



International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206

Volume 8, Issue 10, October 2025



**International Journal of Multidisciplinary Research in
Science, Engineering and Technology (IJMRSET)**
(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

AI-Driven Decision Support: A Systematic Review of Machine Learning Models in Organizational Intelligence Systems

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ABSTRACT: Artificial Intelligence (AI) and Machine Learning (ML) are transforming how organizations make decisions and adapt to complex, data-driven environments. This systematic review investigates ten peer-reviewed studies published between 2020 and 2025 that explore the integration of machine learning in decision support systems (DSS) and its influence on organizational intelligence. Following the PRISMA 2020 framework, the study synthesizes insights from diverse sectors such as healthcare, management, and manufacturing. Results reveal three dominant trends: (1) the evolution of hybrid human–AI intelligence, (2) the growing demand for ethical and explainable AI, and (3) the role of ML in enhancing resilience and adaptive learning. The review proposes a conceptual model emphasizing transparency, collaboration, and continuous feedback between humans and intelligent systems. This study contributes to developing responsible and intelligent decision ecosystems aligned with ethical governance and sustainable innovation.

I. INTRODUCTION

Organizations today face volatile and data-intensive environments that require precise and adaptive decision-making. Traditional decision support systems (DSS) relied on predefined rules, limiting their scalability and flexibility. The integration of AI and ML has transformed DSS into intelligent frameworks capable of self-learning and generating adaptive insights. This integration allows institutions to convert raw data into actionable intelligence, fostering dynamic organizational growth and competitive advantage.

As stated by Shrestha, Krishna, and von Krogh [9], AI amplifies managerial cognition rather than replacing it, establishing a new partnership between human decision-makers and algorithms. Similarly, Wijnhoven [1] described this interaction as “intelligence amplification,” where continuous feedback between humans and AI promotes collective learning and adaptation. The need for transparency and trust remains critical. Studies such as Sturm et al. [3] and Langer et al. [4] highlighted that AI recommendations are only effective when accompanied by explainable and accountable mechanisms. These human–AI dynamics form the foundation of organizational intelligence, where decision-making evolves from reactive responses to adaptive strategies.

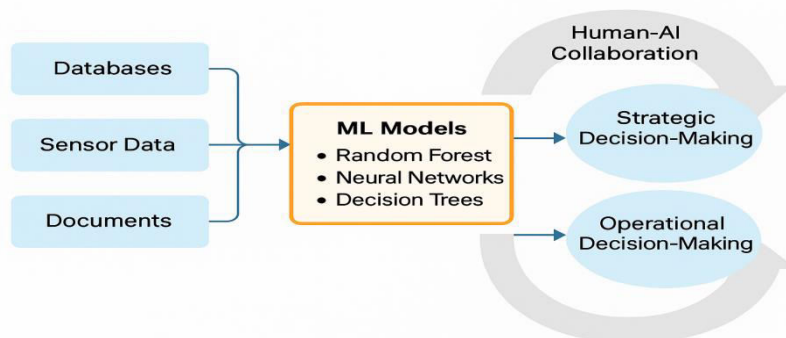


Figure 1: Conceptual Overview of AI-Driven Organizational Intelligence Ecosystem



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The conceptual overview illustrates how data, algorithms, and human expertise converge into a unified decision-making ecosystem. Data sources ranging from structured to unstructured feed into ML models such as Random Forests, Neural Networks, and Decision Trees. These models generate actionable insights that are refined through human judgment and ethical governance layers, resulting in transparent and resilient decision processes.

This study aims to synthesize current literature on AI-driven DSS applications, emphasizing hybrid intelligence, ethical explainability, and organizational adaptability as key outcomes for sustainable digital transformation.

II. LITERATURE REVIEW

The literature demonstrates that machine learning models are central to modern DSS applications across industries. AI-based systems enhance decision-making efficiency, predictive accuracy, and operational resilience. Studies from 2020 to 2025 consistently show that AI adoption fosters hybrid collaboration between humans and machines [1][2][3].

Wijnhoven [1] examined how clinical DSS systems support organizational learning through AI feedback loops. Jaiswal et al. [2] demonstrated the transformative role of big data analytics in insurance, where ML algorithms predict customer behavior and operational risks. Sturm et al. [3] and Langer et al. [4] explored human factors such as trust and transparency, emphasizing that excessive automation may lead to disengagement if explainability is lacking.

Ewertowski et al. [5] introduced machine learning frameworks for assessing organizational resilience, while Kovari [6] argued for balancing accuracy and ethical accountability in AI governance. Ali et al. [7] integrated ML with multi-criteria decision-making (MCDM) methods, promoting interpretability and stakeholder participation. Leewis et al. [8] highlighted decision mining as a technique to enhance operational workflows, and Shrestha et al. [9] positioned deep learning as a cognitive amplifier. Soori et al. [10] reviewed AI-DSS in Industry 4.0, demonstrating its value in predictive manufacturing and logistics.

Relevance to current Research

The reviewed studies collectively contribute to understanding how AI-DSS enhance transparency, adaptability, and organizational intelligence. Their combined insights establish the groundwork for this review's proposed conceptual framework integrating ethical explainability and human collaboration.

No.	Paper Title	Author Name	Key Points	Remark
1	Organizational Learning for Intelligence Amplification	Wijnhoven, F. (2022)	Examines AI adoption and organizational learning via DSS.	Basis for adaptive learning mechanisms.
2	Big Data and Machine Learning-Based Decision Support Systems	Jaiswal, A. et al. (2024)	Uses ML for predictive and risk analytics.	Shows operational intelligence and forecasting.
3	Machine Learning Advice in Managerial Decision-Making	Sturm, B. et al. (2023)	Explores trust and transparency in AI-driven decisions.	Highlights explainability and human oversight.
4	Changing the Means of Managerial Work	Langer, M. et al. (2020)	Analyzes automation and user autonomy.	Emphasizes balance between automation and control.
5	Machine Learning for Assessing Organizational Resilience	Ewertowski, T. et al. (2023)	Uses ML to evaluate adaptability.	Aligns with AI-driven resilience.
6	AI for Decision Support	Kovari, A. (2024)	Balances accuracy, transparency, and trust.	Strengthens ethical AI governance.
7	Intelligent DSS: ML and MCDM Methods	Ali, R. et al. (2023)	Integrates MCDM for interpretability.	Supports hybrid decision frameworks.



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8	Decision Mining for Process Enhancement	Leewis, S. et al. (2025)	Applies decision mining to improve processes.	Empirical support for feedback-based loops.
9	Deep Learning in Organizational Decision-Making	Shrestha, Y. et al. (2021)	Deep learning enhances cognition.	Reinforces augmentation model of intelligence.
10	AI-DSS in Industry 4.0	Soori, M. et al. (2024)	Reviews predictive systems for Industry 4.0.	Validates AI integration in industrial settings.

In this summary, the reviewed studies collectively demonstrate how AI-driven Decision Support Systems (AI-DSS) integrate machine learning algorithms with human reasoning to enhance accuracy, transparency, and adaptability. The convergence of these approaches supports the evolution of hybrid human–AI decision ecosystems, where ethical governance, continuous learning, and resilience are central to sustainable organizational intelligence.

III. METHODOLOGY OF PROPOSED SURVEY

This review followed the PRISMA 2020 guidelines to ensure systematic selection and transparency. Databases searched include Scopus, IEEE Xplore, ScienceDirect, and SpringerLink, using the keywords “machine learning,” “artificial intelligence,” “decision support system,” and “organizational intelligence.”

In total, 211 records were retrieved, 63 duplicates removed, and 28 full-text articles reviewed. Ten studies met all inclusion criteria based on relevance, methodological rigor, and explicit ML use in DSS. The Critical Appraisal Skills Programme (CASP) checklist was used to assess study validity, with all scoring above 8/10.

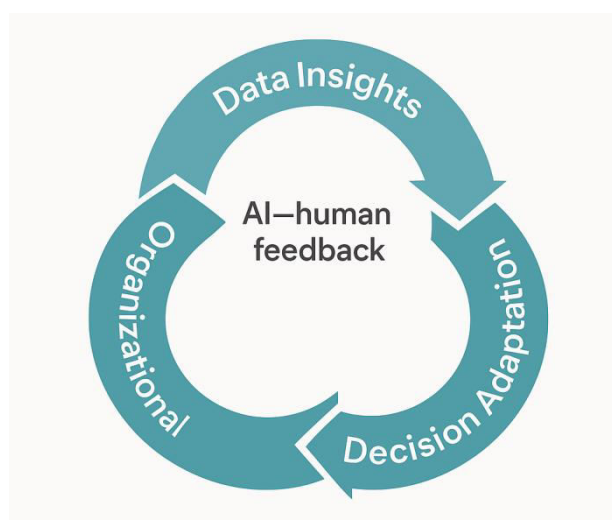


Figure 4: Triple-Loop Learning Model for AI-Enhanced Decision Feedback

The Triple-Loop Learning Model represents a continuous feedback system that integrates artificial intelligence (AI) and human decision-making to enhance organizational intelligence and adaptability. It builds upon the concept of single-, double-, and triple-loop learning, extending it into the context of AI-driven decision environments.

Data Insights (Inner Loop)

This first loop involves the collection, analysis, and interpretation of data through AI models. Machine learning algorithms such as Random Forests, Neural Networks, and Decision Trees extract meaningful patterns and trends from large datasets. These insights provide the foundation for informed decision-making and real-time analysis.

Decision Adaptation (Middle Loop)

At this stage, decision-makers use AI-generated insights to adjust strategies, policies, or operations. The loop emphasizes collaboration between AI and human experts. Feedback from human evaluation such as contextual



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understanding, ethical judgment, or managerial constraints is integrated back into the AI system to refine its learning process.

Organizational Learning (Outer Loop)

The third loop represents the strategic and cultural transformation that occurs when AI-informed decisions influence long-term learning within the organization. Insights gained from data and adaptive decisions are institutionalized into practices, policies, and workflows, promoting continuous improvement and innovation.

Human Oversight and Continuous Feedback

Arrows connecting the loops symbolize ongoing interaction between AI systems and human decision-makers. This ensures that learning is not linear but cyclical each cycle improving both algorithmic accuracy and human understanding.

In essence, the model depicts how organizations evolve through iterative feedback loops, where AI systems learn from human input, and humans learn from AI insights, forming a self-reinforcing ecosystem of intelligence and adaptation.

IV. CONCLUSION AND FUTURE WORK

AI-driven Decision Support Systems (AI-DSS) are reshaping how organizations conceptualize intelligence and sustainability. Their integration enhances learning, adaptability, and transparency—qualities essential for long-term competitiveness. However, effective implementation requires alignment with ethical principles, explainable AI, and human collaboration. Future research should focus on developing standardized explainability metrics, exploring long-term cultural and behavioral impacts, and formulating interdisciplinary AI governance frameworks. By uniting data-driven precision with human oversight, AI-DSS can foster intelligent, ethical, and sustainable decision-making ecosystems.

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