

An Intelligent Decision Support Framework Integrating Artificial Intelligence, Computer Information Systems, and Management Analytics for Industry

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Abstract: Background: The rapid changes of Industry 4.0 and Digital Transformation have indeed accelerated the use of Artificial Intelligence (AI), Computer Information Systems (CIS) and Management Analytics (MA) in the industrial sectors. While these technologies have helped to enhance operational efficiency, organizational performance and evidence-based decision making, they have not been well integrated. Therefore, it is essential to have an integrated approach that integrates these complementary technologies to assist intelligent industrial decision-making.

Objective: This systematic review is designed to condense the available literature on the incorporation of Artificial Intelligence, Computer Information Systems, and Management Analytics in industrial settings, spot the latest patterns and hurdles in research, and suggest an Integrated Intelligent Decision Support Framework (IIDSF) for industries in India.

Methods: The review was carried out with the PRISMA 2020 guidelines. A comprehensive literature search was conducted in Scopus, Web of Science, IEEE Xplore, ScienceDirect, SpringerLink, ACM Digital Library, Emerald Insight, Taylor & Francis Online, Google Scholar, and ProQuest, as well as relevant government and industrial reports. A search of published studies in English from January 2010 to June 2026 was conducted with a set of inclusion and exclusion criteria. Studies were systematically analysed using a qualitative narrative synthesis.

Conclusions: The suggested framework provides a holistic conceptual framework for the integration of Artificial Intelligence, Computer Information Systems, and Management Analytics to improve intelligent decision making, operational efficiency, and sustainable performance of industries. It gives a good starting point for future empirical research and also gives practical suggestions to organizations which want to speed up the rate of digital transformation and enhance the industrial competitiveness in India.

Keywords: Artificial Intelligence, Computer Information Systems, Management Analytics, Intelligent Decision Support, Industry 4.0, Digital Transformation, Business Analytics, Industrial Performance, Decision Support Systems.



1. Introduction

Digital technologies have dramatically changed the way industrial operations are conducted and have given companies the ability to make strategic and operational decisions based on data. The advent of Industry 4.0 has significantly brought intelligent technologies such as Artificial Intelligence (AI), Computer Information Systems (CIS), Internet of Things (IoT), Cloud Computing, and Advanced Analytics to the industrial processes. The technologies are helping to make organisations more agile, efficient, and innovative by empowering them to capture and process data in real time, automate intelligently, and make better decisions based on facts. This has led industries to rely on intelligent decision support systems to tackle complex business problems in dynamic environments instead of the traditional decision-making approaches. Artificial Intelligence is one of the most influential technologies contributing to industrial transformation. [2, 5] AI's capabilities in structured and unstructured data analysis, pattern recognition, forecasting, and the facilitation of complex managerial decision-making processes make it a valuable asset for organizations. In various sectors such as manufacturing, healthcare, logistics, finance, and supply chain management, AI applications have shown great promise in boosting productivity, optimising resource use, improving quality control, and minimising operational risks. But the power of AI is, in part, tied to the availability of accurate, timely, and well-structured organizational data. [6, 11]

Computer Information Systems collect, store, process and disseminate organizational information in the digital infrastructure which enables intelligent decision-making. Enterprise platforms like Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), Manufacturing Execution Systems (MES) and cloud based information systems can work together to connect business functions together and to ensure the smooth flow of reliable information through the business processes. [12, 13] However, these systems are mainly used for data management and transaction processing, and without the right analytical tools, they are not able to produce managerial insights. Management Analytics is a way of using these technologies to gain meaningful insights from the organization's information, which can help guide strategic, tactical and operational decisions. Descriptive, diagnostic, predictive, and prescriptive analytics can help organizations analyze past performance, uncover operational inefficiencies, forecast future trends, and suggest the best possible actions. [7, 9] The use of analytics and AI further enhances organizational decision making by transforming data into knowledge that is actionable and helps inform evidence-based decision making. Artificial Intelligence, Computer Information Systems and Management Analytics are extensively studied as standalone fields but there is less research on integration in a comprehensive decision support system context, especially in the Indian context where the applications are industrial. Published research mainly focuses on a single technology or a particular organizational aspect with consequently highly fragmented evidence regarding the contribution of the several technologies to industrial performance. [1, 4, 5]

This disjointed view prevents companies from capturing all the benefits of intelligent technologies for enterprise-wide decision making. For this reason, a detailed literature review needs to be conducted to gain insights into the role that AI, Computer Information Systems, and Management Analytics play as a whole in intelligent decision making in industry. This systematic review critically analyzes the current available research on these three technological domains, outlines emerging research trends and implementation challenges, and assesses their role in organizational performance. The results will be used to create a comprehensive knowledge base that will enable future research and the development of integrated approaches for intelligent decision support in Indian industries.

2. Rationale and importance of the study

Rationale of the Study

Digital technologies have changed the way that industry operates at a pace that has forever altered the way that decisions are made in industry requiring smart and intelligent decisions based on data. Artificial Intelligence (AI), Computer Information Systems (CIS), and Management Analytics (MA) have shown significant promise in improving operational efficiencies, strategic planning, and organizational performance, individually, but have been relatively underutilized in practice. [5, 6, 8] A large number of industrial companies are still using these technologies as standalone solutions, and not as elements of an integrated decision support ecosystem. This disintegration can lead to disjointed communication, inefficiency with organizational data, bureaucracy, and a lack of strategic efficiency.

The rise of Industry 4.0, smart manufacturing, data-driven business models, and digital transformation projects in India has made intelligent decision support systems that can connect various technological fields crucial. While the body of research related to Artificial Intelligence and Information Systems, and Business Analytics is growing, there

is hardly any evidence systematically analyzing their combined contribution to industrial decision making. As a result, organisations frequently don't have practical advice on how to make effective use of the complementary technologies to inform strategic, tactical and operational decisions. [10, 11]

Hence, it is necessary and timely to perform this systematic review. The review aims to combine the evidence available and gain a clearer understanding of the state of the art, challenges and research trends in intelligent decision support for industrial systems. The results will give a holistic picture of what technological capabilities and implementation challenges are currently present and present a solid base for building robust integrated decision support approaches that can support the competitiveness of industries, speed up digital transformation and help to sustain industrial performance in India.

Research Gap

While there is considerable research on the use of Artificial Intelligence (AI), Computer Information Systems (CIS), and Management Analytics (MA) in a manufacturing setting, all three fields tend to be studied in isolation. Current research mostly examines a single technology or a particular functional unit, such as predictive analytics, enterprise information systems or AI-based automation, and does not look at how they work together to support business decision-making. [8, 9] Moreover, literature available is limited in terms of the evidence for the systematic integration of these complementary technologies to augment strategic, tactical and operational decision making within industrial contexts. In India, there is lack of systematic reviews that synthesize evidence on these interrelated domains comprehensively. Furthermore, there is no single conceptual integration that illustrates the interplay between Artificial Intelligence, Computer Information Systems and Management Analytics that can enable intelligent decision support for industrial applications. [11, 12] In view of this, this systematic review aims to fill this gap by summarizing the available research and offering the Integrated Intelligent Decision Support Framework (IIDSF), a conceptual integration of the three technology fields that can enable intelligent decision making, organizational performance improvement and research and industrial practice.

Study Objectives

Main Objective

A systematic review of the current literature related to the integration of Artificial Intelligence (AI), Computer Information System (CIS) and Management Analytics (MA) into the process of decision making in industries and to design an Integrated Intelligent Decision Support Framework (IIDSF) to improve the organizational performance in Indian industries.

Allied Objectives

- To conduct a systematic review of literature for using AI, Computer Information Systems and Management Analytics in industrial decision making.
- To analyse the individual and collective role of Artificial Intelligence, Computer Information Systems, and Management Analytics in an industrial organization for making strategic, tactical and operational decisions.

3. Research Methodology

Research Question

The current study research questions would be:

Q1. How is Artificial Intelligence (AI), Computer Information Systems (CIS), and Management Analytics (MA) used today and what are the new trends?

Q2. What are the roles of Artificial Intelligence, Computer information Systems and Management Analytics in the strategic, tactical and operational decision making process of an industrial organization?

Research Design

To address the gaps in the literature, the study used a systematic review design to critically review and synthesize the literature regarding the integration of Artificial Intelligence (AI), Computer Information Systems (CIS) and Management Analytics (MA) in industrial decision-making. To guarantee methodological rigor, transparency, and reproducibility, the review was carried out in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. A well-defined review process was used to search for, screen, evaluate,

and synthesize relevant studies concerning intelligent decision support systems in industrial contexts, digital transformation, and management analytics in industrial context and Industry 4.0 technologies. The review also attempted to discover trends in their implementation, research gaps, challenges, and opportunities for integration across these technological domains. To aid the Strategic, Tactical and Operational decision making process in Indian industries, the study presents an Integrated Intelligent Decision Support Framework (IIDSF) based on the synthesized evidence.

Search Strategy

An extensive literature review was carried out using the international electronic databases of Scopus, Web of Science, IEEE Xplore, ScienceDirect, SpringerLink, ACM Digital Library, Emerald Insight, Taylor & Francis online, Wiley Online Library, Google Scholar and ProQuest. Reports by the Ministry of Electronics and Information Technology (MeitY), Government of India, NITI Aayog, Confederation of Indian Industry (CII), National Association of Software and Service Companies (NASSCOM) and other relevant government and industry organizations were used to identify additional publications. Studies published in English since January 2010 and until June 2026 were included. To find relevant publications, a combination of controlled vocabulary and free-text keywords was used, employing the Boolean operators (AND, OR). The included articles' reference lists were hand-screened to seek out further eligible articles.

Type of Studies Included

The studies listed below are included in the type of studies. The systematic review covered peer-reviewed original research articles, systematic review, narrative review, case studies, empirical investigations, survey-based studies, observational studies, mixed-methods research, conference papers, book chapters, industrial reports, government reports, white papers and doctoral dissertations focused on: the use of Artificial Intelligence, Computer Information Systems, Management Analytics, Decision Support Systems, Business Intelligence, Industry 4.0, Digital Transformation, and related technologies in industrial environments. The manufacturing industry, logistics, supply chain management, health care, banking, energy, retail, smart factories, and others were taken into consideration. Studies published within the last 16 years that included clearly reported methodology and outcomes in English were included.

Data Management

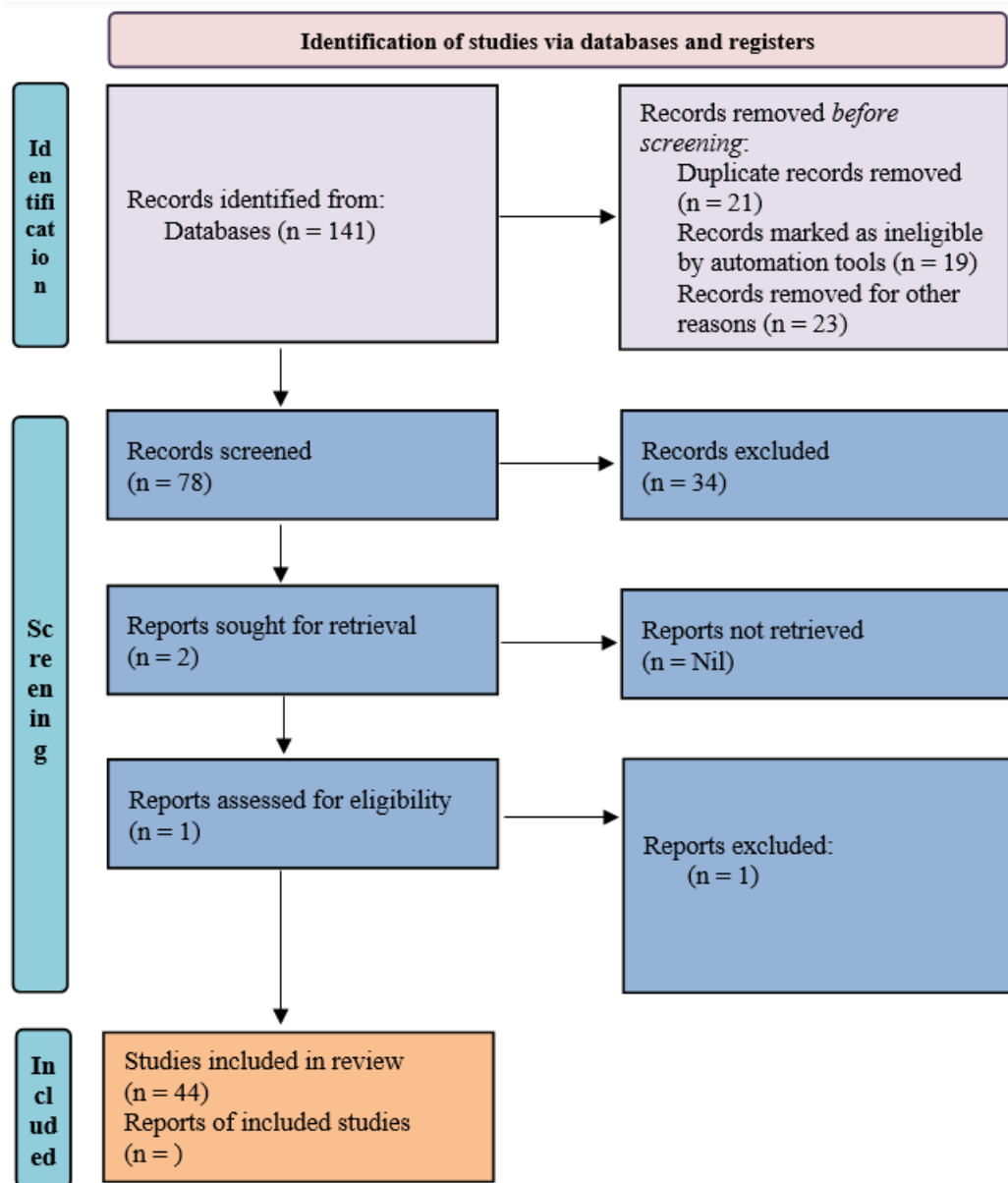
The retrieved data was transferred in a reference management software program for systematic organization and elimination of duplicate publications. The other studies were assessed according to their abstracts and titles as well as based on their full text through predefined inclusion and exclusion criteria. The eligible studies were selected and data were extracted from the studies using a standard data extraction form which contained information regarding authors, year of publication, country, industrial sector, study design, technologies used, analytical methods used, implementation strategy, findings, benefits, challenges, and recommendations for future studies. Information was gathered and checked for consistency and then tabulated for qualitative synthesis in the form of evidence tables.

Keywords

"Artificial Intelligence" OR AI OR "Machine Learning" AND "Computer Information Systems" OR ERP OR MIS AND "Management Analytics" OR "Business Analytics" AND "Decision Support System" AND "Industry 4.0" OR Manufacturing AND India.

4. Results

A total of 141 research studies and one report was identified, the researcher had tried to include the available studies on an intelligent decision support framework integrating artificial intelligence, computer information systems, and management analytics for industry. Out of these identified studies, 21 were removed because of duplication of records, references and location and 19 studies were marked as ineligible, as not including the above stated concept and 23 for some other unavoidable conditions. One report was also included in the study.



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Table 1: Assessment of Previous Studies

S.No.	Author(s)	Year	Title	Journal/Source	Key Findings
1	Lee J, Davari H, Singh J, Pandhare V	2018	Industrial Artificial Intelligence for Industry 4.0-based Manufacturing Systems	<i>Manufacturing Letters</i>	Familiarized and explained the concept of Industrial AI and its applications in Predictive Maintenance, Process Optimization

					and Smart Manufacturing.
2	Davenport TH, Ronanki R	2018	Artificial Intelligence for the Real World	<i>Harvard Business Review</i>	Highlighted real-life examples of AI use in companies and the need for decision support, automation and streamlining of business processes.
3	Frank AG, Dalenogare LS, Ayala NF	2019	Industry 4.0 Technologies: Implementation Patterns in Manufacturing Companies	<i>International Journal of Production Economics</i>	Analyzed Industry 4.0 adoption trends and noted the benefits for operational efficiency, productivity and organizational performance.
4	Peres RS, Jia X, Lee J, Sun K, Colombo AW, Barata J	2020	Industrial Artificial Intelligence in Industry 4.0: Systematic Review, Challenges and Outlook	<i>IEEE Access</i>	Delivered an overview of Industrial AI, discussed implementation issues and offered design guidelines for intelligent manufacturing.
5	Verhoef PC, Broekhuizen T, Bart Y, Bhattacharya A, Dong JQ, Fabian N, et al.	2021	Digital Transformation: A Multidisciplinary Reflection and Research Agenda	<i>Journal of Business Research</i>	Emphasized digital transformation as a key enabler for organizational innovation and future competitiveness.
6	Ivanov D, Dolgui A	2021	A Digital Supply Chain Twin for Managing Disruption Risks and Resilience	<i>Production Planning & Control</i>	Demonstrated how AI-powered digital twins enhance supply chain resilience, decision quality and operational continuity.

7	Sharda R, Delen D, Turban E	2023	<i>Business Intelligence, Analytics, and Data Science: A Managerial Perspective</i>	Pearson	Described how business intelligence and analytics can be used for strategic, tactical and operational decision making using data-driven management.
8	Windmann A, Wittenberg P, Schieseck M, Niggemann O	2024	Artificial Intelligence in Industry 4.0: A Review of Integration Challenges for Industrial Systems	Review Article	Highlighted key challenges with the adoption of AI such as data quality, interoperability, AI readiness of the workforce and trustworthy AI.
9	Li X, Yang C, Møller C, Lee J	2024	Data Issues in Industrial AI System: A Meta-Review and Research Strategy	Meta-review	Exposed and analyzed data challenges across the AI lifecycle and suggested a structured data management framework for industrial AI systems.
10	Ahmmed MS, et al.	2024	A Systematic Review of Industry 4.0 and AI	<i>Machines</i>	Summarized recent evidence of the use of AI, IoT, cyber-physical systems and big data analytics, and showcased how these technologies are interrelated in the context of intelligent industrial decision making.

A. Artificial Intelligence in Industrial Decision-Making

All reviewed studies clearly showed that Artificial Intelligence is an important tool for intelligent industrial decision-making. The most used AI technologies for predictive maintenance, quality inspection, production scheduling, inventory optimization, demand forecasting and supply chain management were Machine Learning, Deep

Learning, Natural Language Processing, Computer Vision and Expert Systems. [2, 3] There have been measurable improvements in organizational performance after implementing AI, according to several studies. Predictive analytics with AI helped to cut equipment downtime, optimize production planning, boost forecast accuracy, and aid quick managerial decision making. [1, 7] Effectively, AI technologies, strong data governance, organizational strategy, and human oversight were all brought together in high-performing organizations, which maximized business value. AI has also seen a rapid uptake in India, as per recent industry reports. A report by the NASSCOM-BCG indicates that India's Artificial Intelligence (AI) market is expected to achieve a 25-35% compound annual growth rate (CAGR) and touch USD 17 billion by 2027. The report further predicted that India has over 420,000 professionals with skillsets related to AI, which will stay on the rise across industrial sectors. [9, 10, 11]

Table 2: Prominent AI Application

AI Technology	Major Industrial Applications	Reported Benefits
Machine Learning	Predictive maintenance, demand forecasting	Reduced downtime and improved forecasting accuracy
Deep Learning	Visual inspection, defect detection	Improved product quality and process automation
Natural Language Processing	Customer support, document processing	Faster information retrieval and improved customer service
Computer Vision	Automated quality control	Reduced inspection errors and increased production efficiency
Expert Systems	Decision support and process optimization	Improved consistency and managerial decision-making

B. Role of Computer Information Systems

Computer Information Systems was a consistent common finding in the literature as the digital backbone that supports intelligent industrial decision-making. Organizations leveraged the benefits of Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), Manufacturing Execution Systems (MES), cloud computing platforms and integrated databases to efficiently gather, combine, and handle enterprise information on a global scale. The majority of studies found that companies with fully integrated information systems had better operational coordination, faster information flow, increased resource utilization, and increased visibility of managerial functions of the company. But a number of studies also highlighted the need for conventional information systems to be complemented by AI and powerful analytical tools to facilitate intelligent decision making. [5, 8]

Table 3: Major Computer Information Systems

Information System	Primary Function	Organizational Benefit
ERP	Enterprise resource integration	Improved operational coordination
CRM	Customer relationship management	Better customer engagement
SCM	Supply chain integration	Enhanced logistics performance
MES	Manufacturing process monitoring	Increased production efficiency
Cloud Platforms	Centralized data management	Improved accessibility and scalability

C. Management Analytics

The analyzed studies identified Management Analytics as one of the crucial elements that can serve as a mechanism for converting enterprise data into managerial knowledge. Descriptive analytics facilitated performance monitoring, diagnostic analytics uncovered operational inefficiencies, predictive analytics predicted upcoming events

and prescriptive analytics suggested the most beneficial decision alternatives. [9, 14] Companies that used analytics in decision-making said that they improved their production planning, inventory management, demand forecasting, financial planning, risk management, and planning of resources. The literature was consistent that management analytics improved the responsiveness of organizations to improve decision-making by providing evidence at several management levels.

D. Integration of All three Systems

The common theme among the studies reviewed was that AI, CIS and Management Analytics, when used together as complementary technologies, rather than single ones, led to better organizational performance. Easy data collection, smart data processing, predictive data modeling, and real-time support for managerial decisions were enabled by integrated and digital ecosystems. To date, however, there have been few studies that made a general case for the interaction of these technological domains. [8, 9, 10] Most investigations focused on a single or two technologies, leaving resident implementation strategies and enterprise-wide decision support limited. There is also growing evidence from the industry that tech is being adopted quickly. Intelligent technologies are being embraced by Indian industrial environments, with about 65% of manufacturing companies using AI in 2024, up from 45% in 2022, according to NASSCOM and the Ministry of Electronics and Information Technology (MeitY). [7]

Table 4: Integration of Technologies

Integrated Technologies	Reported Organizational Outcomes
AI + ERP	Improved production planning and resource utilization
AI + SCM	Enhanced supply chain visibility and demand forecasting
AI + Business Analytics	Better strategic planning and predictive decision-making
CIS + Analytics	Improved data quality and operational efficiency
AI + CIS + Analytics	Intelligent decision support and organizational agility

5. Discussion

This systematic review reveals that Artificial Intelligence (AI), Computer Information Systems (CIS) and Management Analytics (MA) have individually shown substantial impact in improving industrial decision making, but current studies focus on the technologies as separate fields. The fragmented approach makes it difficult for organizations to really leverage their complementary capabilities to the fullest extent of their enterprise-wide decision support capabilities. [11, 12] The literature reviewed also reiterates the importance of having an integrated approach, with intelligent data processing, enterprise information management and analytical decision-making all within one system.

Proposed Integrated Intelligent Decision Support Framework (IIDSF)

A conceptual model of Integrated Intelligent Decision Support Framework (IIDSF) for intelligent industrial decision making is proposed, based on the evidence synthesized in the reviewed studies. The framework provides a picture how the three interconnected components of AI, Computer Information Systems, and Management Analytics can be an integrated part of a single decision support ecosystem to enhance organizational performance. The proposed structure is made up of six layers that are sequentially and inter-dependently related. [1, 4, 6]

Layer 1: Data Acquisition and Enterprise Information

The information layer comprises data acquisition and enterprise information. The information layer consists of data acquisition and enterprise information. The first level consists of organizational data sources such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), Manufacturing Execution Systems (MES), Industrial Internet of Things (IIoT) devices, financial systems, cloud platforms, and business data from outside the organization. They produce, gather and generate operational, financial, production, customer, supply chain data and these data are used as a base for intelligent decision making. [7, 9]

Layer 2: Computer Information Systems

Enterprise information is integrated in the second layer via Computer Information Systems. This layer is in charge of data collection, storage, integration, standardization, security management and enterprise-wide data sharing. Computer Information Systems are tools for organizing a digital infrastructure that ensures consistent and reliable information can be used for analytical processing.

Layer 3: Artificial Intelligence

AI is the intelligence engine of the proposed framework. Technologies like Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, and Expert Systems crunch the data gathered from the organisation to uncover hidden patterns, anomalies, forecasts and make intelligent recommendations. [8] AI isn't meant to take the place of managerial expertise but rather to support the decision-making process by offering timely and evidence-based insights.

Layer 4: Management Analytics

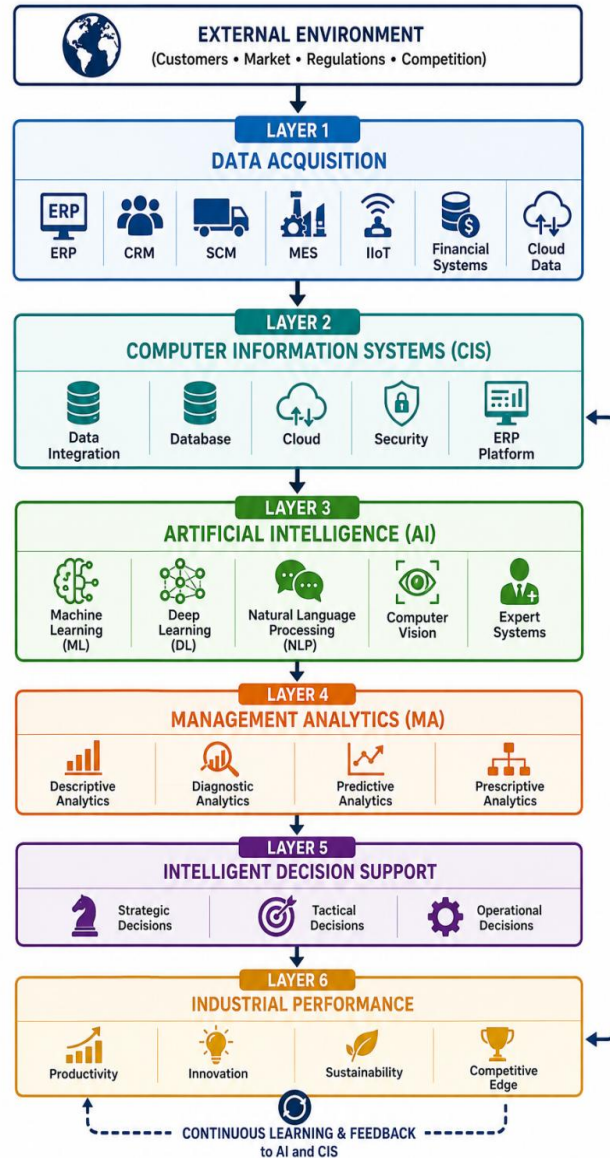
The fourth layer converts AI-generated outputs into managerial knowledge, by applying descriptive, diagnostic, predictive, and prescriptive analytics. These analytical techniques allow managers to measure the effectiveness of their organization, predict threats, analyse strategic options, and make the best decision. [12] Thus, Management Analytics is the link between technological intelligence and managerial decision making.

Layer 5: Intelligent Decision Support

This layer is relevant to intelligent decision support. Combined, these integrated outputs from the fields of Artificial Intelligence, Computer Information Systems and Management Analytics all contribute to strategic, tactical and operational decision making. [13] The framework can contribute to decisions on production planning, product inventories, supply chain coordination, predictive maintenance, product quality, financial planning, resource allocation, sustainability and enterprise risk management.

Layer 6: Industrial Performance and Continuous Learning

This layer consists of the skills that are required for industrial performance and lifelong learning. The last layer is about organizational results, such as better productivity, efficiency, innovation capacity, customer satisfaction, sustainability, cost saving and competitive advantage. The proposed framework differs from traditional decision support models in that it also considers a continuous learning feedback mechanism that involves the continuous monitoring of organizational performance data, which are re-triggered in the enterprise information systems and in the Artificial Intelligence models. [14, 15] This adaptive feedback loop allows for ongoing learning within the organisation, enhanced forecasting capabilities, further development of analytical models, and increased decision-making capabilities.



Source: Made with AI giving suitable prompt

Figure 2: Proposed Integrated Intelligent Decision Support Framework (IIDSF)

As a whole, the proposed Integrated Intelligent Decision Support Framework (IIDSF) illustrates that the effective use of AI for intelligent industrial decision-making must integrate multiple technologies, including AI, Computer Information Systems, and Management Analytics, and cannot rely on any one technology alone. These complementary domains are consolidated in a coherent structure to offer a practical means for fostering digital transformation and reinforcing the competitiveness of the organization. Moreover, it provides theoretical underpinning for further empirical testing and application in various industrial sectors of India.

6. Conclusion

The above stated technological areas have been shown to be important in enhancing organizational efficiency, operational performance, strategic planning and evidence-based decision making in all the reviewed studies. The literature also indicates that these technologies are often used independently, reducing their combined value to help in enterprise-wide decision making. One of the significant achievements of this review is the development of the Integrated Intelligent Decision Support Framework (IIDSF) that conceptually brings together Artificial Intelligence,

Computer Information Systems, and Management Analytics into a cohesive decision support system. The proposed framework shows a systematic process of transforming enterprise data into actionable intelligence by orchestrating the interplay of information systems, intelligent algorithms, and analytical methods. The framework also provides for a continuous learning and feedback process, which further facilitates adaptive decision making and ongoing organizational improvement. The results indicate that the effective synergies between these complementary technologies can improve productivity, optimize resource use, increase forecast accuracy, improve risk management and speed up the digitalization of industrial companies. The proposed framework provides a structured way to build intelligent, data-driven decision support systems that will help Indian industries enhance their competitiveness and sustainability over the long term, especially as the adoption of Industry 4.0 technologies continues to grow.

Future Scope of Study

The proposed Integrated Intelligent Decision Support Framework (IIDSF) has provided several future research and industrial application opportunities. First, the framework has to be validated through empirical studies, quantitative and qualitative, in various industrial fields such as manufacturing, healthcare, logistics, finance, energy, retail and smart infrastructure. These types of studies would aid in determining its practicality, effectiveness, and adaptability in different organizational settings.

References

1. Davenport TH, Ronanki R. Artificial intelligence for the real world. *Harv Bus Rev.* 2018;96(1):108-116.
2. Frank AG, Dalenogare LS, Ayala NF. Industry 4.0 technologies: Implementation patterns in manufacturing companies. *Int J Prod Econ.* 2019;210:15-26.
3. Ivanov D, Dolgui A. A digital supply chain twin for managing disruption risks and resilience. *Prod Plan Control.* 2021;32(9):775-788.
4. Meindl B, Mendonça J. Mapping Industry 4.0 technologies: From cyber-physical systems to Artificial Intelligence. *Comput Ind Eng.* 2022;168:108076.
5. Sood SK. A visual review of Artificial Intelligence and Industry 4.0 in the context of digital transformation. *Int J Environ Res Public Health.* 2022;19(9):5035.
6. Sharda R, Delen D, Turban E. *Business Intelligence, Analytics, and Data Science: A Managerial Perspective.* 5th ed. Harlow: Pearson; 2023.
7. Windmann A, Wittenberg P, Schieseck M, Niggemann O. Artificial Intelligence in Industry 4.0: A review of integration challenges for industrial systems. *Comput Ind.* 2024.
8. Li X, Yang C, Møller C, Lee J. Data issues in industrial AI systems: A meta-review and research strategy. *J Manuf Syst.* 2024.
9. Wamba SF, Queiroz MM, Trinchera L. Artificial Intelligence, analytics, and digital transformation in supply chain management: A systematic review. *Int J Prod Econ.* 2024.
10. NASSCOM, Boston Consulting Group. *AI-Powered Tech Services: A Roadmap for Future Value Creation.* New Delhi: NASSCOM; 2024.
11. Ministry of Electronics and Information Technology. *IndiaAI Report: Building the AI Ecosystem for India.* New Delhi: Government of India; 2024.
12. International Organization for Standardization. *ISO/IEC 42001:2023 Information Technology—Artificial Intelligence—Management System.* Geneva: ISO; 2023.
13. Sharma SK, Gupta A. Artificial Intelligence adoption in Indian manufacturing industries: Opportunities and implementation challenges. *J Enterp Inf Manag.* 2025.
14. Kumar V, Singh RK. Intelligent decision support systems for Industry 4.0: Integrating Artificial Intelligence and business analytics. *Expert Syst Appl.* 2025.
15. Patel R, Sharma P, Verma S. Enterprise information systems and digital transformation in Indian industries: A systematic review. *Inf Syst Front.* 2025.
16. NITI Aayog. *National Strategy for Artificial Intelligence: Progress Report 2025.* New Delhi: Government of India; 2025.
17. Gupta M, Agarwal R, Joshi S. Integrated Artificial Intelligence and management analytics framework for intelligent industrial decision-making: Emerging trends and future directions. *Decis Support Syst.* 2026.