

IoT as a Business Performance Support: A Bibliometric Study

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ABSTRACT

This study examines the development of research on the Internet of Things as a support for business performance through a bibliometric approach. Using data retrieved from the Scopus, the study analyzes publication trends, influential sources, and the intellectual structure of the field. The analysis is conducted using VOSviewer and Bibliometrix to map co-authorship, co-citation, and keyword co-occurrence networks. The findings reveal that IoT research has evolved from a primary focus on technological infrastructure, such as security and connectivity, toward more integrated themes including data analytics, artificial intelligence, and industry applications. Several key clusters emerge, highlighting the role of IoT in operational efficiency, business process transformation, and intelligent decision-making. The results also indicate a growing convergence between IoT and advanced digital technologies, suggesting a shift toward more strategic and performance-oriented applications. This study contributes by positioning IoT as a capability that supports business performance and by identifying emerging research directions for future investigation.

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1. INTRODUCTION

The rapid advancement of digital technologies has transformed how organizations create value, manage operations, and compete in increasingly dynamic markets. Among these technologies, the Internet of Things has emerged as a key driver of organizational transformation by enabling real-time data collection, connectivity between physical and digital systems, and enhanced visibility across business processes. Firms are no longer relying solely on traditional information systems; instead, they are leveraging interconnected devices to monitor performance, optimize resource utilization, and respond more quickly to market changes.

This shift reflects a broader transition toward data-driven and intelligent business environments [1].

Within this context, the relationship between IoT adoption and business performance has attracted growing scholarly attention. Business performance is often understood through multiple dimensions, including operational efficiency, financial outcomes, innovation capability, and customer value creation. IoT technologies contribute to these dimensions by facilitating automation, improving decision-making accuracy, and enabling predictive capabilities. For instance, organizations can use IoT-generated data to anticipate maintenance needs, streamline supply chains, and

personalize customer experiences. These capabilities suggest that IoT functions not merely as a technological tool, but as an enabler of improved organizational outcomes [2].

Despite the increasing volume of research on IoT, the existing literature remains fragmented across disciplines such as engineering, information systems, and operations management. Many studies emphasize technical development or specific industry applications, such as smart manufacturing or logistics, while fewer studies explicitly connect IoT implementation to broader measures of business performance. As a result, there is limited understanding of how the intellectual structure of this research field has evolved, what key themes dominate the discourse, and how different research streams are interconnected. This fragmentation creates a need for a systematic approach to synthesize and map the existing body of knowledge [3], [4].

To address this gap, bibliometric analysis offers a robust method for examining the development and structure of scientific literature. By analyzing publication patterns, citation relationships, and keyword networks, bibliometric techniques can reveal the underlying themes, influential contributors, and emerging trends within a research field. Tools such as VOSviewer and Bibliometrix enable researchers to visualize complex relationships and identify clusters of knowledge that may not be immediately apparent through traditional literature reviews. This approach allows for a more comprehensive understanding of how IoT research relates to business performance.

Based on these considerations, this study aims to map the intellectual structure and research trends of IoT in the context of

business performance using a bibliometric approach. Specifically, the study seeks to identify key themes, influential publications, and collaborative networks that shape this field of research. By doing so, the study contributes to the literature by positioning IoT as a strategic enabler of business performance and by offering insights into future research directions. The findings are expected to provide both academic and practical implications, particularly for organizations seeking to leverage IoT technologies to enhance their performance in an increasingly competitive environment.

2. METHODS

This study adopts a bibliometric approach to systematically analyze the scientific literature on the role of the Internet of Things in supporting business performance. The data were collected from the Scopus database due to its broad coverage of high-quality peer-reviewed publications. A structured search query combining keywords such as “Internet of Things,” “IoT,” and “business performance” was applied to retrieve relevant documents within a defined time span. The dataset was then refined through inclusion and exclusion criteria, focusing on articles and reviews published in English. The analysis was conducted using VOSviewer and Bibliometrix to perform performance analysis and science mapping, including co-authorship, co-citation, and keyword co-occurrence. These techniques enable the identification of research trends, thematic clusters, and intellectual structures, providing a comprehensive overview of how IoT research has evolved in relation to business performance.

3. RESULTS AND DISCUSSION

3.1 Keyword Co-Occurrence Network

suggests an emerging research stream that integrates decentralized technologies to enhance security and transparency.

The purple cluster centers on advanced analytics and intelligent systems, including machine learning, learning algorithms, and edge computing. This cluster

shows that IoT is increasingly combined with artificial intelligence to generate predictive and adaptive capabilities. The integration of these technologies points toward a shift from simple data collection to intelligent, automated decision-making systems.

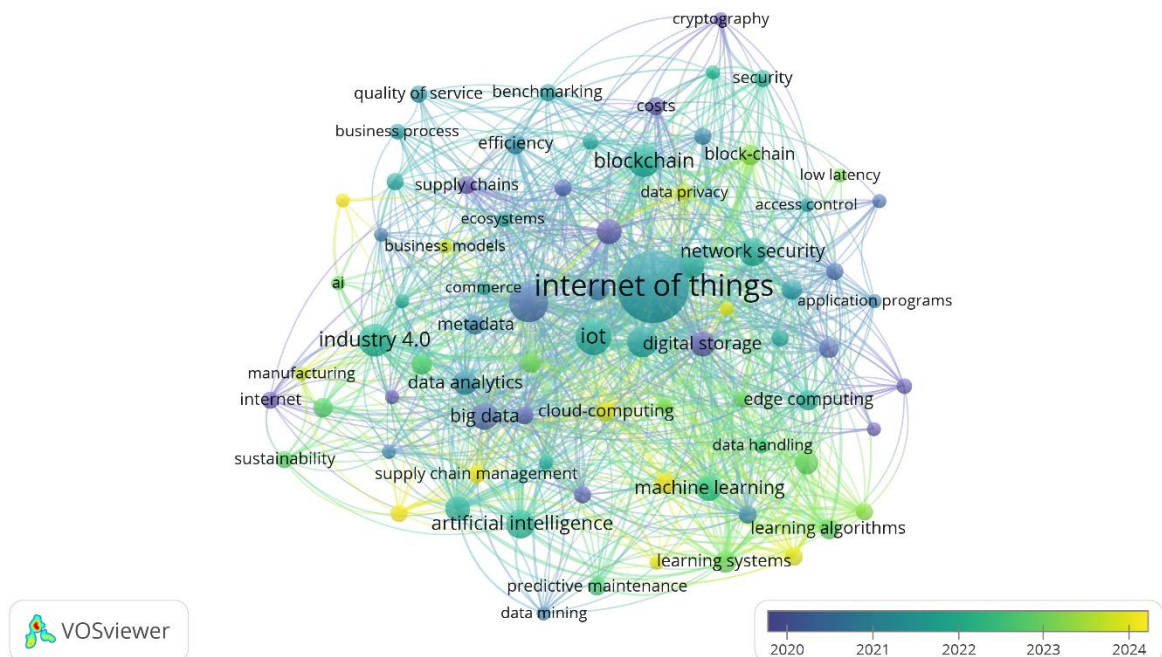


Figure 2. Overlay Visualization

Source: Data Analysis Result, 2026

Figure 2 reveals the temporal evolution of research on the Internet of Things, where colors indicate the average publication year of each keyword. Earlier studies (blue to dark tones, around 2020–2021) are concentrated on foundational aspects such as network security, cryptography, digital storage, and basic IoT infrastructure. This suggests that initial research efforts were primarily concerned with building reliable systems, ensuring connectivity, and addressing security challenges as the technological backbone of IoT began to mature.

As the field progresses into the middle phase (green tones, around 2022–2023), the focus shifts toward integration and application. Keywords such as cloud computing, big data, data analytics, and industry 4.0 become more prominent,

indicating a growing emphasis on how IoT systems can be utilized within organizational and industrial contexts. This phase reflects the transition from purely technical development to value creation, where IoT is increasingly linked to operational efficiency, supply chain management, and broader digital transformation initiatives.

More recent research trends (yellow tones, around 2023–2024) highlight the emergence of advanced and intelligent capabilities, including machine learning, learning systems, artificial intelligence, and blockchain. These developments indicate a movement toward smarter, more autonomous systems that can generate predictive insights and support strategic decision-making. The presence of topics such as data privacy, low latency, and access control also shows that as IoT applications

become more sophisticated, concerns around governance and real-time performance continue to grow.

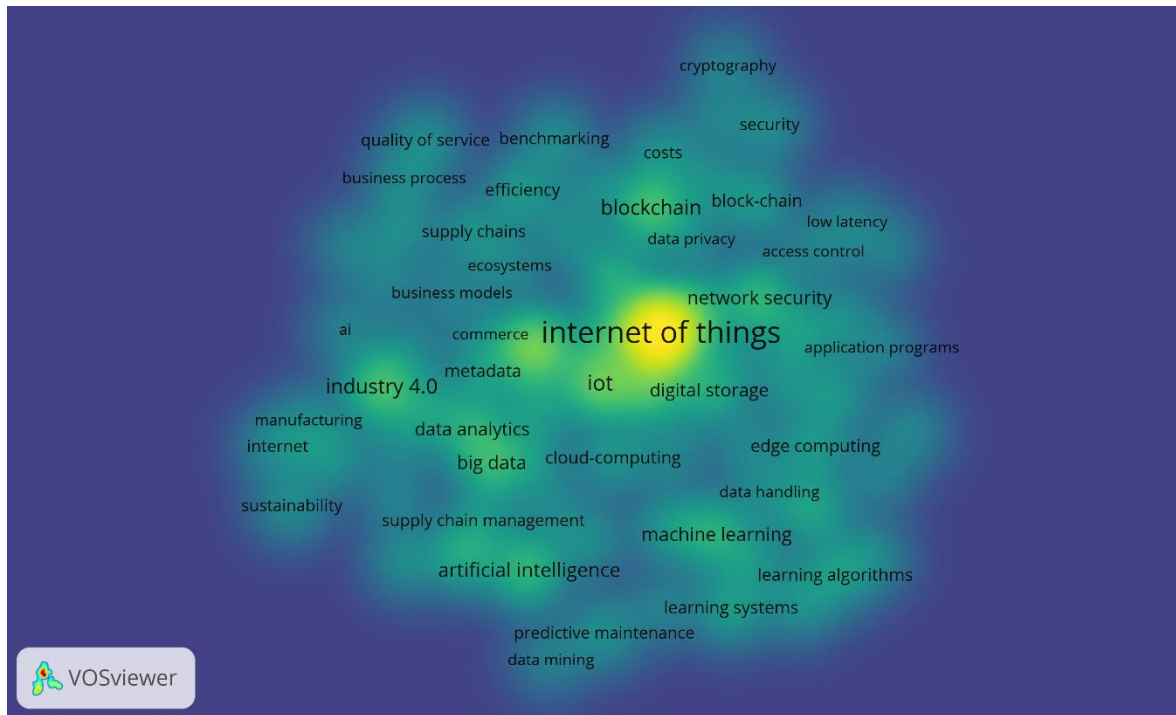


Figure 3. Density Visualization

Source: Data Analysis Result, 2026

Figure 3 highlights the most intensively studied areas within the Internet of Things research landscape. The brightest (yellow) region is concentrated around “internet of things,” indicating its central and dominant role in the network. Surrounding this core, high-density areas include keywords such as network security, digital storage, blockchain, and cloud computing, suggesting that a large portion of the literature focuses on the technological infrastructure that enables IoT systems. This concentration reflects a strong research emphasis on ensuring system reliability, data management, and secure connectivity as

foundational elements for IoT implementation.

Beyond the central core, moderately dense (green) regions extend toward themes such as industry 4.0, data analytics, artificial intelligence, and machine learning. These areas indicate growing attention to the application of IoT in enhancing business processes and generating value from data. Meanwhile, less dense (blue) regions, such as sustainability, manufacturing, and predictive maintenance, suggest emerging or more specialized topics that are still developing within the field.

3.3 Citation Analysis

Table 1. Top Cited Research

Citations	Authors and year	Title
617	[5]	Internet of things for enterprise systems of modern manufacturing
596	[6]	The role of digital technologies for the service transformation of industrial companies
523	[7]	The role and impact of industry 4.0 and the internet of things on the business strategy of the value chain-the case of hungary

Citations	Authors and year	Title
435	[8]	Impact of industry 4.0 on environmental sustainability
355	[9]	Performance Analysis of Machine Learning Algorithms in Intrusion Detection System: A Review
270	[10]	Big data analytics: Applications, prospects and challenges
212	[11]	Investigating the impact of benefits and challenges of IOT adoption on supply chain performance and organizational performance: An empirical study in Malaysia
210	[12]	Blockchain-based business process management (BPM) framework for service composition in industry 4.0
166	[13]	Architecture design approach for IoT-based farm management information systems
128	[14]	Predictive maintenance architecture development for nuclear infrastructure using machine learning

Source: Scopus, 2026

Discussion

The findings of this bibliometric study demonstrate that the Internet of Things has evolved from a purely technological concept into a central element within broader discussions of business transformation and performance enhancement. The dominance of IoT as a core node across all visualizations indicates its integrative role in connecting multiple domains, including data analytics, security, artificial intelligence, and industrial systems. This pattern suggests that IoT is increasingly positioned not as an isolated innovation, but as a foundational infrastructure that supports interconnected and data-driven organizational environments.

The clustering structure further reveals that IoT research is strongly anchored in operational and industrial contexts, particularly through its association with industry 4.0, supply chain management, and manufacturing systems. These linkages indicate that IoT contributes to business performance primarily through improvements in efficiency, process optimization, and real-time monitoring. At the same time, the presence of business models and ecosystems within the same cluster highlights a shift toward more strategic considerations, where IoT enables new forms of value creation and organizational design. This reflects a transition from operational benefits toward broader competitive positioning.

Another important insight emerges from the prominence of technological infrastructure and security-related themes, including blockchain, network security, and data privacy. The close proximity of these concepts to IoT suggests that trust, reliability, and data governance are central concerns in the adoption and scaling of IoT systems. Rather than being peripheral issues, these elements appear to shape how organizations integrate IoT into their operations and how they manage associated risks. This reinforces the idea that the performance implications of IoT are closely tied to the robustness and security of the underlying technological architecture.

The temporal and density patterns also indicate a clear progression in the research focus, moving from foundational infrastructure toward advanced analytics and intelligent systems. The increasing prominence of machine learning, artificial intelligence, and predictive capabilities suggests that IoT is becoming part of a more sophisticated digital ecosystem where data is not only collected but actively used to inform decisions and automate processes. This shift points to a deeper level of integration, where IoT supports adaptive and responsive organizational capabilities that can enhance performance in dynamic environments.

These findings support the view that IoT functions as a strategic enabler of business performance by facilitating data integration, enhancing decision-making processes, and

enabling new forms of innovation. From a theoretical perspective, this positions IoT within the logic of resource-based and capability-oriented frameworks, where its value lies not merely in the technology itself, but in how it is embedded within organizational systems and practices. For future research, there remains a need to further explore the direct linkage between IoT adoption and measurable performance outcomes, particularly in underrepresented contexts such as small and medium enterprises and developing economies.

4. CONCLUSION

This study provides a comprehensive overview of how the Internet of Things has

evolved within the academic landscape as a key enabler of business performance. Through bibliometric analysis, the findings reveal that IoT research has progressed from a focus on technological infrastructure and security toward more integrated applications involving data analytics, artificial intelligence, and strategic business processes. The intellectual structure of the field highlights IoT's role in enhancing operational efficiency, supporting decision-making, and enabling innovation across various organizational contexts. This study reinforces the position of IoT as a strategic resource that contributes to performance outcomes, while also identifying opportunities for future research to further examine its impact in diverse industries and emerging markets.

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