International Journal of Applied Research in Business and Management (ISSN: 2700-8983)
Volume: 07 Issue: 10 Year: 2026
https://doi.org/10.51137/wrp.ijarbm.738

Artificial Intelligence - Powered Project Management Tools for Enhanced Productivity: A Systematic Literature Review

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Abstract:

Artificial Intelligence (AI) is increasingly transforming project management by enhancing productivity improving forecasting accuracy, supporting more informed managerial decision making. Despite the growing body of research on AI applications in project environments the literature remains fragmented across technological, managerial and organisational dimensions. This study addresses this gap through a concept-centric systematic literature review of peer-reviewed studies published between 2022 and 2026. Drawing on a final sample of 72 studies selected from an initial dataset of 205 publications, the review synthesises the literature into key thematic areas, namely AI-enabled productivity, predictive analytics, prescriptive analytics, AI-driven risk prediction, human–AI collaboration, ethical AI governance, digital ecosystems and data infrastructure, governance and organisational integration, sustainability, and managerial decision support. The findings indicate that AI has evolved from a supporting analytical tool into a strategic capability that enables proactive project management through early risk detection, real-time monitoring, performance optimisation, and intelligent decision support. The review further highlights that the effective adoption of AI depends not only on technological sophistication but also on organisational readiness, governance structures, data quality, and the integration of human judgement with intelligent systems. The study contributes to the literature by providing a structured conceptual synthesis of AI in project management and identifying important directions for future research particularly the need for integrated frameworks, empirical validation across the project lifecycle, and stronger attention to ethical and governance considerations in AI-enabled project environments.

Keywords:

Artificial Intelligence, Project Management, Productivity, Predictive Analytics, Ethical AI, Human–AI Collaboration

Submitted: 2026-04-21. Revised: 2026-05-14. Accepted: 2026-05-26.

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International Journal of Applied Research in Business and Management (ISSN: 2700-8983)
Volume: 07 Issue: 10 Year: 2026
https://doi.org/10.51137/wrp.ijarbm.738

Introduction

Organisations are required to manage large volumes of data, complex stakeholder relationships and rapidly evolving technological landscapes while ensuring project efficiency and strategic alignment (Bernardo, Mamede, Barroso & dos Santos, 2024) In response to these changes, Artificial Intelligence (AI) has emerged as a technological capability of enhancing project management processes through automation, predictive analysis and decision support systems (Bento, Pereira, Gonçalves, Dias & Costa, 2022; Taboada, Daneshpajouh, Toledo & de Vass, 2023; Gondia, Moussa, Ezzeldin & El-Dakhakhni, 2023; Pereira, Gonçalves, Dias & Costa, 2024; Nenni, De Felice, De Luca & Forcina, 2025). The rapid enhancement of digital technologies including machine learning, big data analytics and intelligent automation has significantly transformed the way project data is collected, analysed and utilised in managerial decision-making processes (Čančer, Tominc & Rozman, 2023; Altaie & Dishar, 2024; Kozhakhmetova, Mamyrbayev, Zhidebekkyzy & Bilan, 2024). AI powered tools now enable organisations to analyse larger datasets in real time, detect complex patterns and generate predictive insights that enhance project monitoring and performance evaluation (Strang & Vajjhala, 2023; Chen et al., 2025; Sahu, Bera, Parhi & Kandpal, 2025). Predictive models allow project managers to forecast potential delays, cost overruns and operational risk using historical project data and machine learning algorithms (Hamdan, Thneibat & Hyari, 2025; Alsulamy, 2025; Berriche & Loulizi, 2025). Building on these capabilities, prescriptive analytics extends beyond forecasting by recommending optima course of action that support strategic project decision making across competing constraints such as time, cost, scope and quality (Azami, Lei, Hermann & Zubick, 2022; Rodriguez-Garcia, Juan, Martin, López-Lopez & Marco, 2026; Jing & Fu, 2026). Recent research emphasises the importance of hybrid intelligence models in which AI systems utilise managerial judgement rather than replace it (Hughes et al., 2025; Dawarka, Doargajudhur & Dutot, 2025; Hettrich, Krings & Kock, 2025). At the same time, the growing reliance on AI-driven systems has raised important concerns regarding transparency, ethical governance, and responsible data usage within project decision-making processes (Yang, Allen, Zhang & Zhao, 2025; Badhon et al., 2025; Nyqvist, Peltokorpi & Seppänen, 2024). Despite the growing body of research on AI applications in project management, the literature remains fragmented across multiple technological, managerial and organisational perspectives. Existing studies often focus on specific AI applications such as cost prediction, risk forecasting, or scheduling optimisation, while limited research systematically synthesises these contributions into an integrated conceptual framework for AI-enabled project decision-making (Nenni et al., 2025; Taheripour & Sadjadi, 2026).

In response to these gaps, this study investigates the evolving role of AI in project management through a concept-centric literature review. Drawing on a dataset of peer-reviewed studies published between 2022 and 2026; the review organises the literature into thematic categories reflecting key research streams in AI-enabled project management. These themes include AI-enabled productivity, predictive

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analytics, prescriptive analytics, human–AI collaboration, ethical AI governance, digital ecosystems and data infrastructure, governance and organisational integration, sustainability in project management, and AI-driven managerial decision support. By synthesising existing research across these conceptual domains, the study aims to provide a structured understanding of how AI technologies are transforming project decision-making and organisational project governance.

Traditional project management approaches have largely relied on structured planning techniques, manual reporting systems and historical data analysis to support project control and performance monitoring (Bento et al., 2022; Taboada et al., 2023; Pereira et al., 2024). While these approaches have provided valuable insights into project planning and control, they are often limited in their ability to manage the increasing scale, complexity, and uncertainty of modern project environments (Čančer et al., 023; Altaie & Dishar, 2024). The rapid advancement of digital technologies associated with Fourth Industrial Revolution (4IR) has significantly transformed project management practices through the integration of AI, machine learning and big data analytics enabling predictive and data driven project decision-making processes (Gondia et al., 2023; Strang & Vajjhala, 2023; Chen et al., 2025). At the same time, emerging developments linked to the Fifth Industrial Revolution (5IR) emphasise human–AI collaboration, ethical AI governance, and the integration of intelligent decision-support systems into organisational project environments (Hughes et al., 2025; Dawarka, Doargajudhur & Dutot, 2025). One of the primary challenges relates to the growing volume and complexity of project data generated by digital infrastructures such as Building Information Modelling systems, digital twins, and sensor-enabled monitoring platforms (Valinejadshoubi et al., 2025; Shi et al., 2025). Existing research has increasingly explored the technical capabilities of AI in areas such as predictive analytics, cost estimation, risk identification, and project scheduling (Hamdan, Thneibat & Hyari, 2025; Alsulamy, 2025; Berriche & Loulizi, 2025). However, much of the current literature focuses on specific technological applications rather than developing an integrated understanding of how AI transforms broader project management decision-making processes. Limited research has systematically synthesised the different technological, managerial, and organisational dimensions of AI adoption in project management environments (Nenni et al., 2025; Taheripour & Sadjadi, 2026). Differences in project characteristics such as complexity, data availability, lifecycle structure, and uncertainty levels influence how AI tools are implemented and utilised as for example, construction and engineering projects often benefit from AI applications linked to predictive analytics, Building Information Modelling (BIM), and risk forecasting due to the availability of structured and sensor-generated data (Gondia et al., 2023; Valinejadshoubi et al., 2025). However, information technology and organisational projects tend to rely more on AI for decision support, resource optimisation, and workflow automation where data is less physical and more process-driven (Strang & Vajjhala, 2023; Nenni et al., 2025).

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International Journal of Applied Research in Business and Management (ISSN: 2700-8983)
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https://doi.org/10.51137/wrp.ijarbm.738

Although there is a growing body of research on AI applications in areas such as scheduling, cost forecasting, risk prediction, and decision-support systems (Gondia et al., 2023; Strang & Vajjhala, 2023; Hamdan et al., 2025; Alsulamy, 2025; Berriche & Loulizi, 2025; Nenni et al., 2025), the literature remains fragmented and lacks a coherent concept-centric framework that: (i) Consolidate predictive modelling, performance forecasting, and early risk detection mechanisms into an integrated analytical structure. (ii) Explain how AI-driven predictive analytics fundamentally reshapes decision-making processes across the project lifecycle. (iii) Explore the dynamic interaction between automated intelligence systems and human managerial judgement. (iv) Provide clear direction on how predictive analytics can be embedded in a responsible, transparent, and effective manner within project ecosystems. Therefore, a systematic synthesis of existing research is required to better understand the evolving role of AI in project management. This study addresses this gap by conducting a concept-centric literature review of peer-reviewed studies published between 2022 and 2026. The review analyses how AI, predictive analytics, digital ecosystems, and human–AI collaboration is transforming project management decision-making processes. By synthesising existing research across key thematic areas, the study aims to develop a structured understanding of AI-enabled project management and provide insights into the managerial and organisational implications of intelligent decision-support systems in modern project environments.

The main objective of this study is to examine the evolving role of AI in project management and explore how AI-driven technologies are transforming decision-making processes within modern project environments. Specifically, the study investigates how developments in AI, predictive analytics, digital ecosystems, and intelligent decision-support systems influence project performance, managerial decision-making, and organisational project governance. This objective responds to the central research question: how do AI-enabled technologies transform project management practices, and what implications do these developments have for organisations seeking to enhance project performance, decision quality, and strategic project governance in increasingly complex and data-driven environments?

Methodology

This study uses a concept-centric Systematic Literature Review (SLR) to explore how AI-powered project management tools affect productivity in today's project settings. Unlike traditional reviews that organise research by date, this approach groups findings by key concepts and themes. This method helps create a clear summary of how AI is used in project management, governance, and productivity. The review includes both qualitative and quantitative evidence from peer-reviewed journals, conference papers, academic books, and trusted industry reports. By bringing together existing research, the review offers a clear view of how AI tools impact project productivity, decision-making, and management. This method works well for new interdisciplinary fields where ideas and evidence are still coming together.

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https://doi.org/10.51137/wrp.ijarbm.738

The review follows the guidelines set by Webster and Watson (2002), which are common in studies on digital transformation, AI adoption, and technology-driven management. This approach is chosen for three main reasons: AI in project management covers several fields, such as project management, information systems, operations management, and data analytics. This field is still developing its theories and includes a wide range of research and ideas. Productivity outcomes associated with AI adoption are evaluated using various metrics and perspectives, necessitating a thematic synthesis rather than a chronological comparison. Methodologically, a concept-centric review, independent of the specific field of application, comprises six structured stages as depicted in Figure 1: (1) defining the research question; (2) determining the required characteristics of primary studies; (3) retrieving a sample of potentially relevant literature; (4) selecting pertinent literature; (5) synthesising the literature into coherent thematic categories; and (6) reporting the results while identifying research gaps and future research directions (Webster & Watson, 2002; Raff, Wentzel & Obwegeser, 2020; Talero-Sarmiento, Escobar-Rodríguez, Gómez-Ávila & Parra-Sánchez, 2024).

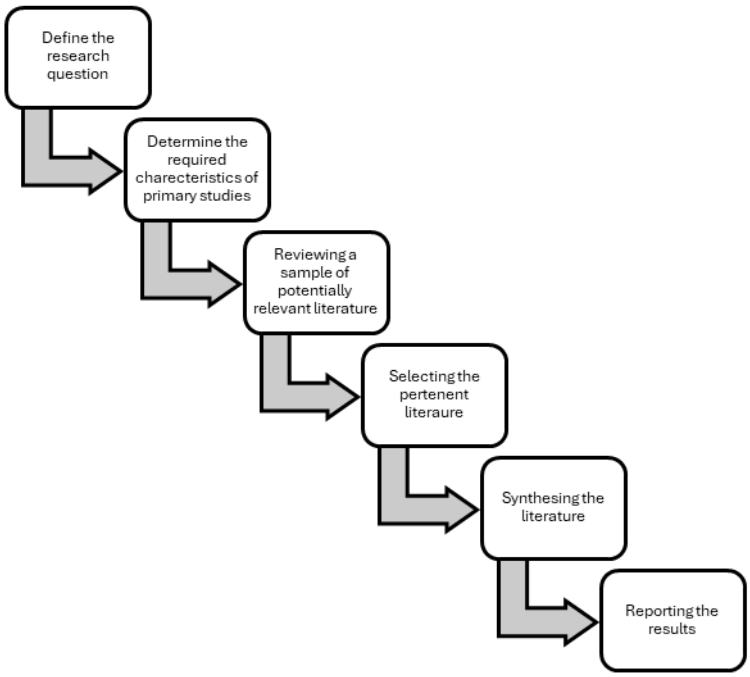

Figure 1: Flow diagram for the concept-centric systematic literature review (Source: Adapted from; Webster & Watson, 2002; Raff, Wentzel & Obwegeser, 2020; Talero-Sarmiento, Escobar-Rodríguez, Gómez-Ávila & Parra-Sánchez, 2024).

The framework integrates AI-based predictive analytic as a strategic capability within contemporary project management environments and is structured as follows:

1. Defining the research question - A comprehensive literature review requires the establishment of the research question(s) at the outset to ensure a structured and focused

analysis. This process forms the foundation for systematic investigation. It is initially hypothesised that scientific contributions related to AI in project management remain conceptually fragmented, with research trajectories still emerging across technical, managerial, and governance domains. While numerous studies address specific applications such as scheduling prediction, cost forecasting, and risk modelling, there is limited integration of these contributions into a unified conceptual framework. This review therefore aims to systematically map existing research, organise it into coherent thematic categories, and identify the principal theoretical and practical dimensions shaping the field.

2. Determining essential characteristics of primary studies - The analysis focuses on peer-reviewed scientific articles and scholarly conference contributions available in indexed databases, specifically Scopus (Elsevier), and written in English. Grey literature such as thesis, dissertations, technical reports, and project deliverables is excluded. The peer-review process ensures a foundational level of academic rigour and distinguishes exploratory modelling attempts from empirically validated and methodologically robust contributions. Eligible studies are required to demonstrate the explicit application of AI, machine learning, deep learning, ensemble techniques, optimisation algorithms, or predictive and prescriptive analytics within project management contexts. These include construction, engineering, infrastructure, and information technology project environments. This ensures that the dataset reflects both methodological diversity and practical relevance.
3. Retrieving a sample of relevant literature - The research extracts English-language documents related to AI in project management. Given that terminology in this domain lacks universal standardisation, an initial broad search strategy is adopted. Various keyword combinations are considered to account for differences in conceptual framing, including “AI,” “project management,” “predictive analytics,” “decision-support systems,” and “machine learning.” Advanced Boolean operators and proximity search techniques are employed to refine the selection process and ensure relevance. The systematic search yields a substantial body of potentially relevant studies, which are subsequently filtered according to predefined inclusion criteria. This process results in a comprehensive dataset of studies relevant to AI-enabled project management.
4. Selecting pertinent literature - Articles specifically addressing AI applications within project environments are identified through a two-step screening proc0edure. First, manual selection based on titles, keywords, and abstracts reduces the initial dataset to studies directly aligned with AI-based forecasting, optimisation, risk modelling, and decision-support systems. Second, cross-referencing of citations is conducted to uncover additional relevant works indexed in Scopus that may not have appeared in the primary search results. This iterative screening process ensures comprehensive coverage while maintaining conceptual

precision in the final sample selected for analysis. The final dataset consists of 205 peer-reviewed studies published between 2022 and 2026.

5. Synthesising the literature - The selected studies are synthesised using a concept-centric approach, whereby research contributions are organised into thematic categories rather than chronological order. This enables a structured interpretation of the literature and facilitates the identification of dominant research streams. The analysis groups the studies into key thematic areas including AI-enabled productivity, predictive analytics, prescriptive analytics, human–AI collaboration, ethical AI governance, digital ecosystems and data infrastructure, governance and organisational integration, sustainability in project management, and managerial decision support. This approach allows for the integration of diverse perspectives and provides a comprehensive understanding of how AI is transforming project management practices.
6. Reporting results and discussing future research directions - The findings derived from the preceding stages are used to critically analyse thematic groupings that define the current state of knowledge and highlight the principal conceptual and methodological gaps within AI in project management. This transition from analysis to future research pathways ensures a systematic identification of areas that remain underexplored. Particular attention is given to the integration of predictive and prescriptive analytics into project lifecycle decision-making, the balance between automated intelligence and managerial judgement, and the increasing importance of ethical governance, transparency, and accountability in AI-enabled project environments.

Table 1 notes the search strategy that employed multiple keyword combinations to ensure comprehensive coverage of AI within project management. Boolean operators and alternative terminology were used to capture variations in conceptual framing across the literature.

Database	Search string	Filters applied	Results retrieved
Scopus	(“artificial intelligence” OR “machine learning” OR “predictive analytics”) AND (“project management”)	English; 2022–2026; peer-reviewed	205
Scopus	(“AI” AND “project scheduling”) OR (“cost forecasting”) OR (“risk prediction”)	English; 2022–2026; peer-reviewed	Included in consolidated search results
Scopus	(“decision support systems” AND “project management” AND “artificial intelligence”)	English; 2022–2026; peer-reviewed	Included in consolidated search results

International Journal of Applied Research in Business and Management (ISSN: 2700-8983)
Volume: 07 Issue: 10 Year: 2026
https://doi.org/10.51137/wrp.ijarbm.738

Table 1: Conceptual framing

The combined search results were consolidated and duplicate records were removed. This process produced an initial dataset of 205 peer-reviewed studies published between 2022 and 2026. A screening process based on titles, abstracts, and keywords was then conducted to assess relevance to AI-powered tools in project management. Studies that did not meet the inclusion criteria were excluded. The remaining articles were further evaluated for methodological relevance and conceptual alignment, resulting in a final sample of 72 studies included in the thematic analysis. Studies were excluded based on predefined criteria, including duplicate records, non-English publications, non-peer-reviewed sources, studies not directly related to artificial intelligence in project management as well as articles lacking sufficient conceptual or empirical relevance to the study objectives.

In addition to the inclusion and exclusion criteria, a quality assessment process was applied to ensure that the selected studies met acceptable academic standards. Each study was evaluated based on its relevance to the research objectives, methodological rigor, clarity of research design, and contribution to the field of artificial intelligence in project management. Studies that demonstrated clear application of AI techniques, well-defined methodologies, and meaningful analytical or empirical insights were prioritised. Conversely, studies lacking methodological transparency or offering limited relevance to predictive or decision-support applications were excluded. This quality appraisal process ensured that the final dataset provided a robust and credible foundation for the concept-centric synthesis. This approach aligns with established systematic literature review practices that emphasise transparency, rigor, and reproducibility in evidence synthesis (Booth, Sutton & Papaioannou, 2016).

Thematic Analysis

The thematic analysis is discussed below.

Key Definitions

To ensure conceptual clarity, this section outlines the core constructs underpinning AI in project management. Table 2 presents the principal concepts, and their definitions as derived from the literature reviewed in this study.

Key Concept	Definition
Artificial Intelligence (AI) in project management	The application of machine learning, deep learning, optimisation algorithms, and intelligent computational systems to automate, augment, and enhance project planning, monitoring, and control processes (Taboada et al., 2023; Nenni et al., 2025).

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International Journal of Applied Research in Business and Management (ISSN: 2700-8983)
Volume: 07 Issue: 10 Year: 2026
https://doi.org/10.51137/wrp.ijarbm.738

AI-enabled productivity	The use of intelligent automation and data-driven systems to improve workflow efficiency, reduce administrative effort, and enhance task execution and project delivery performance (Pereira et al., 2024; Kozhakhmetova et al., 2024).
Predictive analytics	The use of statistical modelling, machine learning, and data mining techniques to analyse historical and real-time project data to forecast future outcomes such as cost overruns, schedule delays, and performance deviations (Gondia et al., 2023; Strang & Vajjhala, 2023; Chen et al., 2025).
Prescriptive analytics	AI-driven systems that extend beyond prediction by recommending optimal project actions through optimisation models and decision algorithms across time, cost, scope, and quality constraints (Azami et al., 2022; Rodriguez-Garcia et al., 2026).
Risk prediction and early warning systems	AI-enabled predictive models designed to identify potential risks, delays, and performance deviations before project failure occurs, supporting proactive project control (Hamdan et al., 2025; Alsulamy, 2025).
Decision support systems (DSS)	Intelligent systems that integrate predictive analytics with optimisation algorithms to support managerial decision-making in areas such as resource allocation, scheduling, and performance optimisation (Nenni et al., 2025; Qureshi & Usman, 2025).
Human–AI collaboration	The integration of algorithmic intelligence and human managerial judgement in project decision-making, emphasising explainability, trust, and oversight (Hughes et al., 2025; Dawarka et al., 2025).
Digital ecosystems and data infrastructure	Interconnected digital platforms, including cloud systems, IoT, BIM, and digital twins, that enable real-time data collection, integration, and analytics within project environments (Valinejadshoubi et al., 2025; Shi et al., 2025).
Ethical AI governance	The principles of transparency, accountability, bias mitigation, and responsible use of AI systems in project decision-making processes (Yang et al., 2025; Badhon et al., 2025).
Sustainability in project management	The application of AI-driven tools to optimise resource utilisation, reduce environmental impact, and integrate ESG considerations into project planning and execution (Censi et al., 2025; Shehadeh et al., 2026).

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https://doi.org/10.51137/wrp.ijarbm.738

Systematic Literature Review (SLR)	A systematic literature review is a structured, transparent, and reproducible research method used to identify, evaluate, and synthesise existing academic literature to answer clearly defined research questions and generate reliable theoretical and practical insights (Booth, Sutton & Papaioannou, 2016; Webster & Watson, 2002).

Table 2: Concept definitions

Evolution of AI in Project Management

Historically, project performance techniques relied on traditional forecasting such as Critical Path Method (CPM), Earned Value Management (EVM) and regression-based estimation models (Gondia et al., 2023). While these approaches provided structured frameworks, their predictive capabilities were constrained (Gondia et al., 2023, Assaad et al., 2020). It is also noted that AI-based models enhance forecasting reliability and enable early identification of cost overruns and schedule delays (Sahu et al., 2025; Geamanu et al., 2026). Early applications of machine learning techniques, including classification algorithms and decision tree models demonstrated improved predictive accuracy compared to conventional statistical approaches (Strang and Vajjhala, 2023). Subsequent research introduced ensemble learning and hybrid modelling approaches which combine multiple algorithms to enhance predictive performance and robustness. These models improved forecasting reliability by integrating diverse data sources and learning techniques, thereby enabling more accurate identification of project risks and performance deviations (Hamdan et al., 2025; Alsulamy, 2025). More recent advancements incorporate deep learning architectures and optimisation-based models capable of processing high-dimensional datasets and uncovering latent performance drivers (Chen et al., 2025). Furthermore, recent studies highlight a shift toward holistic and integrated frameworks that embed AI within digital ecosystems, governance structures, and organisational processes (Taboada et al., 2023; Dimitrov et al., 2023; Kelemu et al., 2024). Furthermore, the integration of AI within digital ecosystems, including BIM, IoT, and cloud-based platforms, highlights a shift toward interconnected and real-time project intelligence environments (Valinejadshoubi et al., 2025; Huang et al., 2026; Chong et al., 2025).

Predictive Analytics in Project Management

Studies consistently demonstrate that AI-based forecasting models outperform traditional estimation techniques through measurable improvements in prediction accuracy, forecasting reliability, and early detection of performance deviations (Chen et al., 2025; Geamanu et al., 2026). Several studies report reduced forecasting error rates and improved schedule prediction precision when compared to conventional estimation approaches (Strang & Vajjhala, 2023; Sahu et al., 2025). Machine learning techniques including regression models, decision trees and ensemble learning algorithms have been

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widely applied to improve the accuracy of cost and schedule predictions (Strang & Vajjhala, 2023; Sahu et al., 2025). Furthermore, neural networks and deep learning models have been increasingly adopted to process high-dimensional datasets and identify latent performance patterns that are not easily detectable using traditional statistical methods (Chen et al., 2025). It is thus noted that forecasting is increasingly positioned as a strategic capability within project management, supporting performance optimisation and risk mitigation.

AI Driven Risk Prediction and Early Warning Systems

The integration of AI-driven predictive analytics has enabled measurable improvements of risk prediction models capable of identifying potential delays, cost overruns, and performance deviations before they occur (Gondia et al., 2023; Berriche & Loulizi, 2025). AI-based risk predication systems can enhance the ability to detect earl warning signals by analysing large volumes of historical data and real time project data which can identify hidden relationships between project variables and uncover risk patterns that may not be visible through conventional analytical techniques (Hamdan et al., 2025; Alsulamy, 2025). Furthermore, the development of adaptive and real time risk monitoring systems which continuously update predictions as new data becomes available enabling dynamic risk assessment through the project lifecycle (Geamanu et al., 2026). There are also several challenges noted which include data quality, model interpretability and the integration of predictive systems within organisation risk frameworks (Yang et al., 2025; Badhon et al., 2025).

Prescriptive Analytics and Decision Making

Traditional decision making in project environments relied heavily on experience, intuition and analytical tools which often limit the ability to evaluate multiple scenarios AI-driven DSS address these limitations by integrating predictive analytics with optimisation algorithms and simulation techniques to provide actionable insights for project managers (Nenni et al., 2025; Qureshi & Usman, 2025). AI based DSS significantly improves decision quality by enhancing the consistency, accuracy and transparency of managerial evaluations (Azami et al., 2022; Didraga et al., 2025). These systems support more effective resource allocation, scheduling optimisation and performance monitoring by identifying optimal solutions within complex and uncertain environments. Furthermore, optimisation techniques embedded within AI systems play a critical role in improving project performance by using algorithms such as genetic optimisation, simulation modelling and multi criteria decision making approaches which enable project managers to identify the most efficient allocation of resource and minimise risks (Rodriguez-Garcia et al., 2026; Li et al., 2026). Therefore, by integrating data from multiple sources and across different project phases, these systems support more informed and coordinated decision-making at both operational and strategic levels.

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International Journal of Applied Research in Business and Management (ISSN: 2700-8983)
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https://doi.org/10.51137/wrp.ijarbm.738

Human-AI Collaboration and Organisational Readiness

AI should be viewed as an augmentation tool rather than a replacement for human expertise as they provide data driven insights, predictive outputs and optimisation recommendations while project managers contribute interpretation, ethical judgement and strategic oversight (Hughes et al., 2025; Dawarka et al., 2025). Effectiveness of human-AI interaction depends on factors such as trust, transparency and system explainability as project managers are more likely to rely on AI generated insights when the underlying models are interpretable and their outputs can clearly be justified (Krpan et al., 2025; Lin & Chang, 2025). Factors such as digital competence, training, and leadership support influence the ability of project teams to effectively integrate AI into decision-making processes (Krpan et al., 2025; Lin & Chang, 2025). It is therefore noted that human-AI interaction is a critical component of AI- enabled project management.

Ethical Governance and Transparency

Ensuring transparency and accountability in in AI generated recommendations is essential for maintaining stakeholder trust and organisational credibility (Yang et al., 2025; Badhon et al., 2025). Without clear governance mechanisms, the use of AI may lead to unintended consequences, including biased decision-making and reduced visibility into how decisions are derived. It is therefore important to integrate AI governance within the existing project management structures rather than treating it as an external compliance requirement which involves establishing clear roles and responsibilities, implementing monitoring and auditing mechanism and ensuring alignment with organisational standards (Khoshkam et al., 2025; Serra et al., 2025)

Digital Ecosystems and Data Infrastructure

Unlike earlier applications where AI functioned as a standalone analytical tool, contemporary project environments are characterised by interconnected digital infrastructures that support seamless data exchange and advanced analytics capabilities (Ailem & Boton, 2026. Thus, technologies such as Building Information Modelling (BIM), Internet of Things (IoT), digital twins, and cloud-based platforms play a central role in enabling AI-driven project management systems (Alshboul & Shehadeh, 2026 & Chong et al., 2025). These technologies facilitate the collection and integration of large volumes of structured and unstructured data. IoT-enabled devices and sensor technologies allow for continuous data acquisition from project sites, providing up-to-date information on project progress, resource utilisation, and environmental conditions (Chong et al., 2025). Similarly, digital twin technologies create virtual representations of physical assets and processes, allowing project managers to simulate scenarios, monitor performance, and adjust project strategies based on real-time feedback (Huang et al., 2026). Furthermore, emerging research highlights the role of interoperable platforms and advanced

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data architectures in supporting AI-enabled ecosystems (Valinejadshoubi et al., 2025. The ability to integrate data across different systems and organisational boundaries is critical for maximising the value of AI applications (Valinejadshoubi et al., 2025; Wong et al., 2025; Gachkar et al., 2025). As a result, organisations are increasingly investing in digital infrastructure to support the scalability and effectiveness of AI-driven project management (Huang et al., 2026; Ailem & Boton, 2026; Alshboul & Shehadeh, 2026).

Limitations of Generative AI in Project Management Contexts

Unlike predictive analytics models that are specifically designed for structured numerical forecasting, generative AI systems primarily operate on probabilistic language patterns and are not inherently optimised for precise quantitative prediction tasks. As a result, their use in areas such as cost estimation, schedule forecasting, and risk prediction may lead to inconsistencies or inaccuracies when compared to specialised predictive models (Nenni et al., 2025; Chen et al., 2025). Furthermore, generative AI systems often lack domain-specific contextual understanding, which limits their ability to fully capture project complexity, interdependencies, and dynamic environmental factors (Strang & Vajjhala, 2023). Project managers may find it difficult to interpret how certain outputs or recommendations are generated, which can reduce trust and hinder adoption in high-stakes project environments. These limitations are particularly significant in projects requiring accountability, regulatory compliance, and auditability of decisions (Yang et al., 2025; Badhon et al., 2025). Therefore, while generative AI offers valuable support in areas such as documentation, communication, and knowledge synthesis, it should be used in conjunction with predictive and prescriptive analytics models rather than as a standalone decision-making tool.

Governance, Organisational Integration and Sustainability

The successful integration of AI within project environments requires the establishment of governance mechanisms that ensure alignment with organisational goals, regulatory requirements, and ethical standards (Khoshkam et al., 2025; Serra et al., 2025). These governance structures define roles, responsibilities, and decision-making protocols, enabling organisations to manage the complexity associated with AI adoption (Al-Ayed, 2025) Studies indicate that organisations that successfully integrate AI into their processes are better positioned to leverage data-driven insights, improve project performance, and enhance decision-making capabilities (Mahgoub & Yu, 2026; Taheripour & Sadjadi, 2026). AI technologies support sustainable project practices by optimising resource utilisation, reducing waste, and improving environmental performance (Censi et al., 2025; Shehadeh et al., 2026). It is also further noted that sustainability is increasingly embedded within digital project ecosystems, where AI supports continuous performance monitoring and optimisation across the project lifecycle (Gachkar et al., 2025).

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Integrated Frameworks and Future Research Directions

Building on earlier sections, this study identifies key themes that demonstrate how project management practices are evolving through the integration of AI and digital technologies. These findings support the use of a concept-centric systematic literature review to examine how AI-powered project management tools influence productivity, decision-making, governance, and sustainability in modern project environments (Bento et al., 2022; Taboada et al., 2023; Nenni et al., 2025; Geamanu et al., 2026). AI-enabled productivity studies specifically indicate measurable operational improvements through reduced administrative effort, faster reporting cycles, improved workflow efficiency, and enhanced task execution across project environments (Pereira et al., 2024; Kozhakhmetova et al., 2024; Nenni et al., 2025). Instead of focusing on a single industry or organisational context, this approach synthesises research from multiple disciplines on topics such as AI-enabled productivity, predictive and prescriptive analytics, human–AI collaboration, ethical governance, digital ecosystems, and organisational integration. This study adopts a concept-focused review method that follows a structured and transparent process applicable across different project environments. Following established guidelines for systematic literature reviews, the process includes six main stages: defining the central research question relating to AI-powered project management productivity, establishing criteria for selecting relevant studies, identifying peer-reviewed publications from the Scopus database, screening and selecting the most relevant articles, organising the literature into key conceptual themes, and finally analysing and reporting the findings in terms of productivity improvements, managerial implications, and future research directions (Raff et al., 2020; Booth et al., 2016). Table 3 demonstrates the concept themes in line with 72 identified scholarly contributions of this study.

Concept	Core Theme	Scholarly Contributions	Key Insights
AI-Enabled productivity	Enhanced task performance and efficiency	Taboada et al. (2023); Gondia et al. (2023); Gao et al. (2023); Rozman et al. (2023); Pereira et al. (2024); Kozhakhmetova et al. (2024); Nenni et al. (2025); Torres et al. (2025); Qureshi & Usman (2025); Serikbay et al. (2025); Toh et al. (2026)	AI-enabled automation improves workflow efficiency, reduces administrative effort, enhances task execution speed, and contributes directly to improved project productivity and delivery performance.
Predictive analytics	Forecasting and early risk detection	Gondia et al. (2023); Strang & Vajjhala (2023); Chen et al. (2025); Sahu et al. (2025);	Predictive analytics enables early identification of schedule delays, cost

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		Hamdan et al. (2025); Alsulamy (2025); Berriche & Loulizi (2025); Geamanu et al. (2026); Cho et al. (2026); Chou et al. (2026); Lekraik & Ojekemi (2025)	overruns, and emerging risks, shifting project management from reactive control to proactive intervention.
Prescriptive analytics	Actionable decision support	Azami et al. (2022); Ansari et al. (2022); Sakka et al. (2023); Sklias et al. (2024); Didraga et al. (2025); Rodriguez-Garcia et al. (2026); Jing & Fu (2026); Tian et al. (2026); Li et al. (2026); Attar et al. (2025)	Prescriptive AI systems extend beyond prediction by recommending optimal project actions, supporting complex trade-offs across time, cost, scope, and quality constraints.
Human–AI collaboration	Hybrid intelligence and shared decision-making	Hughes et al. (2025); Dawarka et al. (2025); Hettrich et al. (2025); Kim et al. (2025); Liu & Liu (2025); Krpan et al. (2025); Kjellmark et al. (2026); Marcos et al. (2026); Wagan & Sidra (2026); Lin & Chang (2025)	Effective project management increasingly relies on hybrid intelligence models that combine human judgement with AI computational capabilities to improve accountability and decision quality.
Ethical AI governance	Responsible and transparent AI use	Ika & Pinto (2025); Yang et al. (2025); Badhon et al. (2025); Dolhopolov et al. (2025); Nyqvist et al. (2024); Martin et al. (2025); Skubis (2025); Tursunbayeva & Chalutz-Ben Gal (2024)	Ethical AI frameworks are essential to ensure transparency, fairness, data protection, and accountability in AI-supported project decision-making.
Digital ecosystems & data infrastructure	Connectivity and real-time project intelligence	Valinejadshoubi et al. (2025); Egba et al. (2025); Sanfilippo et al. (2025); Wong et al. (2025); Gachkar et al. (2025); Shi et al. (2025); Huang et al. (2026); Ailem & Boton (2026); Alshboul &	Integrated digital ecosystems provide scalable data infrastructure and real-time analytics capabilities that enable advanced AI-powered project management tools.

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		Shehadeh (2026); Chong et al. (2025)	
Governance & organisational integration	Strategic oversight and policy alignment	Cooper (2026); Al-Ayed (2025); Khoshkam et al. (2025); Aliu et al. (2025); Gao et al. (2023); Zhang & Wang (2026); Mahgoub & Yu (2026); Taheripour & Sadjadi (2026); Serra et al. (2025)	Embedding AI within project governance frameworks ensures alignment with organisational strategy, regulatory requirements, and ethical standards.
Sustainability in project management	Long-term value and ESG integration	Censi et al. (2025); Shehadeh et al. (2026); Abuhussain et al. (2025); Saeed et al. (2023); Gachkar et al. (2025); Kanyilmaz et al. (2022); Valinejadshoubi et al. (2025); Alnaser & Elmousalami (2025); Mahgoub & Yu (2026)	AI-enabled project management supports sustainability by optimising resource use, reducing waste, and integrating ESG indicators into project planning and execution.
Managerial decision support	Enhanced strategic planning and control	Bento et al. (2022); Taboada et al. (2023); Čančer et al. (2023); Altaie & Dishar (2024); Pereira et al. (2024); Nenni et al. (2025); Rodriguez et al. (2025); Qureshi & Usman (2025); Geamanu et al. (2026); Al-Bataineh et al. (2026)	AI-driven decision support systems enhance managerial effectiveness by integrating complex datasets into actionable strategic insights.

Table 3: Concept-Centric Review

While Table 3 presents the concept-centric thematic synthesis of the reviewed literature, additional analytical clarity can be achieved by illustrating how specific artificial intelligence techniques are applied across different project management domains. Table 4 therefore provides a synthesis matrix linking dominant AI techniques identified in the literature with their corresponding project management application areas. This mapping highlights the practical alignment between technological capabilities and project management functions.

AI Technique	**Project management domain**	**Example application**	**Representative studies**

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Machine learning	Predictive analytics	Schedule delay prediction, cost forecasting	Gondia et al. (2023); Strang & Vajjhala (2023); Chen et al. (2025)
Predictive analytics	Risk management	Early warning systems, emerging risk detection	Hamdan et al. (2025); Alsulamy (2025); Geamanu et al. (2026)
Prescriptive analytics	Decision support	Resource optimisation, scenario modelling	Azami et al. (2022); Didraga et al. (2025); Rodriguez-Garcia et al. (2026)
Intelligent automation	Productivity enhancement	Workflow automation, reporting efficiency	Taboada et al. (2023); Pereira et al. (2024); Nenni et al. (2025)
Generative AI	Knowledge and communication support	Documentation, reporting, knowledge synthesis	Hughes et al. (2025); Dawarka et al. (2025)
IoT / BIM / Digital twin integration	Monitoring and control	Real-time project tracking and performance monitoring	Valinejadshoubi et al. (2025); Chong et al. (2025); Huang et al. (2026)
AI governance frameworks	Organisational governance	Transparency, compliance, accountability oversight	Yang et al. (2025); Badhon et al. (2025); Serra et al. (2025)

Table 4: Mapping AI Techniques to Project Management Domains

Results

Of the scholarly contributions identified and synthesised in Table 3, the literature spans publications between 2022 and 2026, reflecting the rapid evolution of AI in project management. The initial dataset consisted of 205 studies, which were systematically screened and refined to 72 highly relevant peer-reviewed articles included in the concept-centric synthesis. This reflects both the growing interest in AI-enabled project management and the need to focus on studies that directly contribute to the identified thematic areas. The reviewed body of work demonstrates a clear acceleration in research output over recent years, with a strong concentration of studies emerging between 2024 and 2026. This increase aligns with the broader advancement of AI technologies, particularly the widespread adoption of

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machine learning, predictive analytics, and data-driven decision-support systems within project environments. Earlier contributions within the dataset primarily focused on foundational applications such as productivity enhancement, forecasting, and risk prediction (Taboada et al., 2023; Gondia et al., 2023; Strang & Vajjhala, 2023). These studies established the role of AI as a tool for improving efficiency and supporting more accurate project planning and control. From 2024 onwards, the literature shows a noticeable shift toward more advanced and integrated applications of AI. Research increasingly explores prescriptive analytics, optimisation-based decision-support systems, and the integration of AI within digital ecosystems and organisational structures (Azami et al., 2022; Nenni et al., 2025; Geamanu et al., 2026). In addition, recent studies highlight the growing importance of human–AI collaboration, ethical governance, and sustainability considerations, reflecting a broader transition from purely technical applications toward socio-technical and strategic perspectives (Hughes et al., 2025; Yang et al., 2025; Censi et al., 2025).

The dataset also reflects diversity in research approaches, including conceptual frameworks, empirical modelling studies, systematic literature reviews, and applied case-based research. This indicates that the field is evolving from exploratory and technical modelling toward more structured and interdisciplinary research that integrates technological, managerial, and organisational dimensions. Notably, recent studies increasingly position AI not as a standalone analytical tool, but as part of integrated digital ecosystems supported by technologies such as cloud platforms, IoT, and real-time data infrastructures (Valinejadshoubi et al., 2025; Chong et al., 2025; Huang et al., 2026).

Semantic Analysis

Following the methodology outlines, a semantic analysis was concluded using VOSviewer (Van Eck & Waltman, 2010) across the 72 selected publications (2022-2026) included in the final dataset. Initially, a broader set of 205 studies was identified however after applying screening and inclusion criteria a refined set of publications was analysed to ensure conceptual relevance and consistency. Titles, abstracts and key contributions were examined to identify dominant conceptual relationships aligned with the thematic structure developed in this study. After removing generic and non-informative terms a set of high frequency keywords was identified and grouped into conceptual clusters as illustrated in Figure 2. The analysis focused on co-occurrence patterns between concepts, rather than citation strength, to better understand how ideas are connected within the literature. In the visualisation, node size represents keyword frequency, while link strength indicates the degree of co-occurrence between terms. Only the most significant relationships were retained to enhance interpretability and avoid visual noise. The semantic map in Figure 2 reveals that “project management” forms the central and most dominant node, confirming its role as the primary anchor of the research domain. Surrounding this core are closely linked high-frequency terms such as “risk management,” “performance,” “machine learning,” “deep learning,” and “regression analysis,” which collectively indicate a strong emphasis on predictive

modelling and performance optimisation within AI-enabled project environments. The presence of terms such as “text classification,” “natural language processing,” and “large language models” further highlights the growing influence of advanced AI techniques and generative systems in recent studies. Geographically the literature reflects a broad international distribution but however, the maturity of AI adoption varies across regions and sectors. More advanced applications are evident in Asia, Europe, and North America, where predictive analytics, digital infrastructure, and AI-enabled decision-support systems are more fully integrated (Chen et al., 2025; Nenni et al., 2025; Geamanu et al., 2026). In contrast, emerging economies, including parts of Africa and the Middle East tend to reflect earlier-stage adoption, with a stronger focus on organisational readiness, skills development, and implementation challenges (Kelemu et al., 2024; Krpan et al., 2025). Construction and engineering projects dominate predictive analytics and risk forecasting applications, while IT and organisational projects emphasise decision-support systems, workflow automation, and productivity enhancement (Strang & Vajjhala, 2023; Valinejadshoubi et al., 2025). Overall, AI adoption in project management remains globally relevant but context-dependent, highlighting uneven maturity and the need for context-specific implementation strategies.

Key Themes

A comparison of the most prominent terms indicates that the literature is heavily concentrated around predictive analytics, risk management, and performance measurement. The strong clustering of terms such as “risk analysis,” “random forest,” “deep learning,” and “performance metrics” suggests that AI is primarily applied as a tool for forecasting, risk detection, and decision support. In addition, the presence of “sustainable development” and “supply chain management” indicates that AI applications are increasingly being extended beyond technical optimisation toward broader organisational and sustainability objectives. The map also highlights the integration of AI within digital and data-driven environments, as reflected by terms such as “digital devices,” “blockchain,” and “AI systems.” These terms cluster alongside core project management concepts, suggesting a transition from isolated analytical models toward interconnected and platform-based project ecosystems.

Performance and Decision-Oriented Emphasis

Performance-related terminology is highly visible across the semantic structure, reinforcing the idea that AI adoption in project management is largely driven by the need to improve efficiency, accuracy, and project outcomes. Frequently connected terms such as “performance,” “regression analysis,” and “risk management” demonstrate that AI is predominantly positioned as a decision-support and optimisation mechanism, rather than purely a technological innovation. The inclusion of terms such as “job analysis,” “end-users,” and “social network analysis” further suggests an emerging interest in the human and

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Volume: 07 Issue: 10 Year: 2026
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organisational dimensions of AI adoption. This aligns with the growing emphasis on human–AI collaboration and managerial decision-making, as identified in earlier thematic sections.

Thematic Clusters in the VOSviewer Map

The visual structure of the map reveals several distinct but interconnected clusters:

- The central cluster is anchored around "project management", linking multiple themes including performance, risk, and construction-related applications. This cluster represents the core integration of AI within project management practice.
- A technical modelling cluster (right-hand side) includes terms such as "deep learning," "random forest," "logistic regression," and "text classification," highlighting the role of machine learning techniques in predictive analytics and data-driven decision-making.
- A risk and sustainability cluster (upper-left region) includes "risk management," "risk analysis," and "sustainable development," indicating the increasing importance of proactive risk management and ESG-related considerations.
- A digital ecosystem and innovation cluster (lower-left region) includes "blockchain," "augmented reality," and "AI systems," reflecting the integration of AI within broader digital infrastructures.
- A social and organisational cluster (right-lower region) includes "social network analysis," "large language models," and user-related concepts, suggesting the growing relevance of collaboration, communication, and knowledge-based AI applications.

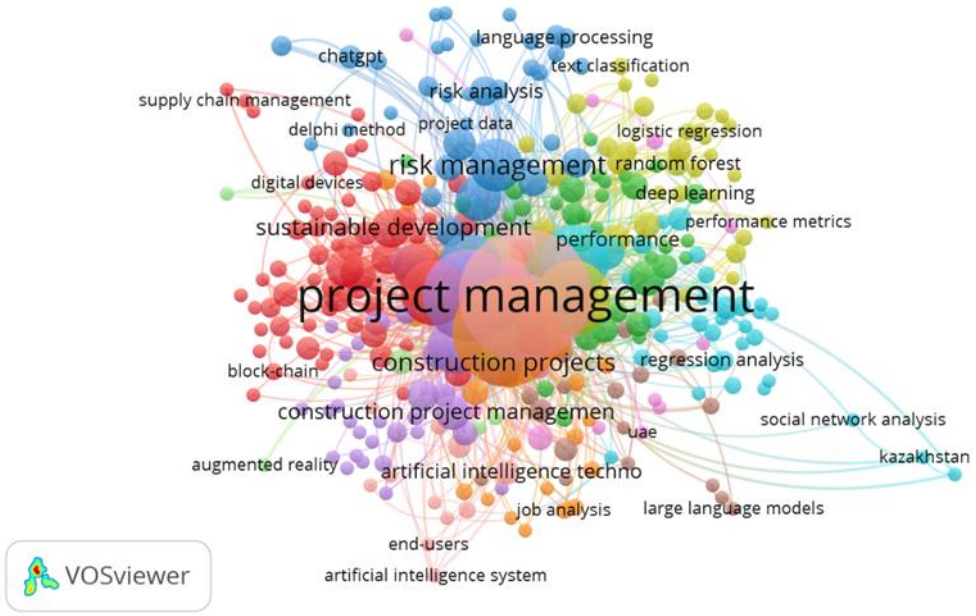

Figure 2: Semantic Clustering of Keywords Related to AI in Project Management (Source: VOSviewer)

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Volume: 07 Issue: 10 Year: 2026
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The semantic structure clearly indicates that predictive analytics and performance optimisation form the analytical core of AI-enabled project management, with strong interconnections between machine learning techniques, risk management, and decision-support processes. At the same time the emergence of terms related to generative AI, sustainability, and digital ecosystems suggests that the field is evolving beyond technical modelling toward more integrated and strategic applications.

Discussion

The integration of AI into project management is reshaping how organisations plan, monitor and control projects in complex and data driven environments. The findings of this study indicate that AI-enabled systems enhance productivity, forecasting accuracy, and decision-making capability, but their effectiveness depends on how well they are integrated within organisational structures and governance frameworks (Taboada et al., 2023; Nenni et al., 2025; Geamanu et al., 2026). AI-driven tools provide significant value by enabling real-time insights, early risk detection, and improved performance optimisation. However, these benefits are not realised automatically. The literature highlights that organisational readiness, data quality, system integration, and managerial trust play a critical role in determining the success of AI adoption (Kelemu et al., 2024; Krpan et al., 2025). This confirms that AI should be viewed as a support mechanism that enhances managerial capability, rather than replacing human expertise. Managers should therefore consider the following strategic implications:

Integration of AI Across Project Processes

Organisations should move beyond isolated AI applications and integrate AI capabilities across the full project lifecycle. This includes linking predictive analytics, decision-support systems, and performance monitoring tools to create a cohesive and data-driven project management environment.

Strengthening Human–AI Collaboration

Project managers remain central to decision-making processes. Organisations should invest in developing digital competencies and ensure that AI outputs are interpretable and usable. Effective collaboration between human judgement and AI systems is essential for achieving reliable decisions.

Establishing Governance and Ethical Framework

The use of AI requires clear governance structures that address issues such as data privacy, algorithmic bias, and accountability. Organisations must ensure that AI systems are used responsibly and that decision-making processes remain transparent and auditable.

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Digital Ecosystem Alignment

AI effectiveness is closely linked to the availability of integrated and scalable digital infrastructure. Organisations should invest in technologies such as cloud platforms, IoT, and data integration systems to support analytics and improve overall project performance.

Summary

This study provides a concept centric synthesis of the literature on AI in project management with specific focus on how predictive and prescriptive analytics are reshaping project processes, decision making and organisational practices. The findings demonstrate that AI has evolved from a supporting analytical tool into a central component of modern project management systems. A key conclusion is that predictive analytics is driving a shift from reactive to proactive project management by enabling early identification of risks and performance issues. Prescriptive analytics further enhances this capability by supporting decision-making through optimisation and recommendation systems. However, the study notes that research focuses on areas such as forecasting, risk prediction, or decision-support systems, with limited integration across the broader project lifecycle. Therefore, this highlights the need for more comprehensive frameworks that connect predictive, prescriptive, and organisational dimensions of AI adoption. Another important finding is that the successful implementation of AI depends not only on technological capability but also on organisational readiness, human expertise, and governance structures. Human–AI collaboration remains essential, as project managers play a critical role in interpreting AI outputs and ensuring that decisions are contextually appropriate and ethical. From a practical perspective, the transition toward AI-enabled project management requires a structured and phased approach. Based on the findings of this study, several key factors can be identified. (i) Organisations must establish a strong data foundation by ensuring data quality, accessibility, and integration across project systems. (ii) Investment in digital infrastructure, including cloud-based platforms and real-time data environments, is essential to support AI-driven analytics. (iii) Organisations should prioritise the development of human capabilities, including digital skills and the ability to interpret AI-generated insights, to enable effective human–AI collaboration. (iv) Governance frameworks must be implemented to address issues of transparency, accountability, and ethical AI use. Finally organisations should also adopt a gradual implementation approach, starting with targeted applications such as predictive analytics and decision-support tools. Despite these contributions, the study has several limitations. The review focuses on peer-reviewed academic literature, which may not fully capture emerging industry practices. The concept-centric approach emphasises thematic synthesis, which may overlook methodological differences between studies. In addition, the rapid evolution of AI technologies means that recent developments in generative AI are still in early stages of application.

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Future research should therefore focus on three key areas. (i) There is a need for empirical studies that examine the long-term impact of AI-enabled systems across the full project lifecycle. (ii) Further research is required to develop integrated frameworks that connect predictive analytics, prescriptive decision-making, and organisational processes. (iii) Greater attention should be given to governance and ethical considerations, particularly in relation to transparency, accountability, and responsible AI use within complex project environments. Furthermore, this study contributes to the literature by providing a structured and integrated understanding of AI in project management, highlighting the central role of predictive and prescriptive analytics while identifying key gaps and directions for future research.

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