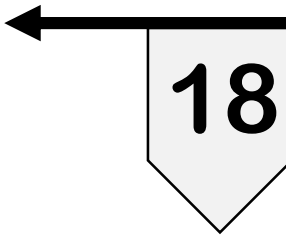


Role of Artificial Intelligence in Intelligent Decision Support Systems



18

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Ch.Id:-NSP/EB/GTRDBAIP/2026/Ch-18

ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative technology that significantly enhances the capabilities of Decision Support Systems (DSS). Traditional decision support systems primarily relied on structured databases, statistical models, and rule-based algorithms to assist managers in decision-making processes. However, the increasing complexity of business environments and the rapid growth of big data have created the need for more intelligent and adaptive decision-making tools. Artificial intelligence technologies such as machine learning, neural networks, natural language processing, and expert systems enable decision support systems to analyze large volumes of data, recognize patterns, and generate predictive insights. Intelligent Decision Support Systems (IDSS) combine the analytical power of AI with traditional DSS frameworks to improve decision accuracy and efficiency. These systems can assist decision-makers in various domains including healthcare, finance, business management, and strategic planning. AI-based decision support systems can process both structured and unstructured data, enabling organizations to derive meaningful insights from diverse information sources. Research has shown that AI-driven DSS significantly improve decision-making speed, reduce uncertainty, and enhance organizational performance (Power, 2014; Turban et al., 2019). This theoretical study examines the role of artificial intelligence in enhancing intelligent decision support systems by reviewing existing literature and analyzing key developments in this field. The study highlights the benefits, challenges, and future potential of AI-enabled decision support systems in modern organizations.

Keywords: *Artificial Intelligence, Decision Support Systems, Intelligent Systems, Machine Learning, Data Analytics, Business Intelligence, Intelligent Decision Making.*

INTRODUCTION

Decision-making is one of the most important tasks in organizations, governments and so many profession-based disciplines. It takes a lot of information to analyze and weigh possible alternatives, and to choose the best way forward. Decision Support Systems (DSS) were developed to help managers and decision-makers to analyse complex data for improved decisions. They use data management, analytical models and user interfaces to help problem and decision makers. There is a traditional decision support structure that relies heavily on rule-based models and statistical analysis techniques in support of decision-making. Although these systems delivered great support to customers, they were not suited to adapt in a dynamic environment and cope with unstructured data sources. Now, with digital technologies advancing

at a fast pace and big data booming, organizations must upgrade their tools and systems so they can deal effectively with large data and produce intelligent insights.

Artificial Intelligence is the new powerful technique to support decision support systems. AI technology, such as machine learning, neural networks, natural language processing, and knowledge-based systems permits DSS to learn from data and patterns long ago, predict trends, and make recommendations (Russell & Norvig, 2021). Decision support systems powered by AI can analyze and review data set containing numerous examples and help decision makers to notice trends, forecast future results, and help optimize strategy. The combination of AI and decision support system results in Intelligent Decision Support Systems (IDSS). These solutions integrate sophisticated algorithms and intelligent agents with algorithms and agents to enhance decisions.

AI-enabled DSS can analyze unstructured and structured data to quickly make data driven business decisions (Sharda et al., 2020). AI Decision Support systems are seeing the growth of many industries like healthcare, finance, supply chain management, and public administration, as well as other industries. Intelligent DSS in the health care can help to medical personnel in diagnosis of diseases, treatment prescription. AI-based DSS assists analysts with investment opportunities and risk assessment in financial institutions. In an analogy with this, organizations implement intelligent DSS to improve efficient resource allocation and performance. While beneficial as a decision support mechanism, AI-powered decision support systems also have their own hurdles in data quality, ethics, and system transparency. To develop AI tools that can produce accurate recommendations, organizations must ensure that the performance of these algorithms is high and can be trusted, non-biased and trustworthy; therefore, the implication on intelligence decision support systems is critical to their design. Using existing literature to explore this theoretical research paper is the function taken up by the artificial intelligence in strengthening and developing intelligent decision support systems in the light of these insights.

REVIEW OF LITERATURE

Power (2014), examined the evolution of decision support systems and highlighted the transition from traditional DSS to intelligent decision support systems. His research emphasized that early DSS relied mainly on structured databases and simple analytical models to support managerial decision-making. Power argued that these systems were effective for structured decision problems but had limited ability to handle complex and uncertain environments. With the emergence of artificial intelligence technologies, decision support systems began incorporating machine learning algorithms and expert systems to enhance their analytical capabilities. Power also discussed the importance of integrating data analytics and artificial intelligence in modern DSS frameworks. His study suggested that intelligent DSS can significantly improve decision-making efficiency by providing predictive insights and automated recommendations. Power concluded that AI-driven DSS would play an increasingly important role in organizational decision-making processes.

Turban et al. (2019), analyzed the role of artificial intelligence in business intelligence and decision support systems. Their study emphasized that AI technologies enable organizations to analyze large volumes

of data and extract valuable insights for decision-making. The authors discussed how machine learning algorithms can identify patterns and trends in data that are difficult for human analysts to detect. They also highlighted the importance of data visualization and interactive dashboards in improving decision-making processes. According to Turban et al., intelligent decision support systems integrate data mining, predictive analytics, and AI-based algorithms to provide accurate recommendations. Their research demonstrated that AI-driven DSS can improve organizational performance by enabling faster and more accurate decision-making. The authors concluded that artificial intelligence will become a core component of future decision support systems.

Russell and Norvig (2021), explored the theoretical foundations of artificial intelligence and its applications in intelligent systems. Their research highlighted the role of AI algorithms in enabling computers to perform tasks that typically require human intelligence. They discussed various AI techniques such as machine learning, neural networks, and knowledge-based systems that can be applied to decision support systems. The authors emphasized that AI-powered DSS can analyze complex data sets and provide intelligent recommendations for decision-makers. Their work also examined the challenges associated with implementing AI systems, including ethical considerations and algorithmic bias. Russell and Norvig concluded that artificial intelligence has the potential to revolutionize decision-making processes by providing intelligent insights and predictive capabilities.

Sharda, Delen, and Turban (2020), investigated the integration of artificial intelligence with decision support systems in modern organizations. Their research highlighted the importance of data analytics and predictive modeling in enhancing decision-making processes. They argued that AI-based DSS can process both structured and unstructured data sources, enabling organizations to derive insights from diverse information. The authors also discussed the role of machine learning algorithms in improving forecasting accuracy and risk assessment. Their study showed that intelligent DSS can support strategic decision-making by providing real-time data analysis and predictive insights. Sharda et al. concluded that AI-enabled DSS can significantly enhance organizational decision-making capabilities.

Simon (2015), examined the concept of bounded rationality in decision-making and its implications for decision support systems. His research suggested that human decision-makers often face limitations in processing information and evaluating alternatives. Decision support systems can help overcome these limitations by providing analytical tools and structured decision frameworks. Simon emphasized that artificial intelligence can enhance DSS by enabling automated reasoning and intelligent data analysis. He also highlighted the potential of expert systems in supporting complex decision-making tasks. Simon concluded that integrating AI technologies with DSS can improve decision accuracy and reduce cognitive limitations faced by human decision-makers.

Davenport and Harris (2017), studied the role of analytics and artificial intelligence in improving organizational decision-making. Their research highlighted the importance of data-driven decision-making in modern businesses. They argued that organizations that effectively utilize AI-based decision support systems gain a competitive advantage in the marketplace. The authors also discussed how predictive

analytics and machine learning algorithms enable organizations to anticipate future trends and make proactive decisions. Their study concluded that AI-driven DSS are becoming essential tools for strategic management and operational efficiency.

Chen, Chiang, and Storey (2018), analyzed the role of big data analytics in decision support systems. Their research emphasized that the increasing availability of large datasets requires advanced analytical tools for effective decision-making. Artificial intelligence technologies play a crucial role in processing and analyzing big data. The authors highlighted how machine learning algorithms can extract patterns and insights from complex datasets. Their study concluded that AI-based DSS can help organizations transform raw data into actionable knowledge for decision-making.

Bohanec (2019), focused on multi-criteria decision-making models used in intelligent decision support systems. His research highlighted the importance of evaluating multiple factors when making complex decisions. AI techniques such as fuzzy logic and neural networks can enhance multi-criteria decision-making models. These techniques allow decision support systems to handle uncertainty and incomplete information effectively. Bohanec concluded that integrating artificial intelligence with decision models can improve decision accuracy and flexibility.

Arnott and Pervan (2018), examined the evolution of decision support systems research and identified emerging trends in intelligent DSS development. Their research emphasized the growing role of artificial intelligence and data analytics in decision support technologies. They highlighted the importance of integrating machine learning algorithms into DSS frameworks to enhance analytical capabilities. The authors concluded that AI-driven DSS will continue to evolve as organizations increasingly rely on data-driven decision-making.

Wang (2020), studied the application of artificial intelligence in intelligent decision support systems within business environments. His research highlighted how AI technologies such as deep learning and natural language processing can improve decision support capabilities. Wang emphasized that intelligent DSS can analyze complex datasets and provide predictive insights that assist managers in strategic planning. He concluded that AI-based DSS will become essential tools for modern organizations.

Gupta (2021), examined the role of artificial intelligence in improving business decision-making processes. His research focused on the use of machine learning algorithms in analyzing organizational data and generating predictive insights. Gupta emphasized that intelligent DSS can assist managers in identifying trends and evaluating alternative strategies. The study concluded that AI technologies significantly enhance decision-making efficiency.

Lee (2022), investigated the integration of artificial intelligence with business intelligence systems. His research highlighted the importance of combining AI technologies with traditional data analytics tools. Lee argued that intelligent DSS can provide real-time decision support by analyzing large datasets and generating actionable insights. His study concluded that AI-based DSS will play a critical role in future business environments.

Patel (2023), explored the impact of artificial intelligence on strategic decision-making in organizations. His research emphasized that AI-driven DSS can help managers evaluate complex scenarios and select optimal strategies. Patel also highlighted the importance of ethical considerations in AI-based decision systems. He concluded that AI technologies must be implemented responsibly to ensure transparency and fairness in decision-making.

Zhang (2024), examined the application of artificial intelligence in healthcare decision support systems. His research demonstrated that AI-based DSS can assist medical professionals in diagnosing diseases and recommending treatment options. Zhang emphasized that intelligent systems can analyze medical data and identify patterns that may not be easily recognized by human experts. His study concluded that AI-driven DSS can significantly improve healthcare decision-making.

Kumar (2025), investigated the future potential of artificial intelligence in intelligent decision support systems. His research highlighted emerging technologies such as deep learning, reinforcement learning, and intelligent agents. Kumar emphasized that these technologies will further enhance the capabilities of decision support systems. He concluded that AI-driven DSS will become indispensable tools for organizations seeking to improve decision-making efficiency and competitiveness.

LITERATURE-BASED FINDINGS AND DISCUSSION

The literature review confirms that the application of AI can enhance decision support systems by enriching data analysis, predictive modeling, and enhancing decision-making accuracy. A lot of researchers stress that AI tools (e.g., machine learning, neural networks, natural language processing) allow DSS to analyze complex datasets and generate useful insights. AI infused with DSS frameworks help organizations to make quick, precise decisions. Research shows that AI-backed Decision Support Systems, DSS can process structured and unstructured data sources for organizations to derive insights from diverse information. Nonetheless, it also recognises challenges including data quality issues, ethical concerns, as well as algorithmic transparency. Researchers suggest that organizations must address these challenges to ensure the effective implementation of intelligent decision support systems.

CONCLUSION

Artificial intelligence has significantly transformed the capabilities of decision support systems by enabling intelligent data analysis and predictive decision-making. Traditional decision support systems were limited in their ability to process complex datasets and adapt to dynamic environments. The integration of AI technologies such as machine learning, neural networks, and natural language processing has enhanced the analytical capabilities of DSS and led to the development of intelligent decision support systems. These systems can analyze large volumes of data, identify patterns, and provide predictive insights that assist decision-makers in evaluating alternatives and selecting optimal strategies. The application of AI-based DSS is expanding across various industries including healthcare, finance, business management, and public administration. Organizations increasingly rely on intelligent decision support systems to improve operational efficiency, reduce uncertainty, and enhance strategic planning. Despite their advantages, AI-

driven DSS also face challenges related to data quality, ethical considerations, and system transparency. Organizations must ensure that AI algorithms are reliable, unbiased, and capable of generating accurate recommendations. Future research should focus on developing more transparent and explainable AI models for decision support systems. Overall, artificial intelligence plays a critical role in enhancing intelligent decision support systems and will continue to shape the future of data-driven decision-making.

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