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Artificial Intelligence and IoT Integration for Intelligent Decision-Making Systems

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ABSTRACT

This study investigates the incorporation of Artificial Intelligence (AI) and the Internet of Things (IoT) as strategic enablers of organizational performance improvement, presented through a cohesive single-paragraph structure encompassing the Background, Objective, Method, Results, and Conclusion. The Background underscores the intensifying market competition and accelerating pace of technological advancement, which collectively compel organizations to elevate their operational effectiveness and optimize resource allocation. Grounded in this context, the study's Objective is to assess how the adoption of AI and IoT influences operational efficiency and the attainment of competitive advantage. To fulfill this aim, the Method employs a quantitative research design, drawing on survey data obtained from 200 executives representing diverse industry sectors, subsequently analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine direct, indirect, and interaction effects among the constructs. The Results demonstrate that the adoption of both AI and IoT substantially enhances operational efficiency, which in turn serves as a significant driver of competitive advantage; furthermore, AI and IoT individually exert direct favorable effects on competitive advantage, while their concurrent implementation yields a more pronounced impact compared to singular deployment. The Conclusion asserts that the synergistic integration of AI and IoT empowers organizations to streamline operational processes, facilitate data-informed decision-making, and reinforce their long-term competitive standing, thereby recommending that enterprises seeking sustained performance improvements prioritize the strategic adoption of these transformative technological innovations.

1. INTRODUCTION

In the era of rapid technological advancement, organizations are increasingly relying on digital innovations to enhance operational efficiency and sustain long-term competitiveness [1]. The growing complexity

of global markets, coupled with increasing customer expectations and the need for faster decision-making, has encouraged organizations to adopt advanced technologies that can support more intelligent and responsive management practices [2]. Among these technologies, AI and IoT have emerged as two of the most influential drivers of digital transformation [3]. These technologies are not only changing the technological landscape of modern organizations but are also redefining how management strategies are formulated and implemented in various industries [4–6]. AI enables organizations to process large volumes of structured and unstructured data, identify hidden patterns, and generate predictive insights that support strategic and operational decision-making [7]. Through techniques such as machine learning, natural language processing, and data analytics, AI can assist managers in forecasting demand, optimizing production schedules, improving customer service, and identifying potential operational risks [8, 9]. Meanwhile, the IoT extends the capabilities of digital systems by connecting physical devices, sensors, and machines into a network that continuously collects and exchanges real-time information [10–12]. This connectivity allows organizations to monitor operational processes, track asset performance, and detect anomalies that may affect productivity or operational stability [13, 14]. When integrated effectively, AI and IoT create a powerful ecosystem where real-time data generated from physical operations can be analyzed intelligently to support faster and more accurate managerial decisions [15].

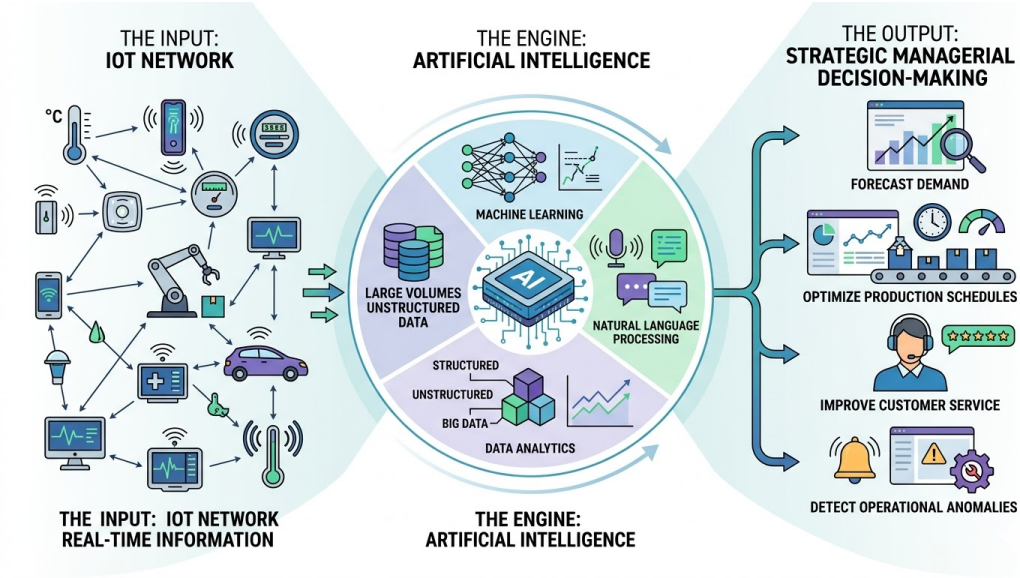

Figure 1. The AI & IoT Ecosystem

As shown in Figure 1, the integration of AI and IoT forms a comprehensive ecosystem that supports the transformation of traditional management approaches. The growing adoption of AI and IoT technologies has significantly transformed traditional management approaches. Organizations are gradually shifting from conventional, experience-based decision-making toward data-driven and technology-supported strategies [16, 17]. This transformation allows managers to gain deeper insights into operational activities, identify inefficiencies, and implement more adaptive strategies in response to changing market conditions [18, 19]. As a result, organizations are increasingly able to improve productivity, enhance service quality, and achieve higher levels of operational excellence. In addition, the strategic use of AI and IoT enables companies to create new business models, improve supply chain coordination, and develop innovative solutions that strengthen their competitive position in the marketplace [20, 21]. Despite the significant opportunities offered by AI and IoT, many organizations still face considerable challenges in implementing these technologies effectively [22]. The adoption process often requires substantial financial investment, advanced technological infrastructure, and specialized expertise that may not be readily available in all organizations [23, 24]. Furthermore, integrating AI and IoT systems with existing legacy systems can be complex and time-consuming, potentially disrupting ongoing operations. Data security and privacy concerns also present critical challenges, particularly when large volumes of sensitive operational data are collected and transmitted across interconnected devices. In addition, resistance from employees who are unfamiliar with new digital technologies can slow down the adoption process and limit the effectiveness of implementation efforts [25].

These challenges highlight the importance of strategic planning, organizational readiness, and effective technology governance in ensuring successful technology adoption [26]. Organizations must develop comprehensive management strategies that align technological capabilities with business objectives, human resources, and operational processes [27, 28]. Without proper strategic alignment, the implementation of advanced technologies may fail to deliver the expected benefits or may even create additional operational complexities. Therefore, understanding how AI and IoT can be strategically integrated into management practices becomes essential for organizations seeking to leverage digital technologies for sustainable performance improvement [29]. This study aims to provide a deeper understanding of how AI and IoT support the development of advanced management strategies by examining how their adoption influences operational efficiency and competitive advantage across industries. By focusing on organizations that have already implemented these technologies, this research explores how AI-driven analytics and IoT-enabled monitoring systems contribute to improved decision-making processes, more efficient resource allocation, and enhanced responsiveness to market dynamics [30]. The study also investigates how the integration of these technologies can reduce operational costs, minimize process inefficiencies, and improve coordination across organizational units [31].

The findings of this research are expected to contribute to the broader discussion on digital transformation and technology-driven management strategies [2, 32]. From a theoretical perspective, this study enriches the existing literature by providing empirical insights into the strategic role of AI and IoT in achieving operational excellence and competitive advantage. From a practical perspective, the results offer valuable guidance for managers and decision-makers who seek to design effective technology adoption strategies that maximize organizational value [10, 33]. Ultimately, the integration of AI and IoT within modern management frameworks can enable organizations to enhance operational performance, improve strategic agility, and secure a sustainable competitive edge in an increasingly technology-driven business environment [13].

2. LITERATURE REVIEW

The accelerating evolution of digital technologies has profoundly shaped the ways in which organizations formulate strategies, oversee operations, and sustain competitiveness within rapidly changing business environments [3]. Among the most notable of these advancements, AI and IoT have risen as pivotal strategic assets that empower organizations to elevate operational performance and reinforce internal capabilities [34]. AI augments organizational functions through automated data analysis, predictive analytics, and intelligent decision support, whereas IoT facilitates the interconnection of physical devices and sensors to produce continuous streams of real-time operational data. The convergence of these two technologies enables organizations to attain more comprehensive visibility into operational processes, enhance transparency, and adopt increasingly data-informed management approaches [4]. Nevertheless, existing literature highlights that the efficacy of AI and IoT implementation is contingent upon the degree to which these technologies are harmonized with organizational structures, operational workflows, and overarching strategic goals. In the absence of adequate integration frameworks and governance mechanisms, technology adoption may fail to yield meaningful performance outcomes [35]. Consequently, investigating the extent to which AI and IoT contribute to operational efficiency and competitive advantage constitutes a critical research agenda, given their potential to underpin sustainable organizational performance across increasingly competitive and technology-intensive market landscapes [36].

2.1. AI and IoT in Organizational Operations

AI and the IoT have established themselves as foundational technologies underpinning the operational functions of contemporary organizations [36]. AI is broadly defined as a class of computational systems designed to execute tasks that would conventionally necessitate human cognitive capabilities, including learning from empirical data, identifying recurring patterns, generating predictive outputs, and facilitating intricate decision-making processes. By leveraging sophisticated algorithms and machine learning methodologies, AI equips organizations with the capacity to process and interpret large-scale datasets, uncover meaningful operational trends, and derive actionable intelligence that can substantially enhance the quality of managerial decision-making [37, 38].

Meanwhile, the IoT extends the capabilities of digital systems by connecting physical devices, sensors, and machines to communication networks that continuously collect and exchange operational data [39, 40]. These connected devices provide real-time visibility into operational activities, allowing organizations to monitor equipment performance, track resource utilization, and detect anomalies that may affect operational stability.

By enabling continuous data collection from physical environments, IoT enhances the ability of organizations to maintain better control over operational processes [41].

The integration of AI and IoT creates a synergistic technological ecosystem in which real-time operational data generated by IoT devices can be analyzed intelligently using AI-driven analytics [42, 43]. This combination allows organizations to move beyond reactive management practices toward more predictive and proactive operational strategies. As a result, organizations can automate repetitive tasks, improve decision accuracy, and enhance the overall efficiency of operational processes. Consequently, AI and IoT play a crucial role in transforming traditional business operations into more intelligent, connected, and data-driven systems [44].

2.2. Operational Efficiency Enabled by AI and IoT Adoption

Operational efficiency represents one of the most important performance indicators for organizations seeking to optimize resource utilization and improve productivity. It refers to the ability of an organization to deliver products or services while minimizing resource consumption, operational costs, and process inefficiencies [45]. In highly competitive markets, organizations must continuously improve operational efficiency to remain competitive and sustain long-term growth. The adoption of AI technologies contributes significantly to operational efficiency by enabling automation, predictive analytics, and intelligent decision support. AI systems can analyze historical and real-time data to identify inefficiencies in operational processes, predict equipment failures, and optimize workflow scheduling. This predictive capability allows organizations to reduce downtime, minimize operational disruptions, and improve overall productivity [46].

Similarly, IoT technologies enhance operational efficiency by providing real-time insights into physical operations. Sensors embedded in machines, production equipment, and logistics systems continuously generate data related to performance conditions, environmental factors, and resource usage. This real-time information enables organizations to monitor operational activities more accurately, detect potential issues early, and implement corrective actions before disruptions occur. As a result, organizations can streamline processes, reduce waste, and improve the reliability of operational systems. When combined, AI and IoT technologies create an integrated operational environment where data-driven insights support continuous process optimization. The ability to collect real-time operational data and analyze it intelligently enables organizations to improve workflow coordination, optimize resource allocation, and enhance overall operational performance. Consequently, operational efficiency becomes a critical mechanism through which technology adoption contributes to improved organizational outcomes.

2.3. Technology-Driven Competitive Advantage

Competitive advantage denotes the capacity of an organization to attain superior performance relative to its market rivals by offering enhanced value to customers or by operating with greater efficiency. In contemporary business landscapes defined by swift technological transformation and heightened competitive intensity, organizations are compelled to engage in continuous innovation and strategic adaptation in order to preserve and sustain their competitive standing. The strategic adoption of digital technologies has therefore become a critical factor in building sustainable competitive advantage. AI and IoT technologies contribute to competitive advantage by enabling organizations to improve decision-making, enhance service quality, and respond more effectively to market dynamics. AI systems allow organizations to analyze customer behavior, predict demand patterns, and develop personalized services that enhance customer satisfaction. In addition, AI-driven analytics support strategic decision-making by identifying emerging market trends and potential opportunities for innovation [47].

At the same time, IoT technologies enhance organizational agility by providing real-time information about operational performance and environmental conditions. This continuous monitoring capability allows organizations to adjust operational strategies quickly in response to changing market conditions or operational disruptions. By improving responsiveness and operational transparency, IoT technologies strengthen an organization's ability to maintain consistent service quality and operational reliability. The integration of AI and IoT therefore provides organizations with powerful technological capabilities that support innovation, efficiency, and strategic flexibility. These capabilities allow organizations to differentiate themselves from competitors, develop more efficient operational processes, and respond more effectively to evolving market demands. As a result, the strategic implementation of AI and IoT plays a crucial role in enabling organizations to achieve and sustain long-term competitive advantage [48].

3. RESEARCH METHODOLOGY

This study employs a quantitative research approach to examine the influence of AI and IoT on operational efficiency and competitive advantage. Data were collected through a cross-sectional survey distributed to organizational executives and technology decision-makers who are involved in the implementation of AI and IoT. The collected data were analyzed using PLS-SEM to evaluate the relationships among the research variables. To provide a clearer overview of the methodological structure used in this study, the main components of the research design are summarized in Table 1.

Table 1. Research Design Summary

Research Component	Description
Research Approach	Quantitative research
Research Method	Cross-sectional survey
Respondents	Executives, technology managers, and organizational decision-makers
Sample Size	200 respondents
Sampling Technique	Purposive sampling
Data Collection Method	Online questionnaire
Measurement Scale	5-point Likert scale
Data Analysis Technique	Partial Least Squares Structural Equation Modeling (PLS-SEM)

The information presented in Table 1 outlines the fundamental methodological framework used in this research. These components collectively describe how the data were collected, measured, and analyzed to evaluate the relationships between AI adoption, IoT adoption, operational efficiency, and competitive advantage.

3.1. Research Design

This study adopts a quantitative research design to examine the associative relationships between technology adoption and organizational performance outcomes. A cross-sectional survey methodology was employed, as it facilitates the collection of data from respondents at a single point in time, thereby offering meaningful insights into the prevailing implementation of AI and IoT technologies within organizational contexts. The proposed research model is oriented toward investigating the manner in which AI and IoT adoption exert influence on operational efficiency and competitive advantage.

PLS-SEM was selected as the principal analytical technique, given its appropriateness for evaluating complex research models and its capacity to simultaneously assess both measurement models and the structural relationships among variables. This analytical approach enables the study to rigorously determine the magnitude and statistical significance of the hypothesized relationships delineated within the conceptual framework.

3.2. Research Participants, Sampling Procedure, and Data Gathering

The study population comprises executives, technology managers, and organizational decision-makers who are directly engaged in the deployment of AI and IoT technologies within their respective organizations. A purposive sampling strategy was utilized to ensure that the selected participants possessed adequate knowledge and firsthand experience pertaining to digital transformation initiatives. A total of 200 respondents took part in this study, drawn from organizations operating across multiple industry sectors, including manufacturing, services, technology, and retail.

Data collection was conducted by means of an online questionnaire disseminated through professional networks and digital communication channels. The instrument employed a five-point Likert scale to measure the primary research constructs, namely AI adoption, IoT adoption, operational efficiency, and competitive advantage. Prior to questionnaire completion, respondents underwent a screening process to verify that they held sufficient familiarity with the practical implementation of AI and IoT within their organizations. To provide further conceptual clarity regarding the key variables examined in this study, Table 2 presents the principal constructs incorporated into the research model.

The variables presented in Table 2 represent the key constructs examined in this research. These constructs form the basis for analyzing how the adoption of AI and IoT technologies influences operational efficiency and contributes to the development of competitive advantage within organizations.

Table 2. Research Variables

Variable	Description
Artificial Intelligence Adoption	The extent to which organizations utilize AI technologies for data analysis, automation, and decision support
Internet of Things Adoption	The degree to which organizations implement IoT devices for real-time monitoring and operational connectivity
Operational Efficiency	The ability of organizations to optimize resources, reduce operational costs, and improve workflow performance
Competitive Advantage	The capability of organizations to outperform competitors through innovation, responsiveness, and operational excellence

3.3. Variables, Instruments, and Measurement

This study examines four primary variables: AI adoption, IoT adoption, operational efficiency, and competitive advantage. All variables are measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The measurement indicators were designed to capture how digital technologies influence organizational performance and strategic outcomes. AI adoption focuses on the use of automation, advanced data analytics, and predictive insights to support decision-making processes. IoT adoption evaluates the extent to which organizations implement real-time monitoring and device connectivity within operational activities. Operational efficiency reflects the organization's ability to optimize processes through cost reduction and improved workflow speed, while competitive advantage represents the ability of organizations to strengthen market position through responsiveness and improved service quality.

To provide a clearer overview of the variables and measurement indicators used in this study, the operationalization of each construct is summarized in Table 3.

Table 3. Research Variables and Indicators

Variable	Indicators	Scale
AI Adoption	Automation, data analysis, predictive insights	Likert 1–5
IoT Adoption	Real-time monitoring, device connectivity	Likert 1–5
Operational Efficiency	Cost reduction, process improvement	Likert 1–5
Competitive Advantage	Responsiveness, service quality	Likert 1–5

The indicators presented in Table 3 describe how each research variable is measured to capture the influence of AI and IoT on organizational performance. AI adoption is assessed through indicators related to automation, data analysis, and predictive insights, reflecting how organizations utilize intelligent systems to streamline processes and support managerial decision-making. IoT adoption is measured through real-time monitoring and device connectivity, which indicate the extent to which interconnected devices enhance visibility and control over operational activities. Operational efficiency includes indicators such as cost reduction and process improvement, representing the organization's ability to optimize resources and minimize inefficiencies through technology use. Competitive advantage is evaluated through responsiveness and service quality, demonstrating how improvements in efficiency and technological capabilities enable organizations to differentiate themselves and strengthen their market position.

3.4. Data Analysis Procedure

Data analysis was performed utilizing SmartPLS software, commencing with the evaluation of the measurement model to establish construct reliability and validity through assessments of Composite Reliability, Cronbach's Alpha, Average Variance Extracted (AVE), and discriminant validity. Upon confirmation of measurement model adequacy, the structural model was subsequently examined by inspecting path coefficients, R^2 values, and effect sizes to determine the magnitude and direction of interrelationships among the research constructs. The bootstrapping procedure, employing 5,000 subsamples, was applied to evaluate the statistical significance of each proposed hypothesis. This analytical framework enables the study to comprehensively assess both the direct and mediating effects of AI and IoT adoption on organizational performance outcomes.

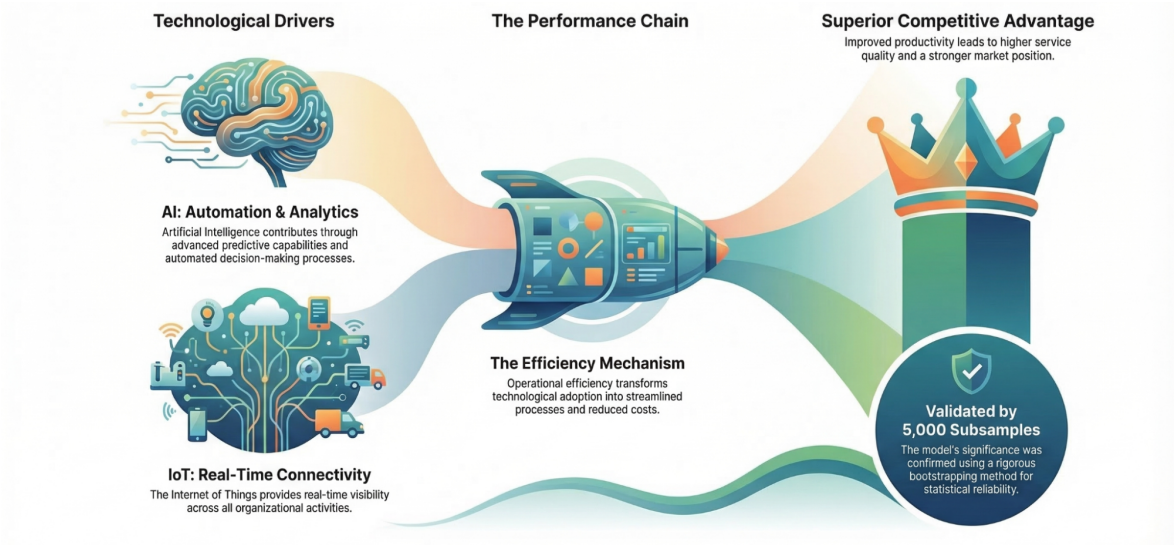

Figure 2. How AI & IoT Drive Performance

Figure 2 illustrates the core conceptual framework of this research, showing how AI and IoT function as key technological drivers that enhance operational efficiency, which subsequently strengthens competitive advantage. AI contributes through automation, advanced data analytics, and predictive capabilities, while IoT improves real-time visibility and connectivity across operational activities. Both technologies channel their impact toward operational efficiency, depicted at the center of the framework as the primary mechanism that transforms technological adoption into organizational improvements. From operational efficiency, arrows extend toward competitive advantage, emphasizing that streamlined processes, reduced costs, and improved productivity lead organizations to achieve superior responsiveness, higher service quality, and a stronger market position.

4. RESULTS AND DISCUSSION

The findings of this study reveal that the implementation of AI and IoT exerts a significant and favorable influence on both operational efficiency and competitive advantage. The structural model assessment conducted through PLS-SEM corroborates that both AI and IoT make substantial contributions to the enhancement of organizational performance by means of process automation, real-time operational monitoring, and data-informed decision-making. Furthermore, operational efficiency was found to serve as a significant mediating mechanism in reinforcing competitive advantage. These findings collectively suggest that organizations that successfully incorporate AI and IoT technologies are considerably better positioned to streamline operational processes, curtail operational expenditures, augment productivity levels, and respond more adeptly to the demands of dynamic and evolving market conditions.

4.1. Structural Model Results

The structural model was assessed by means of SmartPLS to establish the nature and direction of relationships among AI adoption, IoT adoption, operational efficiency, and competitive advantage. The analytical procedure centered on the examination of path coefficients, statistical significance levels, and the coefficient of determination (R^2) to gauge the explanatory capacity of the proposed research model. A comprehensive summary of the hypothesis testing outcomes is presented in Table 4.

The results presented in Table 4 show that all proposed hypotheses are supported. AI adoption significantly improves operational efficiency by enabling automation, predictive analytics, and enhanced data-driven decision-making. Similarly, IoT adoption positively influences operational efficiency through real-time monitoring and improved visibility of organizational resources. Furthermore, operational efficiency strongly affects competitive advantage, confirming its role as a key mechanism that translates technology adoption into improved organizational performance. To further evaluate the predictive strength of the model, the coefficient of determination (R^2) values for the endogenous variables are presented in Table 5.

Table 4. Structural Model Path Results

Hypothesis	Relationship	Path Coefficient	t-value	Result
H1	AI Adoption → Operational Efficiency	0.41	5.87	Supported
H2	IoT Adoption → Operational Efficiency	0.38	5.21	Supported
H3	Operational Efficiency → Competitive Advantage	0.52	6.14	Supported
H4	AI Adoption → Competitive Advantage	0.26	3.98	Supported
H5	IoT Adoption → Competitive Advantage	0.29	4.12	Supported

Table 5. Coefficient of Determination (R^2)

Variable	R^2 Value	Interpretation
Operational Efficiency	0.56	Moderate explanatory power
Competitive Advantage	0.64	Strong explanatory power

The R^2 values presented in Table 5 indicate that the model has substantial explanatory power. AI and IoT adoption jointly explain 56% of the variance in operational efficiency, while the combination of technology adoption and operational efficiency explains 64% of the variance in competitive advantage. These findings confirm that the proposed research model effectively captures the relationship between digital technology adoption and organizational performance outcomes.

4.2. Discussion on Technology Adoption and Organizational Performance

The obtained findings substantiate the research objective articulated in the abstract, affirming that the adoption of AI and IoT yields significant improvements across both operational and strategic dimensions. AI elevates organizational performance by enhancing the speed and precision of decision-making processes through the application of advanced data analytics and predictive capabilities. Concurrently, IoT augments operational visibility by facilitating continuous surveillance of devices, equipment, and operational environments via interconnected sensor networks and integrated systems.

When deployed in conjunction, AI and IoT collectively establish a synergistic technological ecosystem. IoT produces substantial volumes of real-time operational data, while AI furnishes the analytical capability necessary to convert this data into actionable intelligence. Such integration empowers organizations to streamline operational processes, minimize downtime, and optimize the utilization of available resources. Consequently, organizations are rendered capable of attaining greater operational stability and enhanced responsiveness in navigating the complexities of contemporary business activities.

These findings are in alignment with preceding studies that underscore the significance of digital transformation in advancing organizational performance. The assimilation of advanced technologies enables enterprises to transition from conventional management practices toward more data-driven and adaptive operational strategies.

4.3. Discussion on Operational Efficiency and Competitive Advantage

The results of this study confirm that operational efficiency serves as a key mediating factor linking technological adoption to competitive advantage. Organizations that successfully improve operational efficiency through AI and IoT technologies are able to reduce operational costs, accelerate processing times, and minimize inefficiencies in their operational workflows. These improvements enable organizations to deliver higher-quality services and respond more effectively to customer demands.

Improved operational efficiency also strengthens the strategic capabilities of organizations by enhancing productivity and operational reliability. As processes become more streamlined and resource utilization becomes more optimized, organizations gain the ability to focus on innovation, service improvement, and strategic differentiation. These capabilities are essential for maintaining competitiveness in increasingly dynamic business environments.

Furthermore, the direct impact of AI and IoT adoption on competitive advantage suggests that digital technologies not only improve internal operational processes but also contribute to broader strategic benefits. Organizations that leverage advanced technologies are better positioned to adapt to changing market conditions,

introduce innovative services, and maintain stronger relationships with customers. Consequently, the adoption of AI and IoT plays a critical role in enabling organizations to achieve sustainable competitive advantage in modern technology-driven markets.

5. MANAGERIAL IMPLICATIONS

The findings of this study provide several important managerial implications for organizations seeking to enhance performance through digital transformation initiatives. First, managers should prioritize the strategic adoption of AI and IoT as complementary technologies that support operational improvement and organizational competitiveness. Rather than implementing these technologies independently, organizations should focus on integrating AI-driven analytics with IoT-enabled real-time monitoring systems to create a more intelligent and responsive operational environment.

Second, successful implementation requires strong managerial commitment in terms of resource allocation, technological infrastructure, and workforce readiness. Managers should invest not only in advanced technological systems such as automation platforms, predictive analytics tools, and connected devices, but also in employee training programs that enhance digital competencies and promote technology acceptance within the organization. Establishing effective data governance policies and ensuring system compatibility across operational units are also critical to maximizing the benefits of AI and IoT adoption.

Third, organizations should leverage operational efficiency as a strategic capability that translates technological adoption into tangible organizational performance improvements. Managers are encouraged to continuously monitor operational workflows, identify inefficiencies, and utilize data-driven insights generated by AI and IoT systems to support faster and more accurate decision-making. By optimizing resource utilization, reducing operational costs, and improving process coordination, organizations can significantly enhance productivity and service quality.

Overall, the integration of AI and IoT technologies can help organizations build more agile, adaptive, and competitive operational structures. Managers who effectively align technological capabilities with organizational strategies will be better positioned to respond to market changes, improve operational performance, and sustain long-term competitive advantage in increasingly technology-driven business environments.

6. CONCLUSION

This study investigates the impact of AI and IoT on operational efficiency and competitive advantage within organizational settings. The findings affirm that the adoption of AI and IoT makes substantial contributions to the advancement of organizational performance. Both technologies foster operational efficiency through process automation, real-time operational monitoring, and data-informed decision-making capabilities. Moreover, operational efficiency was found to serve as a mediating variable in reinforcing competitive advantage, indicating that enhancements in internal organizational processes can translate into more robust strategic positioning. Additionally, the results disclose that AI and IoT adoption independently exerts a direct influence on competitive advantage, underscoring the pivotal role of digital technologies in enabling organizations to become more adaptive, productive, and responsive within dynamic and evolving business environments.

This research furnishes empirical evidence that the strategic assimilation of AI and IoT technologies supports the attainment of both operational and strategic organizational outcomes. Organizations that effectively harness these technologies are considerably better positioned to streamline operational processes, elevate productivity, and sustain competitive differentiation in increasingly technology-intensive markets. Notwithstanding its contributions, this study is subject to several limitations. The adoption of a cross-sectional research design constrains the capacity to observe temporal changes in technology adoption and its corresponding effects on organizational performance. Furthermore, the dependence on self-reported data introduces the possibility of respondent bias. The study sample is additionally confined to organizations that have already undertaken the implementation of AI and IoT technologies, which may potentially restrict the generalizability of the findings to organizations characterized by comparatively lower levels of digital maturity.

Subsequent research is encouraged to extend the scope of this study through the utilization of longitudinal data, with the aim of capturing the long-term ramifications of AI and IoT adoption on organizational performance. Future scholars may also consider exploring industry-specific contexts to elucidate how the impacts of technological adoption diverge across sectors such as manufacturing, services, and technology-oriented industries. In addition, the incorporation of supplementary variables including innovation capability, digital

readiness, organizational culture, and cybersecurity management could yield a more holistic understanding of the mechanisms through which digital technologies drive organizational transformation and the sustained attainment of competitive advantage.

7. DECLARATIONS

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7.2. Author Contributions

Conceptualization: VM; Methodology: LW; Software: MT; Validation: JZ and MR; Formal Analysis: VM and MT; Investigation: JZ; Resources: LW; Data Curation: MT; Writing (Original Draft Preparation): VM and MR; Writing (Review and Editing): VM and JZ; Visualization: MT; All authors, VM, LW, MT, JZ, MR, and RY, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

REFERENCES

[1] V. Serafimova and V. Vasilev, "Digital culture as a competitive advantage in the sustainable development of organizations," *Agora international journal of economical sciences*, vol. 18, no. 1, pp. 210–222, 2024.
[2] A. G. Kalandarovna and A. M. A. Qizi, "Development and increase of competitiveness of the organization," *ASEAN Journal of Educational Research and Technology*, vol. 2, no. 3, pp. 265–274, 2023.
[3] H. M. Sidik, E. S. Raharjo, and S. Anggiani, "Organizational design and competencies as sources of sustainable competitive advantage in a rapidly changing technological environment," *Jurnal Pendidikan Indonesia*, vol. 5, no. 12, p. 2125, 2024.
[4] A. Barreto, R. A. Hadikusumo, and W. Ruswandi, "Digital transformation as a catalyst for business performance and competitive dynamics in emerging economies," *The Journal of Academic Science*, vol. 2, no. 4, pp. 1228–1238, 2025.
[5] D. Jonas, E. Maria, I. R. Widiasari, U. Rahardja, T. Wellem *et al.*, "Design of a tam framework with emotional variables in the acceptance of health-based iot in indonesia," *ADI Journal on Recent Innovation*, vol. 5, no. 2, pp. 146–154, 2024.
[6] A. A. Bimantara, R. Nurfaizi, R. Ahsanitaqwim *et al.*, "Advancements and challenges in the implementation of 5g networks: A comprehensive analysis," *Journal of Computer Science and Technology Application*, vol. 1, no. 2, pp. 111–118, 2024.
[7] T. Van Hoang *et al.*, "Impact of integrated artificial intelligence and internet of things technologies on smart city transformation," *Journal of technical education science*, vol. 19, no. Special Issue 01, pp. 64–73, 2024.
[8] M. K. N. Kumar and M. S. Santhi, "Digital transformation through ai in the internet of things landscape: A business perspective," *Dr. TM Hemalatha*, p. 17.

[9] S. W. Dyatmika, B. Suyanto, E. Setijaningrum, A. Rizky, and T. Mkhize, "Enhancing brand loyalty through customer satisfaction strategies in digital business," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 556–566, 2025.

[10] S. Jayadatta, "A study on latest developments in artificial intelligence (ai) and internet of things (iot) in current context," *Journal of Applied Information Science*, vol. 11, no. 2, pp. 21–28, 2023.

[11] A. M. Ojeda, J. B. Valera, and O. Diaz, "Artificial intelligence of big data for analysis in organizational decision-making," *Global Journal of Flexible Systems Management*, vol. 26, no. 3, pp. 515–527, 2025.

[12] S. Vudugula, S. K. Chebrolu, M. Bhuiyan, and F. Z. Rozony, "Integrating artificial intelligence in strategic business decision-making: A systematic review of predictive models," *International Journal of Scientific Interdisciplinary Research*, vol. 4, no. 1, pp. 01–26, 2023.

[13] P. Anastasios and G. Maria, "Predictive ai in business intelligence enhancing market insights and strategic decision-making," *American Journal of Technology Advancement*, vol. 1, no. 8, pp. 72–90, 2024.

[14] M. Paramesha, N. Rane, and J. Rane, "Big data analytics, artificial intelligence, machine learning, internet of things, and blockchain for enhanced business intelligence," *Artificial Intelligence, Machine Learning, Internet of Things, and Blockchain for Enhanced Business Intelligence (June 6, 2024)*, 2024.

[15] R. Asaad, R. I. Ali, and S. Almufti, "Hybrid big data analytics: Integrating structured and unstructured data for predictive intelligence," *Qubahan Techno Journal*, vol. 1, no. 2, 2022.

[16] R. E. Browder, S. M. Dwyer, and H. Koch, "Upgrading adaptation: How digital transformation promotes organizational resilience," *Strategic Entrepreneurship Journal*, vol. 18, no. 1, pp. 128–164, 2024.

[17] V. Shelake, S. Fernandes, and S. Shrungare, "Ai-driven personalized movie recommendations: A content and sentiment-aware model for streaming and digital entrepreneurship," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 306–317, 2025.

[18] S. Angelopoulos, E. Bendoly, J. C. Fransoo, K. Hoberg, C. X. Ou, and A. Tenhiala, "Digital transformation in operations management: Fundamental change through agency reversal," *Journal of operations management, Forthcoming*, 2023.

[19] R. Rangegowda, "Strategic capacity planning in uncertain business environments: Challenges, adaptability, and technological integration," *OPERATIONS MANAGEMENT*, p. 72.

[20] D. S. Nazara, A. Sutrisno, N. Nersiwad, and M. Muslimin, "Digital transformation in operations management: Leveraging technology to improve business efficiency," *Journal of Operations Management*, vol. 1, no. 5, pp. 77–84, 2024.

[21] B. Tjahjono, D. Hermawan, S. Millah, and R. Evans, "Bridging the skills gap curriculum transformation for automation industries and the role of digital technopreneurship," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 650–662, 2025.

[22] A. S. Al Najjar and M. S. Qandeel, "Operational strategy, capabilities, and successfully accomplishing business strategy," *Journal of Applied Research in Technology & Engineering*, vol. 6, no. 1, pp. 1–11, 2025.

[23] H. Hokmabadi, S. M. Rezvani, and C. A. De Matos, "Business resilience for small and medium enterprises and startups by digital transformation and the role of marketing capabilities—a systematic review," *Systems*, vol. 12, no. 6, p. 220, 2024.

[24] G. Nicola and R. Setiawan, "Creating competitive advantage through digital innovation: Insights from startupreneurs in e-commerce," *Startupreneur Business Digital (SABDA Journal)*, vol. 3, no. 2, pp. 131–140, 2024.

[25] N. Iriani, A. Agustianti, R. Sucianti, A. Rahman, and W. Putera, "Understanding risk and uncertainty management: A qualitative inquiry into developing business strategies amidst global economic shifts, government policies, and market volatility," *Golden Ratio of Finance Management*, vol. 4, no. 2, pp. 62–77, 2024.

[26] R. Kask, L. Lawrence, and A. R. A. Zahra, "Evaluating the impact of digital technology adoption on business strategy transformation: An smartpls analysis in the e-commerce industry," *ADI Journal on Recent Innovation*, vol. 6, no. 1, pp. 81–88, 2024.

[27] M. N. Ayubi and A. Retnowardhani, "Optimizing learning experiences: A study of student satisfaction with lms in higher education," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 527–541, 2025.

[28] T. Kittappa, P. Priyadarsini, R. Muzhumathi, M. Akurati, R. Sakthiganapathy, and G. Ramachandran, "Artificial intelligence of sustainability and internet of things industry 4.0 automation applications," in

2024 4th International Conference on Sustainable Expert Systems (ICSES). IEEE, 2024, pp. 898–901.

[29] D. S. S. Wuisan, R. A. Sunardjo, Q. Aini, N. A. Yusuf, and U. Rahardja, "Integrating artificial intelligence in human resource management: A smartpls approach for entrepreneurial success," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 3, pp. 334–345, 2023.

[30] United Nations, "Goal 8: Decent work and economic growth," United Nations Department of Economic and Social Affairs, Sustainable Development, 2025, accessed: 30 October 2025. [Online]. Available: https://sdgs.un.org/goals/goal8

[31] O. A. Popoola, H. E. Adama, C. D. Okeke, and A. E. Akinoso, "Cross-industry frameworks for business process reengineering: Conceptual models and practical executions," *World Journal of Advanced Research and Reviews*, vol. 22, no. 01, pp. 1198–1208, 2024.

[32] C. Lukita, A. W. A. Rahman, I. N. Hikam, and U. Rahardja, "Integrating strategic management with sdg 10 for sustainable development and equity," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 638–649, 2025.

[33] D. Misnawati, B. Perdana, S. Ariana, N. Damayanti, and D. R. Saputra, "Filter bubble phenomenon on instagram and its impact on teenagers lifestyle and social interaction," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 3, pp. 973–985, 2025.

[34] N. Ul Amin and M. A. Khan, "Driving competitive advantage in the digital era: The role of dynamic capabilities, innovation, and leadership." *Dinasti International Journal of Economics, Finance & Accounting (DIJEFA)*, vol. 5, no. 5, 2024.

[35] H. Paimash, N. Biloshkurska, and S. Koberniuk, "Digital strategy for company development in a competitive environment," *Social Development: Economic and Legal Issues*, no. 1, pp. 45–55, 2025.

[36] V. Tebenko, N. Kutsai, M. Shashyna, O. Omelianenko, and I. Bakushevych, "Digital transformation in business: The impact of technology on efficiency, innovation and competitiveness." 2024.

[37] I. Martincevic, "The correlation between digital technology and digital competitiveness." *International journal for quality research*, vol. 16, no. 2, 2022.

[38] M. H. Kadim, A. Kadim, M. Muhtarom, and U. Rahardja, "Digital financial management adaptability for global market expansion," *International Journal of Cyber and IT Service Management (IJCITSM)*, vol. 6, no. 1, pp. 116–127, 2026.

[39] S. Massa, M. C. Annosi, L. Marchegiani, and A. Messeni Petruzzelli, "Digital technologies and knowledge processes: new emerging strategies in international business. a systematic literature review," *Journal of Knowledge Management*, vol. 27, no. 11, pp. 330–387, 2023.

[40] U. Rahardja, P. A. Sunarya, Q. Aini, S. Millah, and S. Maulana, "Technopreneurship in healthcare: Evaluating user satisfaction and trust in ai-driven safe entry stations," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 6, no. 3, pp. 404–417, 2024.

[41] A. Sunarya, R. A. Sunarjo, M. Abbas, O. A. Al-Kamari, and S. Maulana, "Ai-driven educational data analytics and intelligent tutoring in learning factory environments," *International Transactions on Education Technology (ITEE)*, vol. 4, no. 1, pp. 14–30, 2025.

[42] E. Erika, B. S. Riza, S. Maulana, and S. Rahagi, "Mapping the nexus of strategic management and sustainable development goals 12 with a focus on innovation: A bibliometric analysis," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 7, no. 1, pp. 71–84, 2025.

[43] U. Rahardja, Q. Aini, R. Supriati, and M. A. Al Hafiz, "Optimizing digital promotional graphic design strategies using the aida model," *ADI Journal on Recent Innovation*, vol. 7, no. 2, pp. 220–230, 2026.

[44] H. Gunawan, C. Lukita, T. Angreni, M. S. Hartawan, L. Sunarya, S. Maulana, and W. N. Wahid, "Blockchain-enabled tokenization for transparent and inclusive financing of sustainable infrastructure projects," in *2025 4th International Conference on Creative Communication and Innovative Technology (ICCIT)*. IEEE, 2025, pp. 1–5.

[45] A. Kanivia, H. Hilda, A. Adiwijaya, M. F. Fazri, S. Maulana, and M. Hardini, "The impact of information technology support on the use of e-learning systems at university," *International Journal of Cyber and IT Service Management (IJCITSM)*, vol. 4, no. 2, pp. 122–132, 2024.

[46] E. T. Rusmiati, L. Febrina, Y. Sari, and E. M. S. Sakti, "Adoption of ai driven ecological preaching systems using sem pls analysis," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 8, no. 1, pp. 284–295, 2026.

[47] M. Nurkanti, U. Rahardja, M. Lubis, and A. A. M. Shukri, "Deep learning-based biology learning with ethnopedagogy and local wisdom to support sustainable development goals," *Jurnal Pendidikan IPA In-*

donesia, vol. 15, no. 1, 2026.

[48] S. S. Wulandari, M. L. B. M. Diah, and A. Asari, "Digital proficiency and entrepreneurial mindset for sme success through market savvy and tech literacy," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 1, pp. 26–36, 2025.