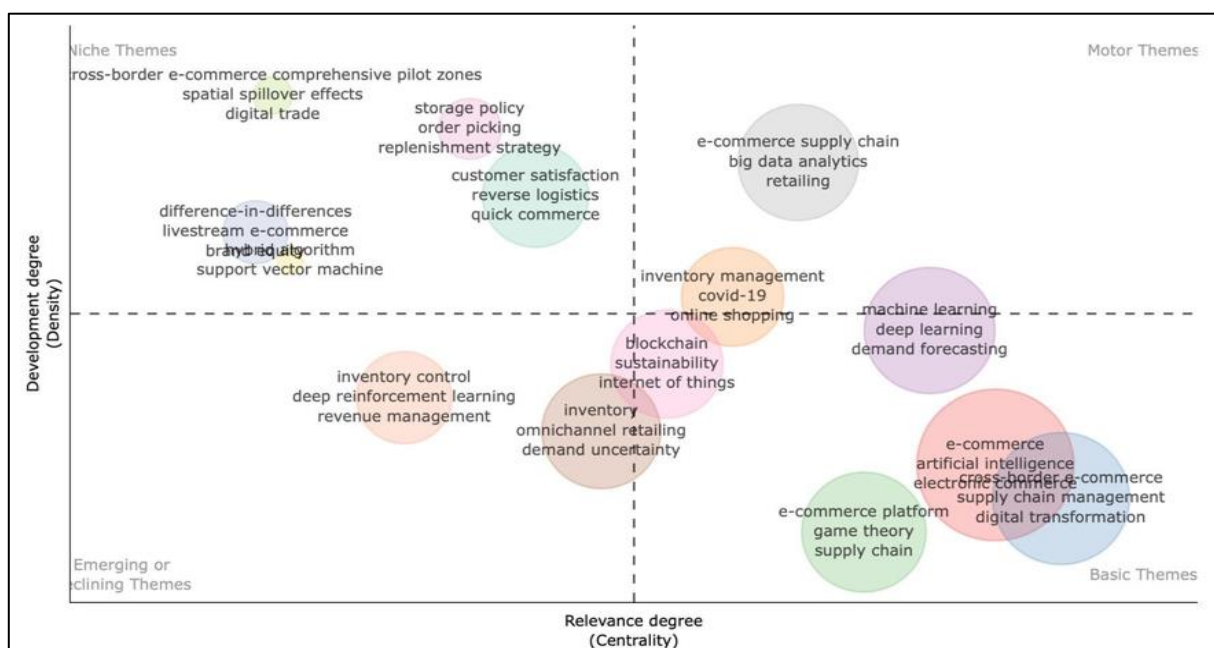


Fig 5 Thematic Map

The thematic map provided above supports the first claim about the field of study being fragmented empirically. Indeed, only e-commerce supply chain and big data analytics are in the motor-theme quadrant, and that is in the very bottom of the second quadrant. It suggests that the field does not appear to have a core theme researched extensively and intensively. Sustainability, blockchain, omnichannel retailing are in the quadrant of emerging/de-emerging themes, meaning the field has them as adjuncts, not as essentials. Finally, the subtopics of order picking, reverse logistics, quick commerce represent small clusters of literature on separate topics unrelated to the core e-commerce/AI/supply-chain-management basic themes dominating the bottom right quadrant of the map.

➤ *Overall Analytical Interpretation*

Together, the five analyses reveal the scope of a large field of interdisciplinary research in need of consolidation around a common core. The distribution of sources and authors (Figures 1–2) is broad across production economics, logistics, and retail operations, with no journal or author dominating the field. Trend topics (Figure 3) demonstrate the evolution of the field from foundational logistics topics toward contemporary emphases on AI, digital transformation, and cross-border e-commerce, while the three-field plot (Figure 4) identifies a core author group as well as smaller clusters of work on demand forecasting, blockchain applications, and sustainability, suggesting a multidimensional field.

The thematic map (Figure 5) confirms this impression, with e-commerce supply chain/big data analytics emerging as a motor theme, while AI and digital transformation remain basic but immature themes, and sustainability and omnichannel retailing are peripheral to the field, with operational topics such as order picking representing isolated niches.

Together, this evidence suggests that the apparent maturity of the field masks a set of disconnected specialisms that motivate the research agenda of the present article.

V. FUTURE RESEARCH AGENDA

➤ *Basis and Approach*

This agenda is based on the 498 papers analyzed for this project (2011–2027) and addresses the thematic map's (Figure 5) fragmentation—focused on an immature core (technology) and marginalized topics (sustainability, omnichannel) and isolated sub-topics (processes) with few conceptual connections. Instead of generic suggestions, this agenda was derived from weaknesses identified in the analyzed papers (see Section 5.3). Indeed, the papers studied separately address decision-making, new approaches in AI, and single uncertainties, use inconsistent terminology, and do not compare different AI technologies. Each of the following research directions follows the IPO approach.

➤ *Integrating Channel, Network and Financing Decisions*

Most papers optimise one channel, location or echelon at a time, with few exceptions: (B. Ma et al., 2024) link return

policies to physical inventory in omnichannel retailing, (Hui et al., 2025) optimise a multi-echelon cross-border distribution network, and (Puttemans et al., 2025) review joint location–inventory models. A separate financing stream, covering bonded warehouses (Song et al., 2024) and pledge-financing risk (Leng et al., 2025), rarely connects to operational inventory control. Future studies should compare integrated and dissociated formulations on identical data, measuring stockouts, service level and financing cost together.

➤ *Learning-Based Control and Standardised Benchmarking*

The field is shifting toward machine learning and deep reinforcement learning, applied to omnichannel inventory (S. Ma, 2026) and to multi-agent ordering in dual-channel supply chains (Zhou et al., 2026). However, (Bergsma et al., 2025) note that the 122 machine-learning studies they reviewed are difficult to compare, and LLM-based inventory analytics (Zabraoui et al., 2026) remain tested only in limited settings. Future work should benchmark learning-based policies against well-tuned classical policies on shared instances and real retailer data, reporting cost, fill rate, speed and transparency.

➤ *Compound Uncertainty and Sustainability*

Uncertainty is usually added to deterministic models one source at a time: demand in a dual-channel warehouse (Qiu et al., 2022), cash flow with an overdraft facility (Chen & Archibald, 2026), or an epidemic shock (Y. Liu et al., 2026). Sustainability likewise appears as an extra objective under clean demand assumptions ((San-José et al., 2025);(Zemzami et al., 2026)). Future research should develop adaptive policies for simultaneous demand, supply and financial disruptions, and test carbon-aware policies under those conditions, judged on recovery speed and service stability as well as cost and emissions.

➤ *Customer and Stakeholder Outcomes*

A newer stream models scarcity behaviour (Schiffels & Jost, 2026), customer substitution (Müller et al., 2026) and preference-based reservation (Baek, 2026), largely in isolation. Few papers ask who uses these systems and whether they trust them.(Zabraoui et al., 2026) made inventory analytics easier for managers through conversational AI, and (Abudy et al., 2025) linked inventory strategy to the expertise of a company's board, but neither measured whether people actually adopt these tools. Future research should test whether the tools that explain their decisions earn more trust from managers, and whether small sellers and cross-border sellers, who do not have much data, can realistically use AI-based inventory tools.

➤ *Terminological Fragmentation and Keyword Standardisation*

The keyword analysis revealed a gap in vocabulary rather than method. Authors use different words for the same thing: e-commerce appears 142 times and electronic commerce 5 times; inventory management (13), inventory (10), inventory control (6) and inventory optimisation (5) all mean roughly the same thing; the same thing happens with supply chain management (21) and supply chain (9), and with

blockchain (11) and blockchain technology (8). This makes important concepts look less prominent than they are and weakens searches, since a string built on “inventory management” can miss papers that only used “inventory control.” This agenda recommends that authors and journals

agree on standard keywords, and that future bibliometric studies merge synonyms before analysing keywords.

➤ Future Research Agenda Framework

The table below summarises Sections 2–6.

Table 3 Future Research Agenda Framework

Research area	Inputs	Process	Outputs	Future research agenda
Integrated decisions	Channel demand, network structure, returns, financing terms	Joint inventory–location–financing optimisation; integrated vs dissociated comparison	Cost, stockouts, service level, financing cost	Show when joint planning adds measurable value.
Learning-based control	Historical and non-stationary demand, real retailer data	ML/deep RL benchmarked against classical policies on shared instances	Cost, fill rate, speed, transparency, generalisability	Test whether learning-based control beats strong classical baselines.
Uncertainty and sustainability	Demand, supply and cash-flow shocks; emissions and carbon pricing	Robust, adaptive, multi-objective optimisation	Recovery time, service stability, cost, emissions	Build policies that recover from simultaneous shocks.
Customer and stakeholders	Scarcity, substitution, preferences; manager expertise, firm size	Behaviour-aware models; adoption and usability studies	Revenue, lost sales, managerial trust, uptake by small sellers	Link behaviour and adoption to operational models.
Terminology	Overlapping author keywords	Keyword harmonisation before co-occurrence analysis	Accurate concept frequency, search recall	Standardise keywords so counts reflect real research attention.

➤ Conclusion

The field does not need yet another new algorithm. What is missing is connection: across channels, networks and financing, between different types of uncertainty, and between new AI methods and the old methods they claim to beat. Future research should build connected models, test them fairly on shared, real data, and use consistent keywords so progress can actually be measured.

VI. CONCLUSION

The aim of this study was to determine the overall growth of the amount of published research in the area of stock control over time, to identify the main areas of study and key words in the area, and to highlight areas of omission that future studies could focus on in greater detail.

Our research is based on the analysis of 498 publications retrieved from the databases in 2011-2027. The findings of this scoping review highlight the evolution of the topic over time. While the foundational focus on logistics and mathematical models continues to be relevant, contemporary studies increasingly explore more sophisticated technologies, including machine learning, deep reinforcement learning and blockchain. Nevertheless, as the thematic map in Section 4 illustrates, the state of the art in this field is fragmented: physical stock management and financial decision-making are considered completely separate areas, while sustainability is not identified as an issue at all.

The results of this study have a number of implications. This research presents a comprehensive map of this particular field and thus gives structure to the body of knowledge and a framework to future researchers in the relationship between inputs, processes, and outputs. This study helps businesses

understand the need to take the time to evaluate these new artificial intelligence tools against their existing methods and to consider the potential impact of integrating physical inventory management and using warehouse financing. More generally, developing strong supply chain models also has a positive impact on society, providing a balance between public health and economic stability in the event of significant disruptions, such as pandemics. In addition, policy adjustments to harmonize academic terminology and policy adjustments to embed carbon pricing into the routine of logistics are required to support these improvements.

However, there are some limitations to this study. Due to a lack of time and not having active subscriptions to all publisher databases, some relevant articles outside of our primary search engines may have been missed. Because they examine only digital retail, the results cannot be readily transferred to brick-and-mortar retail. Additionally, we identified some biases due to overlapping author keywords: keywords in the text may have been different for the same concept across different authors, which could have led to an underestimation of some trends.

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