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The Role of Internet of Things in Smart Business Decision-Making: A Narrative Review

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ABSTRACT: The Internet of Things (IoT) has emerged as a critical driver of smart business decision-making, enabling organizations to enhance efficiency, transparency, and responsiveness across industries. This narrative review examines the integration of IoT into business systems, focusing on its contributions to Enterprise Resource Planning (ERP), marketing strategies, sustainability leadership, smart environments, and sector-specific applications in agriculture, education, and healthcare. Literature was systematically collected from Scopus, Web of Science, and Google Scholar, using targeted keywords and Boolean operators. Inclusion criteria prioritized peer-reviewed studies that examined IoT in relation to business decision-making, resulting in a dataset of empirical and conceptual research published between 2018 and 2024. Findings reveal that IoT enhances decision-making accuracy through ERP integration, strengthens marketing strategies by enabling real-time consumer insights, and supports sustainability leadership by advancing Environmental, Social, and Governance (ESG) practices. In addition, IoT facilitates the development of smart environments that leverage big data and artificial intelligence for predictive analytics. Sectoral evidence confirms IoT's effectiveness in improving agricultural productivity, optimizing educational management, and enabling remote healthcare monitoring. Nonetheless, critical systemic challenges persist, particularly cybersecurity threats such as data breaches, lack of common interoperability standards across IoT platforms, and infrastructural readiness gaps in regions with limited digital capacity. These barriers highlight the need for supportive policies, investment in digital infrastructure, and organizational cultures receptive to technological change. Future research should focus on empirical validation of IoT's impact on managerial decision quality and explore cross-sectoral comparisons to enrich theoretical and practical understanding. By addressing these challenges, IoT can fulfill its promise as a transformative enabler of sustainable and innovative business strategies.

Keywords: Internet of Things, Smart Business Decision-Making, Data Analytics, ERP Integration, Sustainability Leadership, Smart Environments, Digital Transformation.

INTRODUCTION

The rapid evolution of digital technologies has fundamentally reshaped the landscape of contemporary business decision-making. Among these technologies, the Internet of Things (IoT)

has emerged as a vital driver of business innovation, offering organizations new capabilities to streamline processes, optimize performance, and enhance strategic responsiveness. IoT refers to the interconnection of physical devices embedded with sensors, software, and communication technologies, enabling the collection and exchange of data in real time. This continuous flow of data provides a basis for advanced analytics that can directly inform decision-making processes. As businesses increasingly face competitive pressures in volatile markets, IoT is no longer a peripheral innovation but a strategic necessity (Húdik et al., 2019). Recent studies have underscored IoT's ability to digitize core processes, differentiate marketing strategies, and expand product offerings, thereby strengthening competitive advantage (Martín et al., 2023).

The global trend towards widespread IoT adoption reflects both the maturity of enabling technologies and the urgent need for organizations to respond to dynamic market conditions. With billions of devices now interconnected, companies are leveraging IoT platforms to transform raw data into actionable insights, facilitating timely and well-informed decisions. As Martín et al. (2023) argue, the fusion of IoT with real-time analytics allows firms to detect emerging patterns, anticipate risks, and identify opportunities with unprecedented speed and accuracy. This trend has become particularly significant in an era defined by digital disruption, where business agility and the ability to adapt rapidly to new challenges are essential for survival.

Statistical evidence highlights the exponential growth of IoT adoption in recent years. Al-Jumah et al. (2024) demonstrated that IoT platforms are increasingly used to support decision-making by enhancing customer experience, reducing operational costs, and boosting efficiency. Similarly, Nozari et al. (2021) found that firms adopting IoT technologies reported substantial gains in productivity and cost-effectiveness, largely due to their ability to harness big data and artificial intelligence (AI) for advanced decision support. These findings underscore IoT's role as a cornerstone of modern data-driven decision-making strategies. By enabling seamless data integration across business functions, IoT facilitates not only operational efficiency but also strategic alignment with broader organizational objectives.

Global trends further illustrate IoT's diffusion across diverse industrial contexts, ranging from large-scale manufacturing to small and medium-sized enterprises (SMEs). Sarker (2021) emphasizes that IoT provides scalable solutions tailored to the unique challenges faced by SMEs, offering these organizations the tools necessary to remain competitive in digitally mediated markets. Abdel-Basset et al. (2019) reported that machine learning and data analytics integrated into IoT frameworks have significantly improved decision-making processes, particularly in business intelligence applications. Furthermore, Peštek and Ejubović (2024) highlight that IoT adoption spans critical industries such as logistics, healthcare, and agriculture, where the ability to process real-time data is transforming operational paradigms. The diffusion of IoT into these sectors indicates its versatility as a cross-industry enabler of smarter and more efficient decision-making.

These developments collectively signal a paradigm shift in the business decision-making process, moving away from intuition-driven approaches towards data-driven strategies supported by IoT. Companies now possess the ability to respond to market fluctuations with greater precision, identify latent opportunities, and strengthen their competitiveness in global markets. Reports such

as *Disruptive Technologies and Business Innovation: IoT in Perspective* (2024) and empirical studies by Rattanawiboomsom et al. (2023) further illustrate IoT's transformative potential, suggesting that its role extends beyond operational improvements to redefining entire business models. Rusli et al. (2024) reinforce this perspective, arguing that IoT adoption has transitioned from a strategic option to a fundamental requirement for sustaining relevance in technology-driven economies.

Despite its clear potential, IoT adoption in organizational contexts is not without significant challenges. Among the most pressing concerns are data security and privacy. The vast volume of data generated by IoT devices exposes organizations to risks of data breaches and cyberattacks, which can undermine trust and compromise decision-making effectiveness. Al-Aqrabi and Hill (2018) highlighted the necessity of robust authentication frameworks within IoT architectures to ensure the integrity of data collected from diverse and distributed networks. More recent work by Li and Zhang (2024) emphasized that investments in network security are critical for sustaining IoT implementations, though such measures often impose additional financial and temporal burdens on organizations. This dual challenge of safeguarding data while minimizing costs represents a persistent tension in the deployment of IoT systems.

Interoperability also poses a substantial barrier to IoT's effective integration. As Húdik et al. (2019) observed, IoT applications frequently operate under heterogeneous protocols and standards, leading to incompatibility issues that complicate data consolidation for decision-making purposes. The lack of standardized frameworks hinders organizations from achieving comprehensive visibility across systems, thereby limiting the potential benefits of IoT-enabled analytics. Such fragmentation underscores the importance of establishing common standards and platforms to facilitate seamless interoperability and data sharing.

Beyond these technical barriers, the literature identifies a notable gap concerning empirical evidence on IoT's direct impact on managerial decision quality. While much of the existing research highlights IoT's theoretical potential to enhance business processes, relatively few studies provide systematic analyses of how IoT-derived insights concretely influence managerial outcomes (Radovici et al., 2020). Abdel-Basset et al. (2019) similarly noted that while IoT is frequently associated with improved business intelligence, there is limited empirical investigation into the causal mechanisms linking IoT data analytics with decision-making performance. This gap indicates the need for further research to establish robust evidence on IoT's managerial implications.

The challenges of IoT adoption are further evident in sector-specific contexts. For instance, Micle et al. (2021) found that while IoT adoption in agriculture has demonstrated promising improvements in productivity through smart farming practices, technical knowledge gaps and infrastructural limitations have constrained broader implementation. These findings suggest that while IoT possesses transformative potential, its effectiveness is contingent upon contextual factors such as technological readiness, infrastructure development, and stakeholder engagement. Addressing these limitations requires a comprehensive approach that integrates technical, organizational, and policy dimensions.

Overall, the central challenges hindering IoT adoption—security risks, interoperability issues, and insufficient empirical validation—highlight the complexity of implementing IoT at scale. These challenges underscore the importance of multidisciplinary approaches that combine technological innovation with organizational strategies and regulatory frameworks. Without such holistic integration, the full potential of IoT in enhancing decision-making processes may remain unrealized.

Given these considerations, the literature reveals clear gaps that justify further investigation. While numerous studies affirm IoT's potential to transform decision-making, there is insufficient research examining its specific impacts on managerial outcomes, particularly in diverse industry contexts. Radovici et al. (2020) stressed the absence of rigorous frameworks linking IoT adoption with measurable improvements in decision-making quality. Similarly, Abdel-Basset et al. (2019) emphasized the scarcity of structured analyses connecting IoT-driven data analytics with managerial decisions. This lack of empirical grounding highlights the urgency for studies that bridge the theoretical promises of IoT with concrete managerial realities.

The primary aim of this review is therefore to synthesize and critically evaluate existing research on the role of IoT in smart business decision-making. Specifically, it seeks to identify the mechanisms through which IoT facilitates data-driven insights, the challenges that hinder its implementation, and the contextual factors that shape its effectiveness. By integrating findings across industries and geographies, this review intends to provide a comprehensive understanding of IoT's contributions to managerial decision-making and its implications for future business strategies.

The scope of this review encompasses diverse geographic regions and industry sectors where IoT adoption has gained traction. It examines cases from advanced economies, where technological infrastructure and digital readiness provide fertile ground for IoT integration, as well as from emerging markets, where unique challenges and opportunities influence adoption patterns. Particular attention is given to industry-specific applications in agriculture, healthcare, manufacturing, and supply chain management, as these sectors exemplify both the promise and the challenges of IoT in practice. By adopting this cross-sectoral and cross-regional perspective, the review aims to illuminate both the universal and context-specific dimensions of IoT's role in business decision-making, thereby contributing to a more nuanced and comprehensive body of knowledge.

METHOD

This study employed a structured and systematic approach to gather, select, and analyze literature concerning the role of the Internet of Things (IoT) in business decision-making. The methodology was designed to ensure both the comprehensiveness and the quality of the sources included, thereby providing a rigorous foundation for the subsequent analysis. The methodological process focused on identifying relevant scholarly works, establishing inclusion and exclusion criteria, and

applying a systematic evaluation framework that reflects established standards for narrative reviews in business and technology research.

The first step in the methodological process was the selection of appropriate databases to serve as the primary repositories for the literature search. Based on established practices in technology and management research, the databases Scopus, Web of Science, and Google Scholar were selected as the main sources for the collection of materials. Scopus and Web of Science are widely regarded as authoritative repositories due to their coverage of high-impact, peer-reviewed journals and their inclusion of citation metrics that are crucial for evaluating scholarly impact (Húdik et al., 2019; Abdel-Basset et al., 2019). Google Scholar was also included as it offers broader access to diverse materials, including conference proceedings, working papers, and emerging studies that may not yet be indexed in more selective databases. The use of these databases allowed for both the depth and breadth of the literature to be captured in a balanced manner.

The process of literature collection was guided by a carefully constructed search strategy that combined key terms relevant to IoT and business decision-making. Keywords were selected based on their recurrence in the scholarly discourse and their relevance to the research objectives. Primary search terms included "Internet of Things," "IoT," "business decision-making," "smart business," "data analytics," and "real-time decision support." These terms were supplemented with synonyms and related phrases to ensure comprehensive coverage of the field. The search strategy utilized Boolean operators to refine the results and maintain focus on the intersection of IoT and decision-making. For instance, the query "IoT AND business decision-making" was applied to identify studies directly linking these concepts, while "IoT OR smart technology" allowed for broader inclusion of related technological discussions (Micle et al., 2021; Yang et al., 2021). Quotation marks were also employed around compound terms such as "smart decision-making" and "real-time analytics" to preserve conceptual coherence within the retrieved results.

In addition to keywords and Boolean logic, filters were applied within the databases to narrow the scope of the search to materials that were most relevant and reliable. Publication years were restricted to the period from 2018 to 2024 in order to capture the most recent developments in IoT applications within business contexts, while also allowing for sufficient temporal scope to identify evolving trends. Document types were limited primarily to peer-reviewed journal articles, conference proceedings, and book chapters to ensure academic rigor. Where relevant, review articles were included to provide broader perspectives, but grey literature, such as blogs or non-academic reports, was excluded to maintain scholarly reliability. The filtering process also considered subject areas, focusing on business, management, computer science, and engineering domains, where IoT research is most prominent (Farquharson et al., 2021).

To further refine the dataset, inclusion and exclusion criteria were established. Studies were included if they met the following conditions: (1) they explicitly addressed IoT applications in business decision-making or management contexts, (2) they were published in English, and (3) they presented empirical findings, conceptual frameworks, or systematic analyses of IoT. Exclusion criteria were applied to eliminate studies that only mentioned IoT tangentially without direct relevance to decision-making, articles published in non-academic outlets, and duplicates

across databases. This process ensured that only high-quality and directly relevant works formed the basis of the review (Li & Zhang, 2024; Kodors et al., 2023).

The types of studies included in the review were diverse, reflecting the multifaceted nature of IoT research. Empirical studies such as randomized controlled trials and case studies were prioritized where available, as they provided concrete evidence of IoT's impact on decision-making processes. Cohort studies and longitudinal analyses were also considered valuable for understanding adoption patterns and long-term implications. Conceptual studies and systematic reviews were included to provide theoretical grounding and synthesize prior knowledge, thus offering a balanced perspective on both practical and theoretical dimensions of the topic. The inclusion of varied research designs allowed for a comprehensive understanding of IoT's role in business decision-making, from practical implementation challenges to conceptual advancements.

The literature selection process involved multiple stages of screening and evaluation. In the initial phase, the titles and abstracts of the retrieved studies were reviewed to assess relevance to the research topic. Articles that did not meet the inclusion criteria were discarded at this stage. The second phase involved a full-text review of the remaining studies to confirm their alignment with the objectives of this study. Each article was evaluated based on methodological rigor, relevance of findings, and contribution to the understanding of IoT in decision-making. Discrepancies or uncertainties in selection were resolved through iterative cross-checking and re-evaluation of the inclusion criteria. This systematic filtering process ensured that the final corpus of literature represented both the depth and the breadth of scholarship on IoT in business decision-making.

The final dataset comprised a diverse collection of studies, reflecting different geographic contexts, industrial sectors, and methodological approaches. This diversity allowed for cross-comparison and synthesis of findings across various applications of IoT, such as in manufacturing, healthcare, agriculture, and supply chain management. By combining empirical and conceptual works, the methodology ensured that the review could capture not only evidence of IoT's practical impacts but also the theoretical frameworks that underpin its integration into business processes.

In summary, the methodological approach adopted in this study reflects a systematic and rigorous process designed to identify, evaluate, and synthesize relevant literature on IoT in business decision-making. By relying on authoritative databases such as Scopus, Web of Science, and Google Scholar, applying precise keyword strategies, and enforcing strict inclusion and exclusion criteria, the study ensured the reliability and relevance of its evidence base. The inclusion of diverse research designs further strengthened the comprehensiveness of the review, enabling it to provide nuanced insights into both the opportunities and challenges associated with IoT adoption. This methodological rigor is essential for producing a robust narrative review that can meaningfully contribute to the academic discourse on digital technologies and their role in shaping contemporary business strategies.

RESULT AND DISCUSSION

The findings of this narrative review reveal that the integration of the Internet of Things (IoT) into business decision-making processes is multifaceted, spanning technological, organizational, and sectoral dimensions. The literature points to significant advancements in how IoT contributes to efficiency, transparency, and responsiveness across industries, while also highlighting the challenges and contextual factors that shape its effectiveness. The results are organized into five key themes: IoT in Enterprise Resource Planning (ERP) integration, IoT in marketing and strategic planning, IoT in sustainability leadership, IoT in smart environments, and IoT in specific sectors such as agriculture, healthcare, and education.

IoT in ERP and Business Systems Integration

A consistent theme emerging from the literature is the pivotal role of IoT in enhancing business efficiency through integration with Enterprise Resource Planning (ERP) systems. Empirical evidence demonstrates that IoT-enabled ERP platforms not only accelerate data processing but also improve decision-making accuracy by ensuring that real-time information is available to managers and decision-makers. Rusli et al. (2024) emphasize that IoT integration supports cost-based decision-making models, offering a more transparent view of resource allocation in industrial contexts. Case studies from manufacturing facilities in Malaysia further illustrate these findings, showing that IoT-enabled automation reduced both operational costs and the time required for critical decision-making processes. These improvements have encouraged organizations to optimize resource utilization and eliminate inefficiencies. Comparative research in European contexts confirms similar results, with IoT-ERP integration significantly improving operational planning and responsiveness in industrial supply chains (Húdik et al., 2019).

IoT in Marketing and Strategic Planning

The influence of IoT on modern marketing strategies is evident across product development, pricing, promotion, and distribution channels. IoT-enabled analytics allow firms to understand consumer preferences in real time and evaluate marketing effectiveness dynamically. Húdik et al. (2019) argue that IoT enhances customer profiling by generating continuous streams of consumer behavior data, which businesses can leverage to adapt product offerings quickly. Peštek and Ejubović (2024) provide empirical support for this claim, showing how IoT applications enrich customer experience through targeted interactions and personalized services. These capabilities have direct implications for customer satisfaction and loyalty, as organizations are able to fine-tune strategies in response to real-time consumer feedback. In the United States, large retail corporations have used IoT-driven analytics to redesign promotional strategies, leading to measurable increases in sales and customer retention (Martín et al., 2023). In contrast, emerging markets show a slower but growing uptake of IoT in marketing, reflecting infrastructural disparities that shape adoption rates and outcomes (Sarker, 2021).

IoT in Sustainability Leadership

Another critical theme is IoT's contribution to sustainability leadership, particularly in advancing Environmental, Social, and Governance (ESG) practices and achieving Sustainable Development

Goals (SDGs). Eskerod et al. (2019) describe how IoT technologies enable organizations, such as hotels, to monitor carbon emissions and resource consumption with greater precision, supporting environmentally responsible decision-making. Addou et al. (2023) demonstrate the integration of IoT with blockchain technologies in supply chains, ensuring transparency and traceability of goods from origin to consumer. This not only enhances operational efficiency but also mitigates risks associated with counterfeit products and supply disruptions. Li and Zhang (2024) further reinforce these insights, showing that IoT systems strengthen organizational risk management by providing early warnings of potential disruptions. Comparative studies between Europe and Asia highlight that while European industries have focused heavily on IoT-driven carbon reduction strategies, Asian firms have emphasized supply chain transparency and resilience. These regional differences suggest that IoT's role in sustainability leadership is context-specific, shaped by local regulatory and market priorities.

IoT in Smart Environments

The convergence of IoT, big data, and artificial intelligence (AI) has been instrumental in the development of smart environments that enhance decision-making capacity. IoT provides real-time data collection, which, when analyzed through advanced AI techniques, generates actionable insights. Sarker (2021) observed that IoT-generated data, when processed using AI, significantly improves the accuracy of predictive models used in business intelligence applications. Jørgensen (2025) underscores the importance of integrating IoT with IT infrastructure and analytics systems to ensure efficient data storage, processing, and interpretation. This layered integration, involving sensors, networks, and applications, positions IoT as a critical bridge between physical systems and digital platforms. Evidence from smart city initiatives in Scandinavia illustrates that IoT-based smart environments have facilitated improvements in transportation planning, energy efficiency, and public service delivery. Comparisons with similar initiatives in North America reveal parallel gains, though the latter contexts have faced greater challenges regarding data privacy and interoperability standards.

IoT in Sector-Specific Applications

The literature also highlights IoT's transformative role in specific sectors, particularly agriculture, healthcare, and education. In agriculture, IoT has been widely applied in smart farming practices. Micle et al. (2021) document how farmers use IoT devices to monitor soil conditions, weather patterns, and crop health in real time, enabling more precise and efficient resource management. Applications such as automated irrigation systems informed by soil moisture sensors have improved water efficiency and crop yields. Comparative data from European and Asian agricultural sectors show that while European farms have focused on sustainability metrics such as reducing pesticide use, Asian farms have prioritized yield maximization to meet food security demands.

In the education sector, IoT is reshaping the management of smart campuses. Li and Zhang (2024) illustrate how IoT systems allow institutions to monitor student attendance, manage classroom environments, and optimize campus facilities. Empirical evidence indicates that these systems improve both student engagement and resource efficiency. In developed countries such as Japan, IoT-enabled smart campuses have advanced toward integrating AI tutors and adaptive learning

environments, while institutions in developing contexts are gradually adopting IoT for infrastructure management and student monitoring.

Healthcare has also emerged as a key domain where IoT contributes significantly to decision-making. Rattanawiboomsom et al. (2023) emphasize the role of IoT-enabled medical devices in remote monitoring and telemedicine, which allow physicians to track patient health in real time and respond to emergencies more quickly. Evidence suggests that IoT applications in healthcare improve diagnostic accuracy and treatment responsiveness while reducing costs associated with hospital visits. Comparative studies indicate that in North America, IoT healthcare adoption has focused on integrating wearable devices with patient health records, while in Southeast Asia, telemedicine platforms powered by IoT have become vital tools in extending healthcare access to rural populations.

The cumulative evidence across these sectors demonstrates that IoT is not simply a tool for operational efficiency but a transformative force reshaping decision-making processes. Its applications extend across strategic planning, sustainability leadership, and sector-specific innovations, with significant variation depending on geographic and industry-specific contexts. While the positive impacts are clear, the literature also reveals disparities in adoption due to infrastructural, regulatory, and organizational constraints.

In summary, the results of this review highlight the diverse ways IoT is being leveraged to enhance business decision-making. From ERP integration and marketing strategies to sustainability leadership and sector-specific innovations, IoT is driving efficiency, transparency, and responsiveness in ways that are redefining business practices globally. Comparative evidence across regions illustrates both commonalities and divergences in adoption patterns, underscoring the importance of contextual factors in shaping IoT's outcomes. These findings provide a strong empirical and conceptual basis for understanding the opportunities and challenges that IoT presents in the evolving landscape of smart business decision-making.

The results of this review reinforce and extend the existing body of knowledge concerning the role of the Internet of Things (IoT) in business decision-making. A consistent observation across studies is that IoT does not merely facilitate the acquisition of real-time data but also transforms the very nature of decision-making by improving responsiveness, accuracy, and the strategic use of information. Húdik et al. (2019) demonstrated that organizations leveraging IoT-generated data can formulate more dynamic marketing strategies, thereby creating competitive advantage. This aligns closely with the broader discourse in digital transformation literature, which emphasizes the shift from static, historical data-based decision-making toward predictive and adaptive approaches enabled by digitization (Sarker, 2021). The findings of Peštek and Ejubović (2024) regarding enriched customer experiences further validate this narrative, suggesting that IoT's contribution to business practice extends well beyond operational efficiency to the realms of consumer engagement and market differentiation.

Comparisons with prior research reveal that IoT integration into ERP systems has consistently yielded improvements in transparency and accuracy, as illustrated by Rusli et al. (2024). Their findings echo earlier arguments that digitization of resource planning processes enables firms to

align decision-making more closely with cost structures and real-time resource availability. Similar outcomes have been documented in European and North American contexts, where IoT-ERP integration has become a cornerstone of supply chain optimization and real-time resource management (Húdik et al., 2019; Martín et al., 2023). The convergence of these findings across diverse geographies underscores IoT's global relevance, even as sectoral and contextual variations influence the pace and nature of adoption.

At the same time, challenges identified in the literature highlight the systemic factors that critically shape IoT implementation outcomes. Regulation emerges as one of the most significant determinants of success. Strict data protection frameworks in healthcare, for example, have both enabled and constrained IoT adoption, as firms must balance the benefits of real-time patient monitoring with compliance to privacy mandates (Salih et al., 2019; Rattanawiboomsom et al., 2023). The regulatory environment thus operates as both a safeguard and a barrier, shaping how IoT applications can be scaled and integrated into existing practices. Beyond regulation, organizational culture plays a decisive role. Micle et al. (2021) found that without managerial support and employee buy-in, IoT investments often fail to generate their intended outcomes, as reluctance to adopt new technologies undermines utilization rates. This finding resonates with broader studies of digital innovation adoption, which emphasize the interplay between technological readiness and organizational receptivity.

Infrastructure readiness is another systemic factor that has received significant attention. Li and Zhang (2024) noted that robust network architectures and hardware capabilities are prerequisites for effective IoT deployment. Regions with limited digital infrastructure have struggled to fully harness IoT's potential, resulting in uneven adoption rates across global markets. This disparity is particularly evident when comparing IoT-enabled smart campus initiatives in technologically advanced countries such as Japan with more nascent deployments in developing economies, where infrastructural deficiencies limit the scope of IoT applications in education and resource management (Li & Zhang, 2024). These variations suggest that the impact of IoT cannot be divorced from the broader ecosystem in which it is embedded.

Literature across business and technology studies offers recommendations for overcoming these barriers. A recurring theme is the call for supportive policy frameworks that encourage investment in the technological infrastructure required for IoT (Farquharson et al., 2021). Such policies may include subsidies for IoT deployment, public-private partnerships to share knowledge and resources, and regulatory clarity to reduce uncertainty in sensitive sectors. Sarker (2021) emphasizes the need for organizations to cultivate a culture of continuous learning and technological adaptability, enabling employees to develop the skills required to work effectively with IoT systems. Abdel-Basset et al. (2019) add that incremental approaches to IoT adoption, rather than large-scale rollouts, can mitigate risk and allow firms to adapt gradually. This staged implementation strategy has proven effective in industries where the costs of failure are high, such as healthcare and agriculture.

Solutions must also account for the complex interdependencies between IoT, big data, and AI. Studies such as Sowmya (2025) underscore that IoT achieves its greatest value when integrated with advanced analytics and machine learning models. IoT alone provides the raw material—real-time data streams—but its strategic utility depends on the capacity to analyze and interpret this

data effectively. Abdel-Basset et al. (2019) argue that conceptual models integrating IoT with AI-driven analytics are critical for ensuring that firms derive actionable insights, particularly in contexts where decision-making must balance multiple variables such as cost, sustainability, and consumer demand. The emphasis on integration highlights a broader lesson from the literature: technological adoption should not be seen as isolated investments but as components of a holistic digital strategy.

The discussion of IoT's role in sustainability leadership illustrates the importance of aligning technological innovation with global sustainability goals. Eskerod et al. (2019) highlighted how IoT applications in the hospitality industry enabled accurate carbon emission tracking, aligning firms with environmental accountability standards. Addou et al. (2023) expanded on this by showing how IoT and blockchain integration enhanced supply chain transparency, a theme also taken up by Li and Zhang (2024) in their analysis of risk management systems. These studies collectively suggest that IoT is not only a business enabler but also a catalyst for advancing ESG commitments. However, regional variations in emphasis—carbon reduction in Europe versus supply chain transparency in Asia—indicate that local regulatory pressures and market priorities shape how IoT is mobilized toward sustainability outcomes.

Despite the breadth of findings, significant limitations remain in the existing body of research. Radovici et al. (2020) and Abdel-Basset et al. (2019) pointed out that while much of the literature highlights IoT's potential, there is a relative scarcity of empirical studies linking IoT adoption directly to improvements in managerial decision quality. This gap suggests that while theoretical and conceptual frameworks abound, systematic evaluations of IoT's impact on decision-making performance are less common. The absence of longitudinal analyses also limits understanding of IoT's long-term implications, particularly regarding how organizations sustain and adapt IoT systems over time. Moreover, much of the existing literature remains sector-specific, with relatively few cross-sectoral studies comparing adoption patterns and outcomes across industries such as healthcare, agriculture, and education.

Future research should address these limitations by adopting mixed-methods approaches that combine quantitative measures of decision-making performance with qualitative insights into organizational practices. Comparative studies across regions and sectors could also illuminate how contextual differences shape IoT's effectiveness, providing more nuanced guidance for practitioners and policymakers. Furthermore, research into the socio-ethical dimensions of IoT adoption—such as data privacy, surveillance concerns, and digital inequality—remains underdeveloped and warrants greater scholarly attention. By engaging with these gaps, future scholarship can strengthen the empirical and conceptual foundations necessary to fully understand IoT's role in reshaping business decision-making in the digital age.

CONCLUSION

This review emphasizes IoT's transformative role in enhancing decision-making across industries. IoT integration improves efficiency in ERP systems, strengthens marketing responsiveness, and advances sustainability goals through carbon monitoring and supply chain transparency. Despite these benefits, barriers such as cybersecurity risks, interoperability issues, and infrastructure gaps

remain. Addressing these through supportive policies, digital investment, and incremental adoption strategies is essential for IoT's long-term impact.

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