

# IoT and Retail Management: A Bibliometric Review of Research Contributions and Opportunities

Loso Judijanto<sup>1</sup>, Nasaruddin<sup>2</sup>, Andi Wahyuni Syam<sup>3</sup>

<sup>1</sup> IPOSS Jakarta, Indonesia and [losojudijantobumn@gmail.com](mailto:losojudijantobumn@gmail.com)

<sup>2</sup> Universitas Cahaya Prima and [nasarnusu95@gmail.com](mailto:nasarnusu95@gmail.com)

<sup>3</sup> Universitas Cahaya Prima and [andiwahyunisyam43@gmail.com](mailto:andiwahyunisyam43@gmail.com)

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## ABSTRACT

The integration of the Internet of Things (IoT) in retail management and supply chain operations has transformed business processes by enabling real-time data collection, automation, and data-driven decision-making. This study conducts a bibliometric analysis using Scopus-indexed literature and VOSviewer to map research contributions, key themes, and emerging trends at the intersection of IoT and retail management. The analysis identifies inventory management, supply chain transparency, automation, and AI-driven analytics as dominant research areas, with growing interest in blockchain-enhanced security, sustainability, and predictive analytics. Citation and co-authorship analyses highlight key influential studies and international collaboration networks, with India, China, and the United States emerging as major research hubs. Despite advancements, challenges remain in IoT security, interoperability, ethical considerations, and regulatory frameworks, necessitating further research on 5G-enabled IoT, edge computing, and resilient supply chains. This study provides a comprehensive overview of IoT-driven retail research, offering valuable insights for academics, industry professionals, and policymakers to drive innovation and efficiency in the digital retail landscape.

**Keywords:** *Internet of Things (IoT), Retail Management, Supply Chain Management, Bibliometric Analysis, VOSviewer*

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## 1. INTRODUCTION

The evolution of the Internet of Things (IoT) has revolutionized numerous industries by embedding intelligence into everyday objects and processes. Initially emerging from advancements in sensor technology, wireless communication, and miniaturized computing devices, IoT has grown into a pervasive network that connects devices, systems, and people [1]. The ability of IoT systems to collect, process, and share vast amounts of data in real time has opened new horizons for innovation across multiple sectors, including healthcare, manufacturing, logistics, and notably, retail management [2]. This interconnected ecosystem not only supports enhanced operational efficiency but also fuels decision-making processes by enabling data-driven insights. As IoT technologies continue to evolve, their integration into business models has become a critical factor for maintaining competitive advantage in the digital age [3].

In parallel with the rapid expansion of IoT, the retail management sector has experienced a profound transformation driven by technological advancements and evolving consumer expectations. Traditionally reliant on brick-and-mortar storefronts and manual inventory systems, the retail industry has increasingly embraced digital transformation to optimize operations and enhance customer experiences [4]. Innovations such as e-commerce platforms, mobile payment systems, and personalized marketing have redefined retail strategies, pushing businesses to adopt more agile and customer-centric models [5]. Retailers are now leveraging data analytics and digital tools to streamline supply chain operations, manage inventory in real time, and foster deeper

engagement with consumers. This shift towards a more integrated digital environment has paved the way for IoT to play a transformative role in redefining the landscape of retail management [6].

The convergence of IoT and retail management represents a significant step forward in the evolution of the modern marketplace. IoT technologies offer retailers unprecedented capabilities for automating and optimizing a wide range of functions, from inventory tracking and supply chain management to customer behavior analysis and in-store experiences. For example, smart shelves and RFID tagging systems can provide continuous updates on stock levels, reducing the risks of overstocking or stockouts [7]. In addition, IoT-enabled devices can gather valuable customer data—such as foot traffic patterns and dwell times—that allow retailers to tailor marketing strategies and improve the overall shopping experience [8]. This integration not only enhances operational efficiency but also fosters a more personalized and responsive retail environment, thereby driving customer satisfaction and loyalty.

Bibliometric analysis has emerged as a powerful methodological tool for synthesizing the extant body of literature across emerging research domains. By quantitatively analyzing publication patterns, citation networks, and research trends, bibliometric reviews provide a comprehensive overview of how knowledge is generated and disseminated within a field [9]. In the context of IoT and retail management, such an approach is invaluable for mapping the evolution of ideas, identifying influential works, and revealing interdisciplinary linkages that may otherwise remain obscured. This method enables researchers and practitioners to discern the developmental trajectory of the field, assess the impact of seminal studies, and highlight research clusters that signal emerging trends. In turn, these insights support the strategic direction of future investigations and the practical implementation of technological innovations.

Despite the growing interest in both IoT and retail management separately, the literature that intersects these fields remains dispersed and, at times, inconsistent. Several studies have explored IoT applications in retail settings, yet there is a noticeable gap in the systematic synthesis of these contributions. The rapid pace of technological change and the multifaceted nature of retail operations have led to a fragmented body of work, where insights are often confined to narrow aspects of the discipline. Moreover, while bibliometric analyses have been applied to either IoT or retail management individually, a dedicated review that integrates both domains is still in its nascent stages. This situation underscores the need for a comprehensive evaluation that not only aggregates the diverse strands of research but also critically examines the opportunities and challenges presented by this convergence [10].

Despite the considerable body of research on IoT and its applications in various sectors, the integration of IoT within retail management remains underexplored and fragmented. Existing studies often focus on isolated aspects—such as inventory management, customer analytics, or supply chain optimization—without providing a holistic view of how these technologies interact and collectively contribute to retail innovation. The absence of a unified, bibliometric review in this area creates a significant gap in our understanding of the research landscape. This fragmentation hampers the ability of both scholars and practitioners to identify overarching trends, benchmark best practices, and recognize emerging research opportunities. Consequently, there is an urgent need to systematically consolidate and analyze the available literature to reveal underlying patterns and guide future research directions in this dynamic field.

The objective of this study is to conduct a bibliometric review of the literature at the intersection of IoT and retail management, with the aim of mapping research contributions and uncovering potential opportunities for future inquiry. By systematically analyzing publication trends, influential authors, and collaborative networks, the study seeks to provide a comprehensive overview of how IoT has been applied within retail contexts and to identify gaps in current research. This integrative approach not only facilitates a deeper understanding of the technological and managerial implications of IoT in retail but also offers strategic insights for academics and industry professionals aiming to drive innovation in a rapidly evolving market landscape.

## 2. LITERATURE REVIEW

The rapid evolution of the Internet of Things (IoT) has garnered considerable attention from both academia and industry, owing to its potential to transform traditional business operations. IoT is broadly defined as a network of interconnected devices that are capable of collecting, transmitting, and analyzing data in real time [11]. Early studies in this domain focused on the technological underpinnings of IoT, emphasizing advancements in sensor technology, wireless communication, and distributed computing architectures [12]. These foundational works provided a framework for understanding how IoT systems are structured and how they can be integrated into various operational environments. As IoT has matured, the literature has expanded to include not only technical aspects but also its applications across diverse sectors, setting the stage for its adoption in more complex business environments such as retail management.

Beyond its technical architecture, the application of IoT has evolved to address a wide array of practical challenges in sectors ranging from healthcare and manufacturing to logistics and retail. Research has highlighted the capability of IoT to enable real-time monitoring, predictive maintenance, and enhanced decision-making through big data analytics [13]. These applications are underpinned by technologies that support continuous connectivity and seamless data exchange, including cloud computing and edge processing. However, the integration of IoT into operational systems is not without challenges. Issues related to data privacy, security, interoperability, and scalability have been recurrent themes in the literature [14]. Such challenges are particularly pertinent in environments like retail, where consumer data must be handled with the utmost sensitivity and where system reliability is crucial to maintaining seamless operations.

Retail management itself has undergone a significant transformation over the past few decades. Traditionally, the retail sector was characterized by brick-and-mortar operations, where inventory management, customer service, and sales were predominantly managed through manual processes. However, the advent of digital technologies has led to a paradigm shift towards omnichannel retailing—a strategy that integrates offline and online experiences to deliver enhanced customer engagement [15]. Scholars have noted that digital transformation in retail is driven by several factors, including the need for real-time inventory management, personalized customer experiences, and streamlined supply chain operations [16]. As retail businesses increasingly rely on data-driven insights to refine their strategies, the integration of advanced technologies such as IoT has become a focal point of contemporary research.

The intersection of IoT and retail management has sparked a growing body of literature that examines how these technologies can be harnessed to improve various aspects of retail operations. One prominent area of focus is inventory management. IoT-enabled solutions such as smart shelves,

RFID tagging, and automated replenishment systems have demonstrated significant potential in reducing inefficiencies associated with traditional stock management practices [15]. For instance, smart shelves equipped with sensors can provide real-time data on product availability, thereby reducing the likelihood of stockouts and overstocks. Similarly, the use of IoT in supply chain management facilitates improved tracking of goods, enhanced transparency, and timely responses to disruptions. These advancements not only improve operational efficiency but also contribute to a more agile and responsive retail environment, capable of meeting the dynamic demands of modern consumers.

In addition to operational efficiencies, IoT is increasingly being applied to enhance the customer experience in retail settings. Research has documented the use of IoT for in-store analytics, where sensor data is utilized to monitor customer movements and behaviors [17]. By analyzing patterns such as foot traffic, dwell times, and interaction points, retailers can optimize store layouts, personalize marketing efforts, and create immersive shopping experiences. These capabilities are complemented by mobile and wearable technologies that integrate seamlessly with IoT systems, enabling retailers to engage with customers on a more personal level. The convergence of IoT and data analytics thus offers a powerful toolset for retailers aiming to build stronger, more personalized relationships with their clientele, ultimately driving customer loyalty and revenue growth.

The literature addressing the integration of IoT in retail management reveals a fragmented body of work, with studies often focusing on isolated aspects rather than the holistic integration of technology and management practices. Several authors have explored the technical feasibility and operational benefits of IoT applications in retail, yet there is a notable absence of research that synthesizes these findings into a cohesive framework. For example, while smart inventory management and in-store analytics have been extensively documented [18], [19], less attention has been paid to the interplay between these technological innovations and broader strategic retail management practices. This fragmentation is further compounded by the diverse methodological approaches employed across studies, which range from case studies and field experiments to theoretical models and simulation-based analyses. As a result, the current body of literature lacks a unified perspective that comprehensively addresses both the technological and managerial implications of IoT adoption in retail.

### 3. METHODS

This study employs a bibliometric analysis to systematically review and synthesize the existing literature on IoT and retail management using data exclusively from the Scopus database. A comprehensive search was conducted by deploying targeted keywords such as “Internet of Things,” “IoT,” “retail management,” “smart retail,” and “digital retail” to capture relevant, peer-reviewed articles published within the designated timeframe. Rigorous inclusion and exclusion criteria were applied to ensure that only high-quality and pertinent studies were retained for the analysis. The refined dataset, composed solely of Scopus-indexed literature, was subsequently analyzed using VOSviewer. VOSviewer facilitated the mapping of co-authorship networks, keyword co-occurrence, and citation patterns, thereby enabling the identification of core research themes, influential authors, and collaborative clusters within the field. Quantitative metrics such as publication counts, citation frequencies, and network centrality measures were computed to assess the evolution and structural dynamics of the research domain.

## 4. RESULTS AND DISCUSSION

### 4.1 Network Visualization

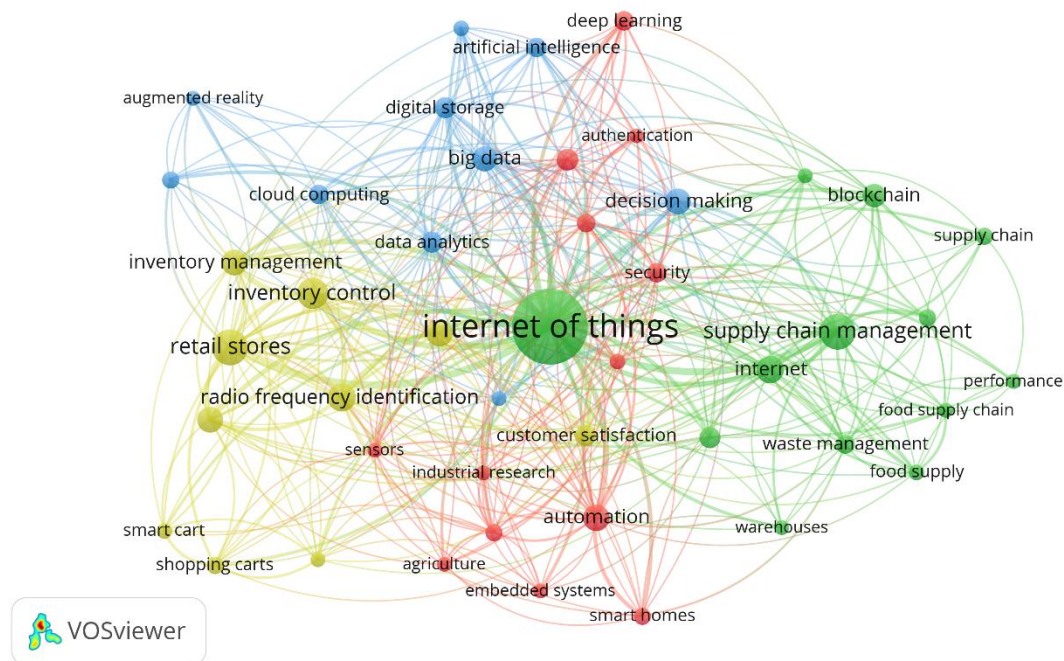


Figure 1. Network Visualization

Source: Data Analysis Result, 2025

This visualization illustrates the relationship between various concepts related to the Internet of Things (IoT) in the context of retail and supply chain management. The keyword “Internet of Things” is at the center of the network with extensive connections to related topics, indicating that IoT is at the core of research in this field. The size of the nodes reflects the number of publications or relevance of the keyword, while the inter-node relationships show the degree of interconnectedness between concepts based on co-occurrence in the academic literature. From this visualization, it can be seen that research on IoT in retail and supply chain is highly multidisciplinary, spanning enabling technologies, management strategies, and operational impacts.

In this network, it can be seen that supply chain management is one of the main themes that has many connections with IoT. IoT is used to improve transparency and efficiency in the supply chain, including inventory management, waste management, and supply chain performance. The presence of blockchain as one of the connected keywords shows that the research also examines how blockchain can improve data security and integrity in IoT-based supply chains. This indicates that the application of IoT in supply chains is not only related to operational efficiency, but also data transparency and security.

In addition to supply chains, retail management is also a major focus of IoT research. Concepts such as retail stores, radio frequency identification (RFID), smart carts, and shopping carts demonstrate the application of IoT in improving customer experience and operational efficiency in physical retail environments. RFID and IoT sensors enable real-time inventory monitoring, assisting store managers in optimizing stock replenishment and reducing item loss. In addition, concepts such as customer satisfaction and industrial research show that the study of IoT in retail focuses not only on technological aspects, but also on its impact on customer experience and business strategy.

In terms of supporting technologies, IoT in retail and supply chain is closely related to big data, cloud computing, artificial intelligence (AI), and data analytics. The nodes related to these technologies show that research not only addresses the implementation of IoT as hardware, but also



how the data collected from IoT devices can be analyzed for better decision making. For example, deep learning and decision making show that analyzing big data from IoT helps managers make more informed decisions, especially in inventory management and data-driven marketing strategies.

Challenges in IoT implementation are also depicted in this map, especially related to security and authentication. Data security is one of the most important issues in the IoT ecosystem, given the amount of sensitive data collected from customers and retail operating systems. Therefore, research in this area also includes how to ensure that IoT systems are safe from cyber threats and how authentication processes can be strengthened to protect user privacy. Given these interconnections, it can be concluded that research into IoT in retail and supply chain focuses not only on the benefits of the technology, but also the challenges that need to be overcome to ensure wider and sustainable adoption.

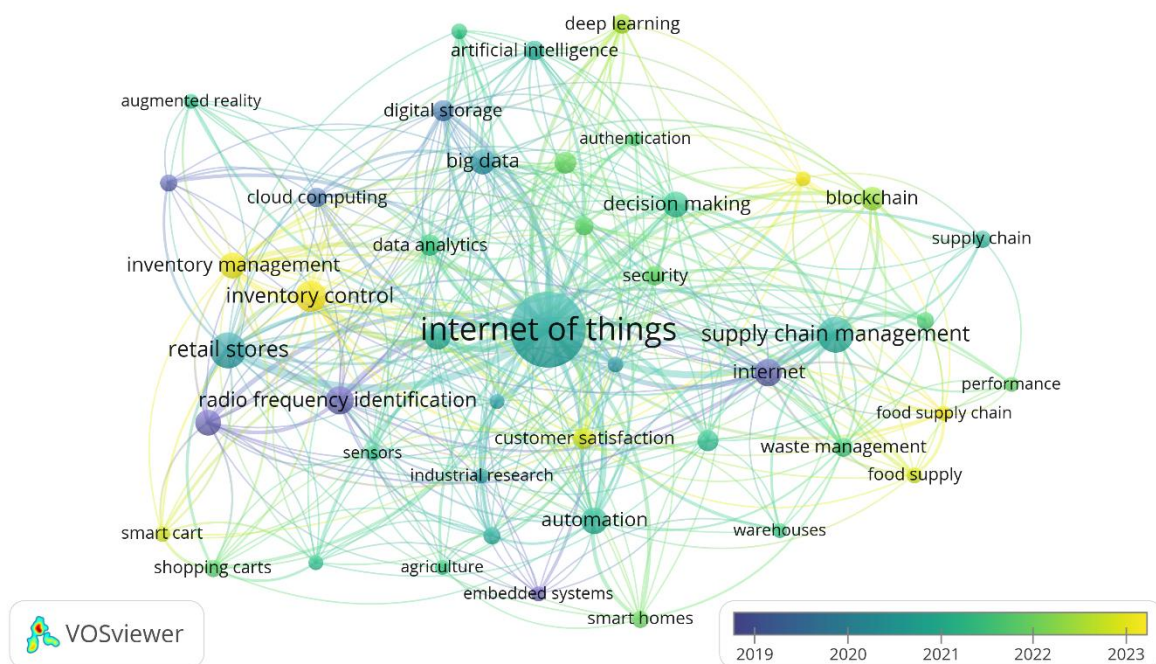


Figure 2. Overlay Visualization

Source: Data Analysis Result, 2025

This VOSviewer visualization represents a bibliometric network of Internet of Things (IoT) research in retail management and supply chain. The color gradient, ranging from blue (2019) to yellow (2023), indicates the temporal evolution of research trends. The centrality of "Internet of Things" (IoT) suggests its role as a key research area, with strong linkages to various emerging technologies and applications. Notably, supply chain management, big data, artificial intelligence, and blockchain are among the dominant themes, reflecting IoT's widespread impact across logistics, automation, and decision-making processes. The interconnectivity between these nodes suggests that IoT is increasingly being studied in combination with data analytics, AI, and cloud computing, enhancing operational efficiencies in retail and supply chain networks.

Examining the color gradient, recent research trends (2022-2023) focus on topics such as blockchain, performance supply chain, and deep learning, which appear in yellow-green hues, indicating their growing importance. Blockchain's increasing relevance suggests a heightened interest in secure, transparent, and traceable IoT-driven supply chains, while deep learning and AI are gaining traction in decision-making and automation. Conversely, older research areas (2019-2020), such as RFID, inventory control, and smart carts, appear in blue-purple hues, reflecting

foundational IoT applications in retail, such as real-time inventory tracking and in-store automation. This shift suggests that research is evolving from early adoption of IoT hardware towards more advanced, data-driven applications.

The network structure also highlights distinct clusters of research. The retail cluster (left side) includes terms like retail stores, inventory management, smart cart, and RFID, emphasizing IoT's role in optimizing inventory tracking, shopping experiences, and in-store automation. The supply chain cluster (right side) focuses on warehouses, food supply, waste management, and performance, showcasing IoT's applications in logistics, sustainability, and operational efficiency. The technology cluster (top) includes big data, AI, cloud computing, and deep learning, signaling an increasing focus on data analytics, predictive modeling, and smart automation.

## 4.2 Citation Analysis

Table 2. The Most Impactful Literatures

Citations	Authors and year	Title	Contributions
355	[20]	Design of Secure User Authenticated Key Management Protocol for Generic IoT Networks	Proposed a secure key management protocol for IoT networks to prevent cyber threats, ensuring authenticated user access and data protection.
288	[21]	Internet of things applications: From research and innovation to market deployment	Provided a comprehensive overview of IoT applications, challenges, and opportunities from research to real-world implementation across industries, including retail.
270	[22]	Modeling the internet of things adoption barriers in food retail supply chains	Identified key barriers to IoT adoption in food retail supply chains using a modeling approach, highlighting issues like cost, data security, and interoperability.
136	[23]	A Fog-Based Internet of Energy Architecture for Transactive Energy Management Systems	Developed a fog-computing-based IoT architecture for energy management, enabling decentralized and efficient energy transactions.
110	[16]	Review of RFID and IoT integration in supply chain management	Provided an extensive review of RFID-IoT integration in supply chain management, emphasizing efficiency, tracking, and inventory management improvements.
109	[24]	A Review on Benefits of IoT Integrated Blockchain based Supply Chain Management Implementations across Different Sectors with Case Study	Examined how blockchain-IoT integration enhances supply chain transparency, security, and traceability across multiple industries.
105	[2]	IoT in supply chain management: a narrative on retail sector sustainability	Discussed IoT's role in retail sustainability, focusing on waste reduction, inventory optimization, and environmental impact minimization.
88	[12]	IoT in supply chain management: Opportunities and challenges for businesses in early industry 4.0 context	Explored the opportunities and challenges of IoT adoption in supply chains, emphasizing digital transformation and business model innovation.
76	[25]	Trends, benefits, risks, and challenges of IoT	Reviewed trends, advantages, risks, and barriers of IoT adoption in smart

Citations	Authors and year	Title	Contributions
		implementation in residential and commercial buildings	buildings, highlighting security concerns and implementation challenges.
76	[26]	Secure Identification, Traceability and Real-Time Tracking of Agricultural Food Supply during Transportation Using Internet of Things	Developed an IoT-based framework for real-time monitoring and traceability of agricultural food supply chains, ensuring food safety and reducing waste.

Source: Scopus, 2025

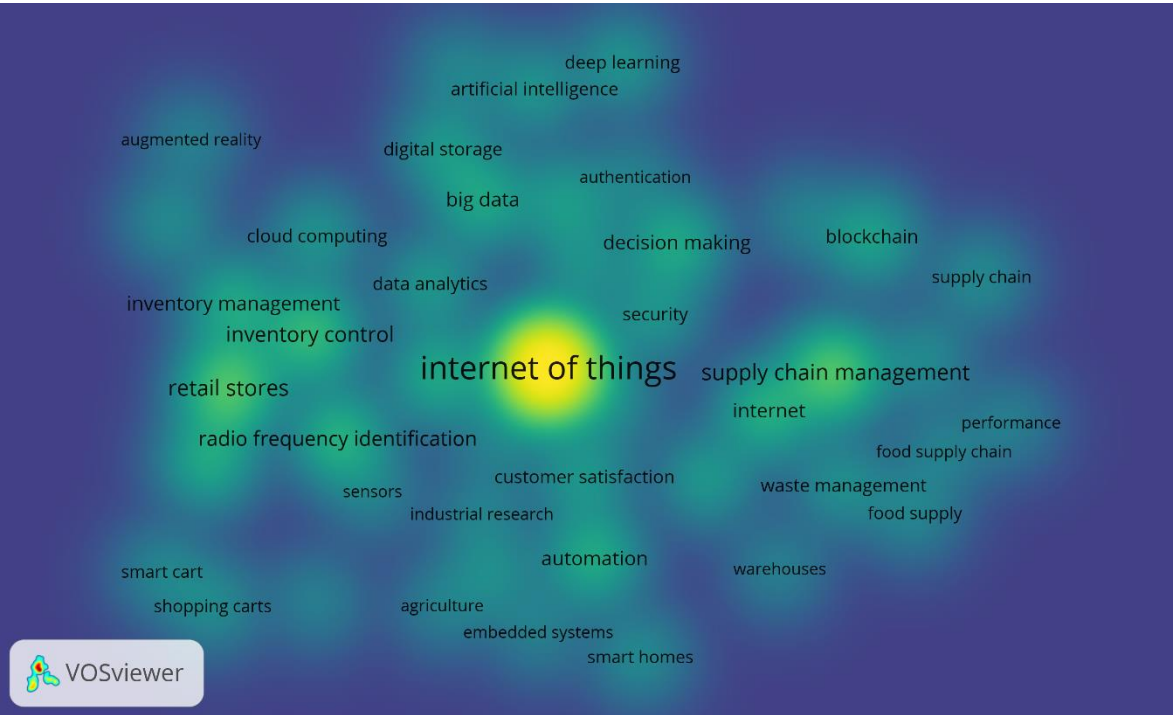


Figure 3. Density Visualization  
Source: Data Analysis Result, 2025

This heatmap visualization from VOSviewer represents the density of research focus areas within the domain of Internet of Things (IoT) in retail management and supply chain. The bright yellow areas indicate the most frequently occurring and highly cited topics, while green and blue areas represent lower research intensity. The central node, “Internet of Things”, has the highest research density, highlighting its pivotal role in academic literature. The supply chain management and radio frequency identification (RFID) topics also exhibit high intensity, suggesting their strong association with IoT applications in logistics and inventory management. Additionally, big data, artificial intelligence, cloud computing, and automation are key emerging themes, indicating that research is increasingly focusing on data-driven decision-making and AI-powered IoT solutions. From a thematic perspective, the retail cluster (left side) includes topics such as inventory management, retail stores, shopping carts, and customer satisfaction, reflecting IoT’s role in enhancing operational efficiency and consumer experience. The supply chain cluster (right side) features blockchain, warehouses, waste management, and food supply, indicating IoT’s growing importance in optimizing logistics and ensuring transparency in food distribution. The presence of security and authentication topics suggests an increasing focus on IoT cybersecurity challenges.



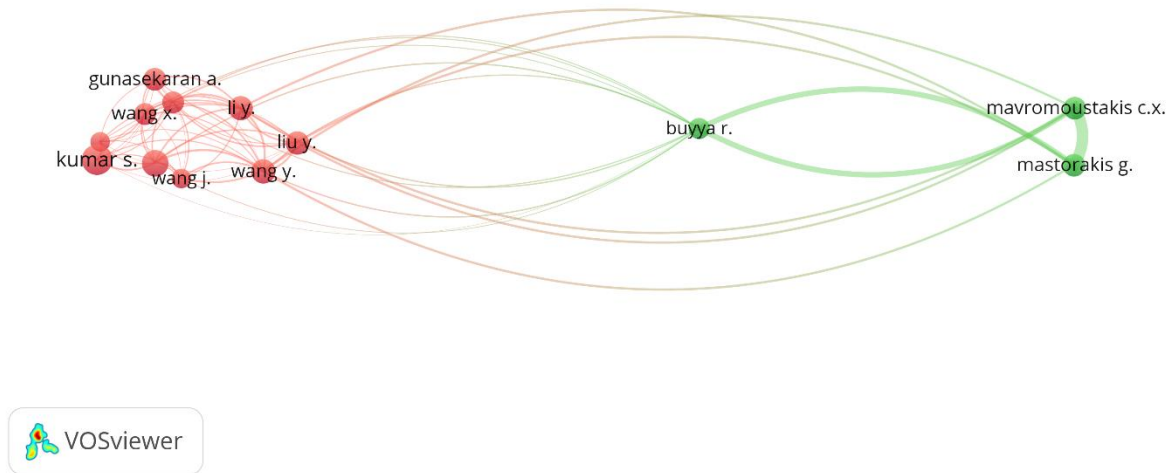


Figure 4. Author Visualization

Source: Data Analysis Result, 2025

This co-authorship network visualization from VOSviewer illustrates the collaboration patterns among researchers in the IoT and retail management/supply chain domain. The three clusters in the network, represented in red, green, and a bridging node in the center, indicate distinct research groups with limited direct collaboration between them. The red cluster on the left, including prominent researchers such as Gunasekaran A., Kumar S., Wang Y., and Liu Y., signifies a tightly connected group working on similar topics, likely focusing on IoT applications in supply chain management and retail operations. On the right, the green cluster features authors such as Mavromoustakis C.X. and Mastorakis G., who appear to be working on IoT topics with a different emphasis, possibly in computing architectures or cloud-based IoT solutions. The central bridging node, "Buyya R.", plays a key role in linking these two research groups, suggesting that this author has contributed significantly across both domains, acting as a bridge between different thematic areas of IoT research.

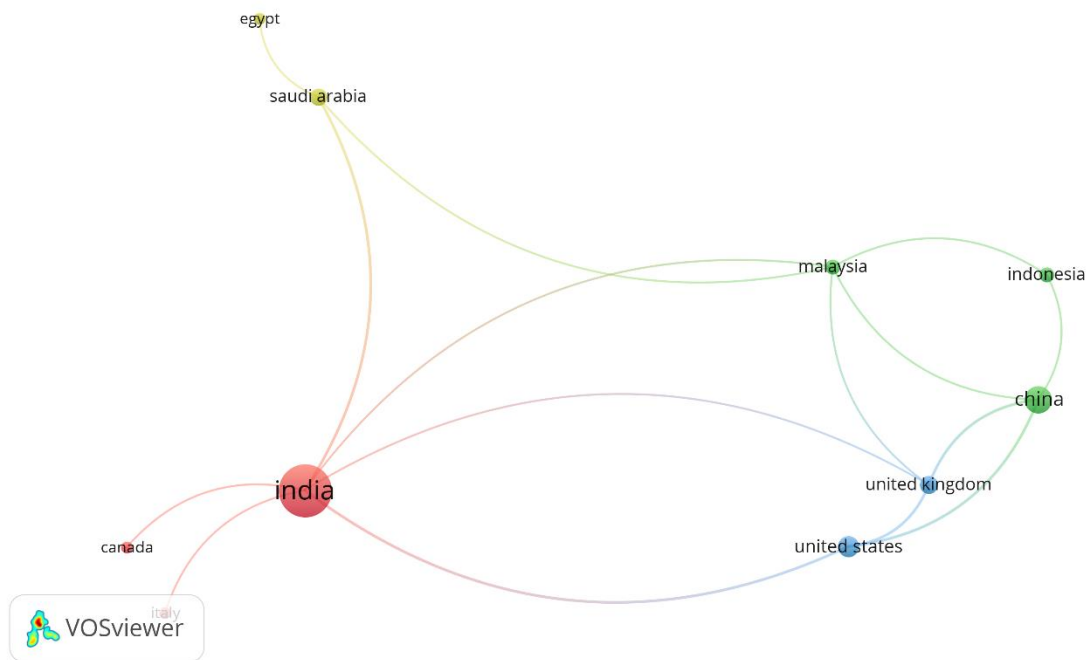


Figure 5. Country Visualization

Source: Data Analysis Result, 2025

This country collaboration network visualization from VOSviewer represents global research partnerships in the IoT and retail management/supply chain domain. The size of the nodes indicates the research output of each country, with India appearing as the most active contributor, forming strong research collaborations with Canada, Saudi Arabia, Egypt, China, Malaysia, the United Kingdom, and the United States. China also plays a significant role in the network, forming connections with Indonesia, Malaysia, the United Kingdom, and the United States, suggesting an active research collaboration hub in the Asia-Pacific region. The United States and the United Kingdom appear to serve as bridges connecting multiple research clusters, facilitating international collaboration. The presence of Saudi Arabia and Egypt in a separate cluster indicates emerging research activities from the Middle East, engaging with India in IoT-related studies. This visualization highlights that IoT research in retail and supply chain management is highly globalized, with strong regional collaborations, particularly between India, China, and Western countries, showcasing increasing cross-border knowledge exchange and interdisciplinary research development.

## Discussion

### 1. Key Research Trends in IoT and Retail Management

The bibliometric analysis reveals that IoT has emerged as a transformative technology within retail management and supply chain operations. The heatmap and co-occurrence analysis show that topics such as inventory management, supply chain transparency, real-time analytics, and automation have received significant attention. The strong linkage between IoT and supply chain management (SCM) suggests that researchers are increasingly focused on leveraging IoT to enhance operational efficiency, logistics, and data-driven decision-making [27]. The presence of blockchain in recent literature indicates that the convergence of IoT and blockchain is gaining traction in securing supply chain transactions, ensuring transparency, and preventing fraud [28]. This aligns with broader industry efforts to improve traceability and security in global supply chains. Additionally, the integration of big data, artificial intelligence (AI), and cloud computing in IoT-

enabled retail management suggests that businesses are moving beyond basic IoT adoption to more advanced, data-driven strategies [29]. The growing research interest in deep learning and decision-making models indicates a shift towards predictive analytics and AI-enhanced automation, allowing retailers to anticipate demand fluctuations, personalize marketing efforts, and streamline operations. These insights suggest that IoT is no longer viewed as a standalone technology but rather as part of a broader digital transformation strategy.

## **2. Impact of Influential Studies and Emerging Research Clusters**

The citation analysis provides insight into the most impactful studies in IoT and retail management. Highly cited papers, such as those by [30] on IoT security protocols, and [30] on adoption barriers in food retail supply chains, have set foundational knowledge for IoT applications in this field. These studies indicate that while IoT adoption brings significant benefits, issues related to security, privacy, and implementation challenges remain prevalent. Emerging research clusters also suggest an increased focus on sustainability in retail supply chains. Studies such as [31] highlight the role of IoT in reducing environmental impact, optimizing energy consumption, and minimizing waste in retail operations. As sustainability regulations become more stringent worldwide, IoT-enabled waste management, energy-efficient logistics, and circular economy initiatives are likely to gain further research attention. This finding underscores the expanding scope of IoT applications beyond operational efficiency towards ethical and environmental considerations. Another growing research cluster pertains to the use of RFID and smart retail technologies. Retailers are increasingly integrating IoT-enabled RFID solutions, smart carts, and digital kiosks to enhance customer experience and streamline in-store operations [32]. This shift is particularly relevant in the era of contactless shopping and digital payments, accelerated by the COVID-19 pandemic. The continued development of smart retail ecosystems suggests that IoT will play a crucial role in shaping the future of physical and digital retail convergence.

## **3. Global Research Collaboration and Knowledge Networks**

The country collaboration analysis reveals a strong international research network in IoT applications for retail and supply chain management. India, China, and the United States emerge as key contributors, forming research alliances with other regions such as the United Kingdom, Malaysia, Saudi Arabia, and Canada. These findings indicate that IoT-related retail research is not confined to a single geographical region but rather spans multiple global markets. India appears to play a pivotal role in IoT research, with strong academic collaborations in both Western countries (United States, Canada, United Kingdom) and emerging economies (Saudi Arabia, Egypt, Malaysia, Indonesia). This suggests that developing nations are actively engaging in IoT research, likely driven by the rapid digital transformation and e-commerce growth in these regions. China also forms a significant research cluster with Southeast Asian countries, indicating a regional focus on IoT-enabled supply chain optimization in Asia's fast-growing retail markets. Interestingly, the co-authorship network visualization reveals limited direct collaboration between Western and Asian researchers, apart from key bridging figures like Buyya R. This highlights an opportunity for greater cross-regional collaboration to foster interdisciplinary insights and innovation in IoT-driven retail management.

## **4. Challenges and Future Research Opportunities**

Despite the growing body of research, several challenges remain in the widespread adoption of IoT in retail management. One of the most critical concerns is data security and privacy. As highlighted in the heatmap and citation analysis, research on authentication and cybersecurity in IoT networks remains a crucial focus area [33]. Retailers must address risks such as data breaches, unauthorized access, and cyber threats, particularly as IoT adoption increases in payment systems, customer analytics, and supply chain tracking. Another significant challenge is the integration of IoT

with existing retail and supply chain infrastructures. Many businesses still operate on legacy systems that are not fully compatible with modern IoT frameworks [34]. Future research should explore strategies for seamless IoT integration, interoperability standards, and cost-effective deployment models. Furthermore, while IoT-driven automation and AI-based decision-making are gaining traction, there is still limited research on the ethical and societal implications of these technologies. Issues such as job displacement due to automation, consumer data ethics, and digital divide concerns should be explored in future studies. Researchers should also investigate how regulatory frameworks and policies can support responsible IoT deployment in retail environments.

From a technological perspective, the integration of IoT with next-generation technologies such as 5G, edge computing, and quantum computing presents exciting research opportunities. Faster connectivity through 5G networks could enable real-time, high-speed IoT data transmission, enhancing smart store experiences, predictive inventory management, and hyper-personalized marketing. Edge computing, on the other hand, could reduce latency and enhance data processing efficiency, allowing retailers to analyze IoT-generated data at the source instead of relying solely on cloud computing. Future research should examine how IoT can enhance the resilience of retail supply chains against disruptions. The COVID-19 pandemic exposed vulnerabilities in global supply chains, prompting businesses to explore IoT-enabled demand forecasting, real-time supply chain visibility, and automated warehouse solutions [35]. As unpredictable disruptions (e.g., geopolitical conflicts, natural disasters, pandemics) continue to impact global trade, IoT research must focus on building adaptive, resilient, and sustainable supply chain models.

## CONCLUSION

The bibliometric review provides a comprehensive mapping of IoT research in retail management, highlighting key themes, collaborations, and future research directions. While significant progress has been made in areas such as RFID-based inventory tracking, blockchain-enhanced transparency, and AI-powered decision-making, challenges remain in security, infrastructure integration, and ethical considerations. The growing international research collaboration presents an opportunity to further enhance knowledge exchange and interdisciplinary innovation. Future studies should explore emerging technologies, sustainability initiatives, and regulatory frameworks to ensure that IoT continues to drive efficiency, transparency, and innovation in retail and supply chain management. By addressing these research gaps, IoT can continue to reshape the retail landscape, offering smarter, more connected, and data-driven solutions for businesses and consumers alike.

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