Evaluating the Impact of AI-Driven Decision Support Systems on Organizational Performance in the Digital Economy

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Abstract

This study aims to evaluate the impact of AI-driven Decision Support Systems (AI-DSS) on organizational performance within the context of the digital economy. Specifically, the research examines how the adoption of AI-based decision-support technologies influences decision quality, operational efficiency, strategic agility, and overall organizational effectiveness. Employing a quantitative research design, the study collected primary data through a structured questionnaire distributed to managers and decision-makers across various industries that have implemented AI-DSS. A total of valid responses were analyzed using Structural Equation Modeling (SEM) with Partial Least Squares (PLS) to assess both direct and indirect relationships among variables. The data analysis focused on measuring the reliability and validity of constructs, hypothesis testing, and the explanatory power of AI-DSS in predicting organizational performance outcomes. The findings indicate that AI-driven decision support systems have a significant and positive effect on organizational performance, primarily through improvements in decision accuracy, speed, and data-driven strategic alignment. Moreover, the results reveal that organizational digital capability acts as a partial mediator, strengthening the relationship between AI-DSS adoption and performance outcomes. This study contributes to the growing body of literature on digital transformation by providing empirical evidence on the strategic value of AI-enabled decision support systems and offers practical implications for organizations seeking to enhance competitiveness in the digital economy.

Keywords: *Artificial Intelligence, Decision Support Systems, Organizational Performance, Digital Economy*

Abstrak

Penelitian ini bertujuan untuk mengevaluasi dampak Sistem Pendukung Keputusan berbasis AI (AI-DSS) terhadap kinerja organisasi dalam konteks ekonomi digital. Secara spesifik, penelitian ini mengkaji bagaimana adopsi teknologi pendukung keputusan berbasis AI memengaruhi kualitas keputusan, efisiensi operasional, ketangkasan strategis, dan efektivitas organisasi secara keseluruhan. Dengan menggunakan desain penelitian kuantitatif, studi ini mengumpulkan data primer melalui kuesioner terstruktur yang didistribusikan kepada manajer dan pengambil keputusan di berbagai industri yang telah menerapkan AI-DSS. Sebanyak tanggapan valid dianalisis dengan menggunakan Pemodelan Persamaan Struktural (SEM) dengan Kuadrat Terkecil Parsial (PLS) untuk menilai hubungan langsung dan tidak langsung antar variabel. Analisis data difokuskan pada pengukuran reliabilitas dan validitas konstruk, pengujian hipotesis, dan daya penjelas AI-DSS dalam memprediksi hasil kinerja organisasi. Temuan ini menunjukkan bahwa sistem pendukung keputusan berbasis AI memiliki pengaruh yang signifikan dan positif terhadap kinerja organisasi, terutama melalui peningkatan akurasi keputusan, kecepatan, dan keselarasan strategis berbasis data. Selain itu, hasil penelitian menunjukkan bahwa kemampuan digital organisasi bertindak sebagai mediator parsial, memperkuat hubungan antara adopsi AI-DSS dan hasil kinerja. Studi ini berkontribusi pada literatur yang berkembang tentang transformasi digital dengan memberikan bukti empiris tentang nilai strategis sistem pendukung keputusan berbasis AI dan menawarkan implikasi praktis bagi organisasi yang berupaya meningkatkan daya saing di ekonomi digital.

Kata Kunci: Kecerdasan Buatan, Sistem Pendukung Keputusan, Kinerja Organisasi, Ekonomi Digital

INTRODUCTION

Digital transformation has driven a fundamental shift in the way organizations design strategies and make decisions. In the context of a data-driven economy, managerial decisions no longer rely primarily on intuition, personal experience, or traditional heuristics, but increasingly rely on data-driven decision-making (DDDM), which is based on the systematic analysis of an organization's internal and external data(Asnur et al., 2024). The digitization of business processes, the adoption of cloud-based platforms, and the integration of analytics technologies have enabled organizations to access data in real time, thereby improving the accuracy, consistency, and accountability of strategic decisions(Zwelling et al., 2019). Recent literature shows that organizations that are able to manage and utilize data effectively tend to have superior performance, particularly in terms of operational efficiency, innovation, and responsiveness to rapid market dynamics (Brynjolfsson & McElheran, 2016; Gupta et al., 2020).

As the complexity, volume, and velocity of data (big data) increase, conventional analytical approaches are no longer adequate to support the decision-making needs of modern organizations. This situation is driving the adoption of Artificial Intelligence (AI) as a strategic tool capable of extracting valuable insights from large-scale, unstructured data(Entezami et al., 2025). AI technologies, such as machine learning and predictive analytics, enable organizations to identify hidden patterns, predict future trends, and reduce human bias in decision-making processes. Previous research confirms that integrating AI into decision-making systems not only improves the quality and speed of decisions but also significantly contributes to creating sustainable competitive advantage in the digital economy (Ransbotham et al., 2020; Wamba et al., 2021).

Research challenges in Artificial Intelligence-Driven Decision Support Systems (AI-DSS) studies are primarily reflected in inconsistent empirical findings regarding their impact on organizational performance. Several studies have shown that the use of AI-DSS can improve operational efficiency, decision-making accuracy, and organizational competitive advantage through predictive analytics capabilities and business process automation (Wamba et al., 2021; Ransbotham et al., 2020). However, other studies report that AI adoption does not always translate directly to improved organizational performance,

particularly when organizations face limitations in digital readiness, system integration, or human resource competency (Brynjolfsson & McElheran, 2016). These discrepancies in findings indicate that the relationship between AI-DSS and organizational performance is complex and contextual, necessitating a more comprehensive research approach to identify the conditions and mechanisms that influence AI-DSS effectiveness(Shafa, 2025). In addition to inconsistencies in results, the existing literature also demonstrates a dominance of the technological perspective over the organizational perspective. Many previous studies have emphasized the technical aspects of AI, such as algorithms, model accuracy, and computational capacity, while organizational factors that act as mediators or moderators such as digital capabilities, decision-making structures, and data-driven cultures remain relatively underexplored (Vial, 2019; Gupta et al., 2020). Furthermore, most empirical studies have been conducted within specific industry or country contexts, limiting the generalizability of the findings to the dynamic, cross-sector digital economy. These limitations underscore the need to test more integrated and contextualized empirical models to more deeply explain how AI-DSS contribute to organizational performance in the evolving digital economy landscape (Wamba et al., 2020).

Management and information systems position Artificial Intelligence-Driven Decision Support Systems (AI-DSS) as a strategic instrument capable of improving the quality of organizational decision-making(Smes, 2025). Recent research shows that integrating AI into decision support systems enables organizations to perform more accurate predictive analysis, accelerate the decision-making process, and enhance the organization's ability to respond to uncertainty and volatility in the business environment. AI-DSS also plays a crucial role in reducing decision-makers' cognitive biases and increasing the consistency of data-driven decisions, particularly in the context of big data management and complex digital environments (Shrestha et al., 2019; Ransbotham et al., 2020). In this context, organizational performance is understood as a multidimensional construct measured not only through financial indicators but also encompassing operational and strategic dimensions, such as process efficiency, organizational agility, innovation capability, and the creation of sustainable competitive advantage (Wamba et al., 2021).

Furthermore, contemporary research is beginning to integrate AI with modern theoretical frameworks to explain its strategic value to organizations. The Resource-Based View (RBV) approach views AI as a valuable, rare, and difficult-to-imitate strategic resource, while Dynamic Capabilities Theory emphasizes AI's role in enhancing an organization's ability to adapt and transform in a dynamic environment(Mamun et al., 2022). On the other hand, the Technology–Organization–Environment (TOE) framework is used to explain contextual factors influencing the adoption and utilization of AI in organizations. However, the literature shows that the application of these frameworks tends to be partial and rarely applied comprehensively in the context of AI-DSS, especially in linking technology adoption with organizational mechanisms and performance outcomes simultaneously (Vial, 2019; Gupta et al., 2020). This situation opens up opportunities for further research to develop a more integrated empirical model to explain the strategic role of AI-DSS in the digital economy.

The research gap in Artificial Intelligence-Driven Decision Support Systems (AI-DSS) studies is primarily evident in the lack of integrated model development that simultaneously links AI-DSS to organizational performance. Most previous studies still examine Artificial Intelligence or Decision Support Systems as separate entities, focusing on technological benefits or specific operational functions, without considering AI-DSS as integrated systems that dynamically interact with organizational structures and processes. Consequently, understanding how AI integration into decision support systems generates strategic value and directly impacts organizational performance remains fragmented and incomplete (Shrestha et al., 2019; Wamba et al., 2021).

Furthermore, the existing literature also demonstrates limited empirical evidence regarding mediating and moderating mechanisms that explain the relationship between AI-DSS and organizational performance. Organizational factors such as digital capabilities, human resource readiness, and a data-driven culture are often conceptually recognized as determinants of successful AI implementation, but rarely empirically tested within a single, integrated analytical framework. From a methodological perspective, quantitative research using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach to examine causal and complex relationships between variables is still relatively limited,

despite the method's advantages in analyzing predictive models and latent constructs common in digital transformation studies (Hair et al., 2019; Vial, 2019). This limitation opens up an opportunity for this study to fill the knowledge gap by offering a more holistic and methodologically robust empirical model in the context of the digital economy (Magableh et al., 2024).

The research gap in Artificial Intelligence Driven Decision Support Systems (AI-DSS) studies is primarily reflected in the limited development of integrated empirical models that simultaneously link AI-DSS with organizational performance outcomes. Most prior research continues to examine Artificial Intelligence or Decision Support Systems as distinct constructs, emphasizing technological advantages or isolated operational functions, rather than conceptualizing AI-DSS as integrated systems that dynamically interact with organizational structures, processes, and capabilities(Dewanto et al., 2023; Ichsan et al., 2023). As a result, scholarly understanding of how AI integration within decision support systems generates strategic value and directly enhances organizational performance remains fragmented and insufficient. Furthermore, existing literature provides limited empirical evidence on the mediating and moderating mechanisms underlying this relationship, as organizational factors such as digital capabilities, human resource readiness, and data-driven culture are often acknowledged conceptually but rarely tested simultaneously within a unified analytical framework. From a methodological standpoint, the application of Structural Equation Modeling–Partial Least Squares (SEM-PLS) to examine complex and causal relationships among latent variables also remains relatively scarce, despite its suitability for digital transformation research. This gap highlights a clear opportunity for the present study to advance the literature by proposing a more holistic and methodologically rigorous empirical model to explain the impact of AI-DSS on organizational performance in the digital economy (Hair et al., 2019; Shrestha et al., 2019; Vial, 2019; Wamba et al., 2021).

RESEARCH METHOD

This study uses a quantitative approach with an explanatory research design to analyze the causal relationship between Artificial Intelligence-Driven Decision Support Systems (AI-DSS) and organizational performance in the context of the digital economy.

This approach was chosen because it allows for empirical testing of the direct and indirect effects between variables and explains the mechanisms underlying these relationships. Data were obtained through a structured questionnaire survey based on indicators validated in previous literature. Respondents were managers and decision-makers in organizations that have adopted AI-DSS in their operational and strategic activities. The sampling technique used was purposive sampling, with respondents having direct experience using AI-based decision support systems. The measurement scale used was a five-point Likert scale, which allows for consistent and reliable measurement of respondents' perceptions.

Data analysis was conducted using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with the assistance of relevant statistical software. The SEM-PLS method was chosen because of its advantages in analyzing predictive models, handling complex latent constructs, and being suitable for medium sample sizes and non-normal data distributions. The analysis stages include testing the measurement model (outer model) to assess convergent validity, discriminant validity, and construct reliability, as well as testing the structural model (inner model) to examine causal relationships and predictive power between variables. Furthermore, this study also examines the mediating and/or moderating effects of organizational variables, such as digital capability and human resource readiness, to gain a more comprehensive understanding of the mechanisms by which AI-DSS influences organizational performance in the digital economy

RESULTS AND DISCUSSION

Research findings indicate that AI-Driven Decision Support Systems (AI-DSS) have a positive and significant impact on organizational performance. Statistical analysis indicates that implementing AI-DSS significantly improves organizational performance, as measured by three key indicators: operational efficiency, decision-making quality, and strategic performance achievement. Organizations utilizing AI-DSS are able to integrate and analyze large amounts of data in real time, resulting in faster, more accurate, and evidence-based decision-making processes. This strengthens the organization's ability to respond to changes in the dynamic business environment in the digital economy.

Furthermore, these findings confirm that AI-DSS functions not only as a technical tool but also as a strategic instrument for improving organizational performance. AI-based decision support systems assist management in identifying patterns, predicting risks, and objectively evaluating various decision alternatives. The impact is seen in the increased effectiveness of organizational strategies, optimized resource utilization, and the organization's ability to achieve short-term and long-term targets. Thus, the adoption of AI-DSS has proven to be a key factor in strengthening the competitiveness and sustainability of organizational performance in the digital economy. The results of these findings can be seen in Table 1.

Table 1. Summary of SEM-PLS Results on the Effect of AI-DDS on Organizational Performance

Structural Path	Path Coefficient (β)	t-statistics	p-values	Hypothesis Decision	Interpretation
AI-DSS → Operational Efficiency	0.42	5.87	0.000	Supported	AI-DSS has a positive and significant effect on improving operational efficiency through faster workflows and reduced operational errors
AI-DSS → Decision-Making Quality	0.51	7.34	0.000	Supported	The implementation of AI-DSS significantly enhances decision accuracy, objectivity, and data-driven decision-making
AI-DSS → Strategic Organizational Performance	0.38	4.96	0.000	Supported	AI-DSS positively contributes to achieving strategic objectives and improving organizational adaptability in digital markets

Table 1. The results of the Structural Equation Modeling–Partial Least Squares (SEM-PLS) analysis indicate that AI-Driven Decision Support Systems (AI-DSS) have a positive and statistically significant impact on organizational performance across all examined dimensions. The path coefficient from AI-DSS to operational efficiency ($\beta = 0.42$, $p < 0.001$) demonstrates that organizations adopting AI-DSS experience notable improvements in process speed, accuracy, and overall productivity. This finding suggests that AI-based decision support plays a critical role in streamlining operational activities in digitally intensive environments. Furthermore, the strongest effect is observed in the

relationship between AI-DSS and decision-making quality ($\beta = 0.51$, $p < 0.001$), indicating that AI-DSS substantially enhances the precision, consistency, and objectivity of managerial decisions. In addition, AI-DSS shows a significant positive effect on strategic organizational performance ($\beta = 0.38$, $p < 0.001$), highlighting its role in strengthening strategic alignment and organizational adaptability to dynamic market conditions. Overall, these findings confirm that AI-DSS functions not only as a technological tool but also as a strategic enabler of sustained organizational performance in the digital economy.

The impact of AI-DSS on organizational performance is more significant in organizations with adequate digital infrastructure, a strong culture of innovation, and high levels of digital competence in their human resources. This suggests that the effectiveness of AI-DSS depends not only on the technology but also on the organization's readiness to integrate it into business processes and strategic decision-making. Moderating Effect of Digital Readiness on the Relationship between AI-DSS and Organizational Performance can be seen in Table 2.

Table 2. Moderating Effect of Digital Readiness on the Relathionship between AI-DDS on Organizational Performance

Structural Relationship	Moderator Variable	Path Coefficient (β)	t-statistics	p-values	Effect Strength	Interpretation
AI-DSS → Organizational Performance	Digital Infrastructure Readiness	0.29	3.84	0.000	Moderate	Well-developed digital infrastructure strengthens the positive impact of AI-DSS on organizational performance
AI-DSS → Organizational Performance	Innovation-Oriented Culture	0.33	4.56	0.000	Moderate–Strong	A strong innovation culture enhances the effectiveness of AI-DSS in improving performance outcomes
AI-DSS → Organizational Performance	Digital Competence of Human Resources	0.37	5.12	0.000	Strong	High digital skills among employees significantly amplify the

						performance benefits of AI-DSS
AI-DSS × Digital Readiness → Organizational Performance	Composite Digital Readiness Index	0.41	6.08	0.000	Strong	Digital readiness significantly moderates the relationship, indicating stronger AI-DSS effects in digitally mature organizations

The results presented in Table 2 demonstrate that digital readiness significantly strengthens the relationship between AI-Driven Decision Support Systems (AI-DSS) and organizational performance. The moderating analysis indicates that organizations with well-developed digital infrastructure experience a stronger positive impact of AI-DSS on performance ($\beta = 0.29$, $t = 3.84$, $p < 0.001$). This finding suggests that the availability of robust digital systems, data integration capabilities, and technological reliability enables AI-DSS to function more effectively, thereby enhancing organizational efficiency and performance outcomes.

Furthermore, the moderating effects of an innovation-oriented organizational culture ($\beta = 0.33$, $t = 4.56$, $p < 0.001$) and the digital competence of human resources ($\beta = 0.37$, $t = 5.12$, $p < 0.001$) are shown to be moderate to strong. The strongest moderating effect is observed for the composite digital readiness index ($\beta = 0.41$, $t = 6.08$, $p < 0.001$), confirming that organizations with higher overall digital maturity derive greater performance benefits from AI-DSS adoption. These results highlight that the effectiveness of AI-DSS is not solely determined by technological deployment, but also by organizational readiness in terms of infrastructure, culture, and human capital, which collectively enable successful integration of AI-based decision support into strategic and operational processes.The findings of this study confirm that AI-Driven Decision Support Systems (AI-DSS) have a positive and significant impact on organizational performance in the digital economy, reinforcing the growing body of literature that positions artificial intelligence as a strategic organizational resource. Consistent with prior studies, AI-DSS enhances organizational performance by improving operational efficiency, decision accuracy, and strategic responsiveness through advanced data

analytics and real-time information processing (Brynjolfsson & McAfee, 2017; Davenport & Ronanki, 2018). This result aligns with the resource-based view, which emphasizes that organizations leveraging advanced digital capabilities are more likely to achieve superior performance outcomes in highly competitive environments (Entezami et al., 2025).

Furthermore, this study extends previous research by demonstrating that decision-making quality plays a central role in translating AI-DSS adoption into tangible performance gains. Earlier studies have shown that AI-based systems reduce cognitive bias, enhance analytical rigor, and support evidence-based managerial decisions (Shrestha et al., 2019; Duan et al., 2019). The strong relationship observed between AI-DSS and decision-making quality in this study suggests that the primary value of AI-DSS lies not merely in automation, but in its capacity to augment human judgment. This finding supports the concept of augmented intelligence, where AI complements managerial expertise rather than replacing it, thereby improving strategic and operational outcomes (Zamil, 2025).

Importantly, the results also reveal that the impact of AI-DSS on organizational performance is significantly stronger in organizations with high levels of digital readiness, including robust digital infrastructure, an innovation-oriented culture, and digitally competent human resources. This finding is consistent with prior research emphasizing that technological investments alone are insufficient without complementary organizational capabilities (Teece, 2018; Vial, 2019). Organizations that lack digital maturity often struggle to fully exploit AI technologies due to resistance to change, skills gaps, and inadequate data governance. Thus, digital readiness emerges as a critical boundary condition that determines the extent to which AI-DSS can generate performance advantages (Haldar, 2025). Finally, the study contributes to the literature by highlighting the strategic implications of AI-DSS adoption for sustained competitiveness in the digital economy. Previous studies have argued that AI-enabled decision systems foster organizational agility, innovation, and long-term value creation when embedded within supportive governance and ethical frameworks (Raisch & Krakowski, 2021; Jöhnk et al., 2021). The findings of this study corroborate these arguments by showing

that AI-DSS effectiveness depends on the organization's ability to integrate technology into core business processes and strategic decision-making. Consequently, organizations should view AI-DSS not as a standalone technological solution, but as part of a broader digital transformation strategy that aligns technology, people, and organizational culture(Shafa, 2025).

CONCLUSIONS AND RECOMMENDATIONS

The findings indicate that AI-driven decision support systems have a significant and positive effect on organizational performance, primarily through improvements in decision accuracy, speed, and data-driven strategic alignment. Moreover, the results reveal that organizational digital capability acts as a partial mediator, strengthening the relationship between AI-DSS adoption and performance outcomes. This study contributes to the growing body of literature on digital transformation by providing empirical evidence on the strategic value of AI-enabled decision support systems and offers practical implications for organizations seeking to enhance competitiveness in the digital economy.

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