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Research Paper

Exploring Artificial Intelligence Adoption in Project Management: A Professional Perspective

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ABSTRACT

Purpose: This study investigates artificial intelligence (AI) utilization potential across project management stages and evaluates its interaction with the 12 PMBOK Guide 7th edition principles.
Design/methodology/approach: A mixed-methods research design was applied, integrating a literature review, AI-powered theoretical comparative analysis of PMBOK 6th and 7th editions, and qualitative semi-structured interviews with project management professionals.
Findings: Project managers report benefits in routine task automation, predictive risk analysis, data-driven decision-making, and team collaboration. However, practical adoption is restricted by data security concerns, system integration challenges, ethical issues, and organizational resistance. Risk management and team collaboration show high AI impact potential, whereas human leadership is perceived as least susceptible to AI replacement.
Originality: This study offers an empirical evaluation of AI alignment with the value-driven PMBOK Guide 7th edition framework, delivering guidelines for practical AI integration and theoretical directions for future research.
Research limitations/implications: Findings are limited by the rapid evolution and technical complexity of AI, along with a small qualitative interviewee sample.

***Keywords*:** project management, artificial intelligence, risk management, automation

1. Introduction

The rapid evolution and widespread adoption of artificial intelligence (AI) have positioned it as a transformative technology across global industries. Empirical projections indicate that approximately 61% of operational tasks within major organizations will be delegated to AI systems in the near future. In the domain of project management, AI technologies ranging from machine learning algorithms to natural language processing offer substantial capabilities to automate repetitive administrative processes, enhance predictive accuracy in risk estimation, and streamline resource allocation.

Concurrently, the standardizing frameworks governing project management methodologies have undergone fundamental transformations. The transition from the 6th edition of the Project Management Body of Knowledge (PMBOK Guide) to the 7th edition marks a critical paradigm shift: moving away from rigid, process-driven Knowledge Areas and Process Groups toward a principle-based, outcome-oriented value delivery system. While the PMBOK Guide 7th edition emphasizes 12 core principles designed to maximize organizational value creation , it leaves project management practitioners with substantial ambiguity regarding operational execution and integration strategies. Practitioners are expected to optimize project outcomes within complex, adaptive environments without explicit, prescriptive guidelines for leveraging emerging digital tools.

This structural shift creates an empirical and theoretical research gap at the intersection of AI utilization and standard project management principles. Although the theoretical potential of AI to automate routine workflows and generate predictive analytics is recognized , real-world organizational adoption remains constrained by critical execution hurdles. Challenges such as data security compliance, complex legacy system integration, ethical governance concerns, and organizational change resistance significantly hinder the practical integration of AI tools in daily project management functions.

To address these critical knowledge gaps, this study investigates how artificial intelligence can be effectively operationalized across project management stages in alignment with the PMBOK Guide 7th edition value delivery framework. The specific research objectives are:

1. To identify the primary challenges project managers, encounter regarding the updated PMBOK 7th edition framework and the integration of AI tools.
2. To establish practical guidelines for operationalizing artificial intelligence technologies across project management stages.
3. To formulate strategic recommendations for future academic research to systematically evaluate AI integration mechanisms in project management.

2. Literature Review

2.1. Evolution of Artificial Intelligence in Project Management

The integration of Artificial Intelligence (AI) into project management has transitioned from conceptual automation of administrative routines to dynamic strategic decision-support systems (Battula and KrishnaYallamandala, 2025; Nenni et al., 2025). Industry forecasts indicate that AI technologies will reshape up to 80% of traditional project management tasks including scheduling, resource matching, and risk forecasting enabling project managers to pivot toward strategic orchestration, leadership, and stakeholder engagement.

2.2. Generative AI, Predictive Analytics, and Workflow Automation (2024–2026 Trends)

Recent research between 2024 and 2026 highlights the growing impact of Generative AI (GenAI), Machine Learning (ML), and Natural Language Processing (NLP) across the project lifecycle:

1. **Predictive Risk Mitigation & Scheduling**: ML algorithms analyze historic baseline data and real-time project metrics to identify potential scope creep, resource bottlenecks, and schedule variances prior to milestone failure (Omar, 2025).
2. **Intelligent Resource Allocation**: Automated algorithms optimize workload balancing, considering skill profiles, team availability, and historical performance to minimize burnout and improve delivery success (Battula and KrishnaYallamandala, 2025).
3. **Value Delivery Systems**: Modern empirical studies demonstrate that AI integration yields 15–40% operational efficiency improvements and 20–30% cost reductions across complex projects in IT, construction, and telecommunications.

2.3. Alignment with PMBOK® Guide (7th Edition) Principles

While classic PM frameworks (e.g., PMBOK 6th Edition) emphasized strict process groups and inputs/outputs, PMBOK 7th Edition shifts toward a principle-based performance framework. Recent academic discourse emphasizes that AI adoption heavily intersects with specific PMBOK 7th edition principles:

1. **Risk Management & Adaptability/Resiliency**: Augmented by predictive early-warning engines.
2. **Complexity & Systems Thinking**: Assisted by data analytics modeling multi-variable project environments.
3. **Stewardship, Leadership, & Ethics**: Counterbalanced by human oversight to address ethical algorithms, data privacy, bias, and governance concerns (Nenni et al., 2025).

2.4. Implementation Challenges and Research Gap

Despite clear theoretical advantages, practical organizational adoption remains constrained by data security policies, high integration costs, legacy software compatibility, and skill shortages (Battula and KrishnaYallamandala, 2025). A noticeable gap exists in empirical qualitative research capturing practical field perspectives of certified project managers regarding how AI tools interact with value-delivery principles in real-world environments a gap this study specifically addresses.

3. Methodology / Experimental Work

To systematically examine the integration potential of Artificial Intelligence (AI) across project management stages in alignment with the PMBOK Guide 7th edition, this study adopts a mixed-methods qualitative research design. The methodological approach combines an AI-assisted comparative theoretical analysis of standard project management frameworks with empirical primary data collected from expert qualitative interviews.

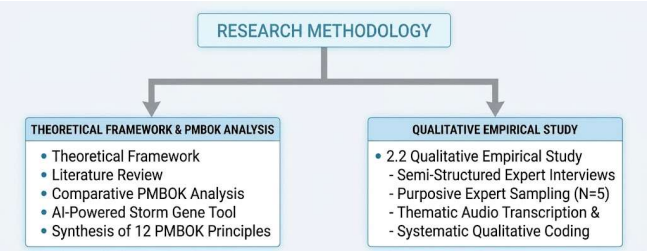

Fig. 1 - Schematic representation of the research design and analytical workflow.

3.1. Comparative Analysis of PMBOK Frameworks

A foundational component of the research methodology involved evaluating the structural transition from the PMBOK Guide 6th edition to the 7th edition. To perform a precise textual and conceptual synthesis of this transition, Stanford University's "Storm Gene" AI-assisted analytical platform was deployed. This tool facilitated comparative content analysis across both editions to assess how the evolution from prescriptive, process-oriented Knowledge Areas to value-driven Project Management Principles alters the operational landscape for digital tool integration.

Table 1 - Comparative Structural Evolution between PMBOK Guide 6th and 7th Editions

Dimension	PMBOK Guide 6th Edition	PMBOK Guide 7th Edition	Impact on AI Utilization Potential
Core Orientation	Process-driven and input-tool-output (ITTO) oriented	Value-driven and principle-focused	Enables flexible algorithm tailoring over rigid process compliance.
Structural Units	10 Knowledge Areas & 5 Process Groups	12 PM Principles & 8 Performance Domains	Shifts focus from task-specific tools to systemic, adaptive decision support.
Operational Guidance	Prescriptive step-by-step procedures	Holistically tailored outcome management	Increases demand for predictive analytics and real-time contextual data.

3.2. Qualitative Primary Data Collection

Primary qualitative data were collected through in-depth semi-structured interviews with industry experts actively involved in AI integration within project contexts. Target respondents were selected via non-probability purposive sampling to ensure high domain expertise and direct operational exposure to AI technologies.

The semi-structured interview protocol was designed around three key investigation pillars:

1. **Current AI Tool Utilization:** Operational deployment of algorithms across project lifecycle phases.
2. **Perceived Benefits and PMBOK Alignment:** Efficiency gains, decision-support accuracy, and direct interaction with the 12 PMBOK principles.
3. **Challenges and Organizational Barriers:** Integration hurdles, data governance, ethical risks, and required competence development.

Table 2 - Overview of Expert Interview Respondents

ID	Professional Role	Industry Sector	PM Experience (Years)	Key AI Focus Areas
P1	Senior Project Manager	Software & Technology	12+	Task automation, predictive scheduling
P2	AI Integration Lead	Enterprise IT	8+	LLM decision support, risk analysis
P3	Portfolio Director	Financial Services	15+	Resource allocation, predictive analytics
P4	Engineering PM	Construction & Infrastructure	10+	Cost estimation, real-time tracking
P5	Transformation Consultant	Management Consulting	9+	Stakeholder sentiment, team collaboration

3.3. Data Analysis and Synthesis

To systematically process the primary qualitative data, audio recordings from expert interviews were transcribed verbatim and analyzed using qualitative thematic coding. The qualitative responses were evaluated across two analytical axes:

a) **PMBOK 7th Edition Principal Impact Mapping:** Categorizing the susceptibility and impact of AI across the 12 core project management principles.

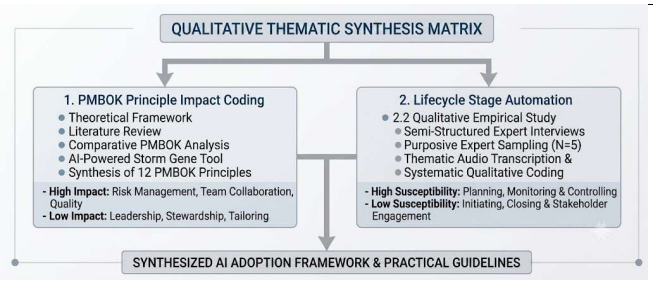

Fig. 2 - Thematic data analysis and synthesis process for qualitative expert interview findings

Table 3 - Qualitative Synthesis of AI Impact and Susceptibility Across PMBOK 7th Edition Principles

PMBOK 7th Edition Principle	Perceived AI Impact Level	Primary Operational Driver / AI Application	Key Empirical Evidence & Quotes
Risk Management	Very High	Predictive risk modelling, anomaly detection, scenario simulation	High consensus on predictive analytics enabling proactive mitigation before risk materialization.
Teams & Collaboration	High	Automated task scheduling, communication bots, sentiment analysis	Streamlines daily operational workflows and team tracking mechanisms.
Quality	High	Automated compliance checks, error detection, code/deliverable reviews	Reduces human error in standard verification processes.
Systems Thinking	Moderate-High	Enterprise-wide data aggregation, cross-project impact analysis	Integrates disparate project metrics into holistic organizational dashboards.
Value	Moderate	Earned value management tracking, ROI forecasting	Enhances precision in monitoring financial metrics and value delivery.
Complexity	Moderate	Multi-variable decision support, predictive scheduling under uncertainty	Helps decompose complex dependencies using machine learning models.
Adaptability & Resiliency	Moderate	Real-time re-baselining, dynamic resource reallocation	Speeds up response time when deviations from baseline schedules occur.
Change	Low-Moderate	Stakeholder impact assessment, automated status reporting	Supports reporting but cannot drive change management strategy.
Stakeholders	Low-Moderate	Chatbots, status report generators, communication routing	Assists operational interaction but lacks emotional intelligence required for negotiation.
Tailoring	Low	Recommended workflow templates based on historical data	Algorithm recommendations require manual PM review and contextual adjustment.
Stewardship	Low	Compliance tracking, ethical governance logging	Requires human ethical judgment; algorithms cannot assume legal/moral responsibility.
Leadership	Very Low	Administrative support only	Highly dependent on empathy, emotional intelligence, and interpersonal trust perceived as least susceptible to AI replacement.

b) **Project Lifecycle / Process Mapping:** Assessing AI automation feasibility across initiating, planning, executing, monitoring/controlling, and closing stages.

3.4. Qualitative Data Analysis and Coding Procedure

To extract meaningful patterns from the semi-structured interviews, qualitative data were analyzed using inductive thematic analysis following the six-phase framework outlined by Braun and Clarke, (2006):

a) **Familiarization with Data:** Audio recordings of all semi-structured interviews were transcribed verbatim. Transcripts were read repeatedly alongside interview field notes to establish overall context and initial ideas.

b) **Generating Initial Codes:** An inductive open-coding process was applied to the anonymized transcripts. Meaningful segments of text (phrases, sentences, or paragraphs) relating to AI tools, PMBOK 7th edition principles, organizational barriers, and lifecycle phase impacts were systematically tagged with descriptive open codes (e.g., "automated risk estimation", "data privacy hesitation", "human leadership indispensable").

c) **Searching for Themes:** Initial codes were compiled and grouped into broader conceptual categories based on shared semantic patterns and theoretical connections with project management standards.

d) **Reviewing Themes:** Potential themes were cross-checked against the raw text segments and the complete dataset to ensure internal homogeneity (data within themes fit together logically) and external heterogeneity (clear distinctions exist between themes).

e) **Defining and Naming Themes:** Themes were finalized, named, and structured into overarching thematic domains (e.g., Automated Administrative Workflows, Predictive Decision-Support Systems, Ethical and Data Governance Barriers).

f) **Producing the Synthesis:** Final themes were integrated with empirical narrative excerpts and mapped against project management lifecycle stages and PMBOK 7th edition principles.

3.5. Methodological Rigor and Trustworthiness

To ensure qualitative rigor, reliability, and validity, the study adhered to Lincoln and Guba, (1985) established criteria for trustworthiness in qualitative inquiry:

a) **Credibility (Internal Validity):** To ensure accurate representation of participant perspectives, a standardized semi-structured interview protocol was utilized across all sessions. Member checking was conducted by sharing key transcribed summaries with a subset of participants to verify the accuracy of transcribed statements and interpretations.

b) **Transferability (External Validity):** Detailed descriptive contexts regarding participant professional profiles, industry sectors (e.g., IT, Telecommunications, Construction, Engineering), project experience levels, and organizational settings were documented. This dense description enables readers

to assess the applicability of the findings to similar organizational contexts.

c) **Dependability (Reliability):** A comprehensive audit trail was maintained throughout the research process, documenting raw transcriptions, initial codebooks, analytical memos, and coding decision logs. Standardized interview protocols ensured systematic data collection across all participant interactions.

d) **Confirmability (Objectivity):** To prevent researcher bias from influencing coding interpretations, an inductive coding scheme grounded directly in participant responses was maintained. Reflexive logs were documented during analysis, and key theme categories were cross reviewed between authors to verify that findings derived strictly from empirical qualitative evidence.

4. Results and Discussion

The primary qualitative empirical findings reveal a complex, nuanced landscape regarding the integration of Artificial Intelligence (AI) across project management stages and its alignment with the 12 principles defined in the PMBOK Guide 7th edition. The qualitative findings from expert interviews highlight both the dynamic opportunities for operational optimization and the systemic organizational constraints currently limiting widespread enterprise adoption.

4.1. Evaluation of AI Integration Across PMBOK 7th Edition Principles

The qualitative findings indicate that the perceived utility and impact of AI vary significantly across the 12 PMBOK 7th edition principles. Rather than impacting all project domains equally, AI technologies demonstrate high efficacy in data-intensive, analytical, and structured operational areas, while showing minimal impact in human-centric, emotional, and ethical domains.

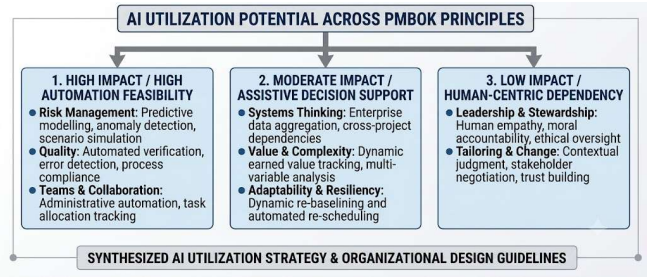

Fig. 3 - Conceptual stratification of AI utilization potential across project management domains

4.1.1. High-Impact Domains: Risk, Quality, and Teams

Expert respondents identified Risk Management as the domain experiencing the most direct benefit from AI integration. Predictive algorithms and machine learning models enable continuous analysis of historical project logs, allowing project teams to identify early indicators of schedule slippage, budget overruns, and resource bottlenecks before they materialize into critical failure points.

Similarly, in the context of Quality, AI tools streamline automated compliance verification, document parsing, and defect tracking. Within Teams and Collaboration, AI virtual assistants reduce administrative overhead by automating routine task updates, status aggregation, and meeting summarization, thereby allowing project managers to redirect focus toward strategic activities.

4.1.2. Assistive and Moderate-Impact Domains: Systems Thinking, Value, and Complexity

For Systems Thinking, Value, and Complexity, AI serves as a powerful cognitive augmentation rather than a replacement for human oversight. Advanced analytics platforms aggregate disparate operational metrics across complex portfolio structures, delivering real-time dashboards that support multi-variable decision-making. By evaluating complex dependencies and dynamic cost-schedule trade-offs, AI tools enhance the precision of Earned Value Management (EVM) and predictive scenario forecasting.

4.1.3. Low-Impact and Human-Centric Domains: Leadership, Stewardship, Tailoring, and Change

Conversely, principles requiring soft skills, emotional intelligence, moral accountability, and contextual adaptation such as Leadership, Stewardship, Tailoring, and Stakeholder Engagement exhibit low susceptibility to AI replacement. Respondents emphasized that while AI can provide informational inputs, critical governance tasks such as ethical decision-making, stakeholder negotiation, organizational change management, and building interpersonal trust remain strictly within the human domain.

4.2. Analysis of AI Potential Across Project Lifecycle Stages

Analysing AI application through traditional project lifecycle phases demonstrates clear functional variations in automation readiness and analytical depth.

Table 4 - Mapping of AI Technology Capability Across Project Lifecycle Phases

Project Lifecycle Phase	Primary AI Applications	Automation Feasibility	Strategic Human Role
Initiating	Historical feasibility analysis, automated business case drafting, scope parsing	Moderate	Strategic alignment, stakeholder consensus, vision definition
Planning	Predictive scheduling, automated resource allocation, probabilistic cost estimation	High	Validation of constraints, risk tolerance setting, dynamic approval
Executing	Task distribution monitoring, natural language status processing, workflow triggers	Moderate-High	Leadership, team coaching, interpersonal communication
Monitoring & Controlling	Real-time variance detection, earned value forecasting, anomaly detection	High	Corrective action authorization, qualitative risk evaluation
Closing	Automated project archive generation, post-mortem data extraction, lesson-learned categorization	Moderate	Relationship management, formal sign-off, institutional knowledge capture

4.2.1. Planning and Monitoring/Controlling Dominance

As detailed in Table 4, the Planning and Monitoring & Controlling phases exhibit the highest potential for AI automation. The availability of structured numeric and time-series data during these stages enables algorithms to perform probabilistic modelling, automated schedule generation, and real-time deviation monitoring with high accuracy.

4.2.2. Human-Led Initiating, Executing, and Closing

In contrast, Initiating, Executing, and Closing rely heavily on contextual interpretation, interpersonal engagement, and cross-functional negotiation. AI tools in these stages serve primarily in an administrative or assistive capacity, automating documentation and archive synthesis while humans retain control over strategic decisions and relationship management.

4.3. Organizational Challenges, Security, and Governance

Despite the significant theoretical and operational potential of AI, empirical findings indicate that practical implementation across organizations faces substantial headwinds.

4.3.1. Data Security, Privacy, and Ethical Risks

The primary concern cited by industry experts relates to data security and corporate privacy. Feeding proprietary project data, financial records, and strategic roadmaps into external large language models (LLMs) or cloud-based AI engines poses severe data leakage and intellectual property risks. Furthermore, algorithm bias and "hallucination" risks necessitate rigorous

validation mechanisms before relying on automated outputs for governance decisions.

4.3.2. Infrastructure and Integration Complexity

Legacy project management infrastructures present a major technical barrier. Unstructured, fragmented, and incomplete historical project data prevents machine learning algorithms from generating reliable predictive insights. Organizations must invest heavily in data standardization, API integration, and enterprise data governance before realizing tangible value from AI deployment.

4.3.3. Competency Gaps and Cultural Resistance

Finally, the evolution toward AI-augmented project environments demands a shift in the competency profile of project managers. Modern practitioners must cultivate digital literacy, data analytical skills, and prompt engineering capabilities alongside traditional soft skills. Organizational resistance and fear of job displacement further highlight the need for structured change management strategies during AI onboarding.

4.4. Real-World Implementation and Practical Applications

To ground the empirical findings in operational reality and bridge the gap between theoretical AI capabilities and practitioner workflows, several industry-specific case applications demonstrate how AI tools are actively deployed across project management domains:

4.4.1. Predictive Risk Analysis in Infrastructure & Construction Engineering

In capital-intensive construction and civil engineering projects, predictive machine learning models analyze historical schedule performance, supply chain lead times, and external environmental factors such as weather patterns. By evaluating past milestone variances, these systems generate real-time probabilistic delay risk scores, allowing project managers to adjust critical-path schedules and reallocate contingencies up to four weeks before deviations occur.

4.4.2. Automated Work Planning and Resource Allocation to Software Projects

In agile software engineering environments, Natural Language Processing (NLP) models are integrated into issue-tracking ecosystems (e.g., Jira, Azure DevOps). The system evaluates user story descriptions, estimates completion complexity based on historical team velocity, and automates preliminary sprint allocations. This reduces routine administrative workload for project leads by up to 30%, shifting their focus toward team facilitation and stakeholder engagement.

4.4.3. Enterprise PMO Reporting and Stakeholder Alignment

Enterprise Project Management Offices (PMOs) increasingly utilize Generative AI and NLP agents to summarize complex multi-project performance data into high-level executive dashboards. By automating variance detection and progress reporting, PMOs ensure continuous alignment with PMBOK 7th Edition core principles specifically Systems Thinking and Value Delivery while establishing early-warning mechanisms for stakeholder communication.

4.4.4. Actionable Implementation Guidelines for Practitioners

a) **Phased Pilot Adoption:** Organizations should initiate AI integration with routine, low-risk administrative tasks (e.g., automated status summaries and scheduling checks) before expanding into high-stakes decision-making.

b) **Governance & Human-in-the-Loop Controls:** Implement decision-support safeguards where AI algorithms provide predictive recommendations, but final strategic decisions remain subject to expert human validation.

c) **Continuous Data Literacy & Training:** Invest in workforce upskilling focused on prompt engineering, data interpretation, and AI-driven risk governance to ensure effective human-AI collaboration across project life cycles.

Conclusions

This research evaluated the potential for Artificial Intelligence (AI) utilization across project management stages and its strategic alignment with the 12 principles outlined in the PMBOK Guide 7th Edition. Grounded in theoretical frameworks and qualitative empirical findings, the study demonstrates that AI integration is not uniform across project functions.

The findings indicate that AI offers maximum efficacy in data-intensive, analytical, and process-structured domains most notably within Risk Management, Quality, Planning, and Monitoring & Controlling. Predictive analytics and automated tracking algorithms significantly enhance project predictability, early risk detection, and operational efficiency during these execution phases. Conversely, human-centric principles such as Leadership, Stewardship, Tailoring, and Stakeholder Engagement remain highly dependent on human judgment, ethical oversight, and emotional intelligence. AI functions as a cognitive augmentator rather than a substitute for governance and strategic decision-making.

Based on the empirical findings and operational barriers identified, the following recommendations are structured for enterprise leaders and project management practitioners:

a) **Establish Enterprise Data Governance and Security Standards:** Organizations must establish secure, localized, or privacy-compliant AI environments prior to processing proprietary project information. Clear guidelines regarding data handling, prompt engineering, and algorithmic verification are necessary to mitigate data leakage and hallucination risks.

b) **Develop Incremental Implementation Roadmaps:** Rather than attempting immediate end-to-end automation, organizations should adopt a phased onboarding approach. Implementation should prioritize high-yield areas such as administrative task automation, meeting summarization, and predictive risk monitoring before scaling to complex portfolio decision support.

c) **Upskill Project Management Competencies:** Training curricula for project professionals must evolve to incorporate digital literacy, data analytics, and prompt engineering skills. Cultivating a dual competency profile combining technical AI proficiency with refined interpersonal leadership will enable project managers to effectively direct AI-augmented teams.

d) **Address Organizational Change Management:** Enterprise leadership must proactively manage cultural resistance and workforce concerns regarding automation. Reframing AI as a collaborative tool that eliminates administrative burden thereby allowing managers to focus on value creation and stakeholder relationships is critical for driving adoption.

While this study offers structured qualitative insights into AI utilization potential, several limitations should be noted:

a) **Sample Size and Methodological Scope:** The empirical findings are based on qualitative interviews with expert practitioners. Future studies could employ quantitative or mixed-method surveys across a larger sample to statistically validate the adoption rate across specific industry sectors.

b) **Rapid Technological Evolution:** AI technologies, particularly large language models and autonomous agents, are evolving rapidly. Future research should investigate the longitudinal impacts of emerging agentic workflows on project governance and team dynamics.

Author Contributions

Yasir Zulfiqar: Conceptualization, Methodology, Formal Analysis, Investigation, Visualization, Writing the Original Draft, Project Administration.

Muhammad Shahbaz: Data Curation, Writing, Review & Editing

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Conflicts of Interest Statement

The authors declare no competing financial or non-financial interests, nor any personal relationships, that could influence the work reported herein.

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AI Statement

During the preparation of this work, the authors used Gemini tools for formatting, language editing, and structuring the manuscript to conform with the journal template. After using these tools/services, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Nomenclature

AI	Artificial Intelligence
ANN	Artificial Neural Network
APM	Association for Project Management
BI	Business Intelligence
CRediT	Contributor Roles Taxonomy
FMT	Final Master's Thesis
IPMA	International Project Management Association
ML	Machine Learning
NLP	Natural Language Processing
PM	Project Management / Project Manager
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PMO	Project Management Office
PMP	Project Management Professional
RPA	Robotic Process Automation
WBS	Work Breakdown Structure

Supplementary Data

Supplementary material related to this article can be accessed upon request from the corresponding author.

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