Integrating GenAI and Project Management: A Phase-wise Model for Co-Creative Information Systems Development

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Abstract

This paper presents the GenAI–PM Integration Model, a conceptual framework for embedding Generative Artificial Intelligence (GenAI) within Agile project management across the Software Development Life Cycle (SDLC). The framework addresses critical challenges posed by increased complexity, data management, and stakeholder collaboration in contemporary projects. It aligns specific GenAI capabilities to Agile project phases, demonstrating how AI can enhance decision-making, streamline processes, improve resource allocation, and foster higher-quality outcomes. By emphasizing co-creative interactions between AI systems and human teams, this model highlights the transformative potential of integrating GenAI into Agile methodologies, contributing to more adaptive and responsive information systems development practices.

Keywords: Project Management, GenAI, Generative AI, Information Systems Development, Software Development Life Cycle.

1. Introduction

Project management (PM) methodologies have historically tried to coordinate tasks, resources and stakeholders in a manner that ensures the congruence of ISD objectives with respect to scope, timeframe and budgetary constraints. However, even the most mature PM methodologies are now being challenged by unprecedented project volatility, exploding data volumes and the need to co-create value with diverse stakeholder groups [18]. Concurrently, Generative Artificial Intelligence (GenAI) has transitioned from a mere laboratory curiosity to a matter of paramount concern for boardrooms. Large-language models (LLM), diffusion-based image generators and code-generation systems have already been demonstrated to possess the capability to draft user stories, design alternative system architectures, produce executable code and even generate synthetic test data. Notwithstanding this evident momentum, the systematic integration of GenAI capabilities with established PM practices across the entire Software Development Life Cycle (SDLC) remains under-explored. Current research in this field: (1) firstly, the merits of individual PM methodologies in ISD have been examined, (2) isolated applications of AI within single SDLC phases have been analysed.

2. Related work

The integration of GenAI with PM methodologies in the ISD represents a convergence of technological innovation and systematic project planning [11]. The field of GenAI has seen significant advances, with applications ranging from machine learning and natural language processing to optimization and automation [10]. Batarseh et al. explored the application of GenAI techniques to optimize ISD processes and demonstrated how machine-learning algorithms can improve code quality and developer productivity [2]. Similarly, Gil et al. proposed a new artificial intelligence (AI) framework for automating project scheduling and resource allocation, demonstrating the potential of GenAI to streamline PM tasks and improve project outcomes [5]. Bodea et al. highlighted the role of AI as a disruptive technology in PM and identified the key drivers and barriers to its adoption [3]. The study [4] found that while the implementation of AI in PM is still in its infancy, its potential for empowerment is significant, significantly improving decision-making and project outcomes [4]. Kim's analysis provides an in-depth examination of the critical success factors for AI implementation in project environments [8]. A comparison between traditional and AI systems shows that AI can lead to cost reductions, quality improvements, and faster response times, provided AI projects are implemented strategically with a long-term vision [8]. Tominc et al. discussed an agility-based model that incorporates AI to improve project success and competitive advantage [19]. This model highlights the importance of agility and adaptability for maximizing the benefits of AI in PM [8]. The findings suggest that the combination of AI and agile methodologies not only increases project efficiency and effectiveness but also contributes to competitive advantage in rapidly changing technological landscapes [19]. The literature [1], [10] highlights the transformative potential of integrating GenAI with PM methodologies in ISD. Therefore, studies such as those by Alshaikhi et al. explored the cause-and-effect relationships between AI characteristics, PM challenges, and organizational change, suggesting the transformative potential of AI in redefining PM practices [1], [4]. These findings are consistent with the ongoing need for structured approaches to fully leverage AI within the ISD PM frameworks.

The SDLC is a systematic approach to ISD that ensures activities are conducted in an orderly, traceable manner, and aligned with organisational objectives, particularly in complex and high-stakes environments. The SDLC is broadly defined as a multistep process that guides the conception, development, and final disposition of software systems. According to the U.S. National Institute of Standards and Technology (NIST), the SDLC encompasses the entire lifecycle of a project. Key processes such as risk management and security planning are incorporated with a view to safeguarding information and ensuring regulatory compliance [12,13], [15]. As Radack emphasises, the integration of information security into each SDLC phase not only improves technical outcomes but also enhances stakeholder confidence and system interoperability [15]. While there may be variation among specific models, the classical SDLC generally encompasses seven stages [12,13], [15]. These seven stages facilitate a structured progression through the development process, while allowing for iterative refinements and feedback loops in more agile variants. It is evident that a plurality of SDLC models have come to the fore in order to cater to a variety of project environments, stakeholder expectations and risk profiles. The lightweight, user-driven methodologies focus on adaptability, continuous feedback and iterative delivery [12,13]. As Maryani et al. observe, each SDLC model possesses distinct strengths and limitations, and the selection of model should be tailored to the project's size, complexity, stakeholder clarity, and need for flexibility [12].

The integration of GenAI with PM methodologies in ISD is based on a co-creative approach, where all people and AI systems, collaborate to optimize project outcomes [16]. The co-creative processes that facilitate such integration, drawing on the principles of value co-creation as outlined by Kautz and Bjerknes and further supported by recent research on human-AI co-creation [7]. Kantosalo and Takala highlight the significance of meta-level communication in these interactions, which optimizes project outcomes by capitalizing on the strengths of both human and artificial agents [6]. In accordance the feedback loops entail regular interactions with stakeholders, which facilitates the refinement of AI systems in accordance with real-world usage and feedback. This enables AI to evolve in response to a project's changing needs [7], [9], [16]. This ensures that AI implementation promotes fairness and diversity [16]. The involvement of stakeholders as proposed by Longoria et al., facilitates a comprehensive co-creation environment. The diversity of perspectives ensures that AI tools in PM do not perpetuate biases, but are developed with an understanding of different user needs and contexts [9].

3. GenAI–PM Integration Model

Integration of PM methodologies and the SDLC with GenAI in ISD requires a systematic and coherent framework. This chapter present proposition of the GenAI–PM Integration Model, a conceptual structure that defines the essential components, relationships, and processes involved in this integration. Building upon established SDLC phases, the GenAI–PM Integration Model enables organizations to systematically embed GenAI functionality across the project lifecycle, fostering intelligent automation, predictive insight, and adaptive collaboration between human stakeholders and AI systems [12,13,14,15]. This scientific model repositions GenAI not merely as an automation tool but as a co-creative system actor capable of dynamic learning, decision support, and context-sensitive intervention throughout the SDLC. To facilitate understanding and practical application, the GenAI–PM Integration Model is complemented by a visual integration diagram developed by the author. This diagram (Fig. 1) illustrates the alignment of GenAI techniques with SDLC phases and corresponding PM stages under both Agile and Waterfall methodologies.

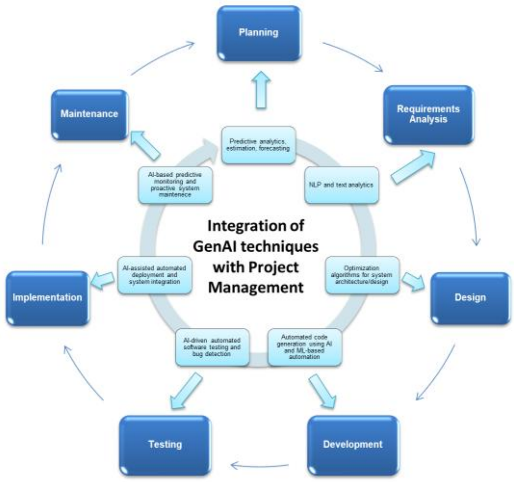

Fig. 1. Integration of GenAI Techniques with SDLC Phases and PM. Source: Own elaboration.

Figure 1 serves as a cognitive tool which visually demonstrates how GenAI can be applied across different stages of ISD, emphasizing the co-evolution of AI technologies and management practices in ISD environments.

In Agile methodologies prioritize flexibility, iterative delivery and adaptive planning. GenAI serves as an enabler of continuous feedback, real-time analytics, and automated testing [17]. It supports Agile teams by facilitating sprint planning, backlog refinement, and dynamic resource allocation. The table below provides a detailed comparison of how GenAI techniques align with SDLC phases and how their practical applications under Agile methodology:

Table 1. Comparative alignment of GenAI techniques with SDLC phases under Agile PM and innovative business value. Source: own elaboration.

	SDLC Phase	GenAI Techniques	Agile PM Stage	Extended GenAI Applications	Innovative GenAI Business Value
1	Planning	AI-driven predictive analytics, estimation, forecasting	Sprint Planning, Backlog Refinement	Predictive risk analysis, cost estimation, scheduling automation, meeting agenda generation	***Enhanced Strategic Decision-Making:*** Real-time predictive analytics for early identification of market trends and potential disruptions, enabling strategic agility. ***Resource Optimization Forecasting:*** Advanced forecasting models for optimizing resource allocation, reducing costs, and improving efficiency.
2	Requirements Analysis	NLP, text analytics	User Story Definition, Backlog Grooming	Automated requirements gathering, stakeholder sentiment analysis, real-time translation	***Intelligent Requirement Elicitation***: NLP-based tools for automated stakeholder interview synthesis, enhancing requirement accuracy and engagement. ***Stakeholder Sentiment Analysis:*** AI-driven analysis dynamically capturing and responding to stakeholder expectations to ensure business alignment.
3	Design	Optimization algorithms for design	Sprint Design, Iteration	Design optimization, scenario modeling, generation of	***AI-Powered Creative Design Exploration:*** Generative models exploring alternative system designs to

		decisions	Planning	alternative architectures	stimulate innovation and competitiveness. ***Automated Design Validation:*** Real-time validation of design choices against KPIs and constraints, improving design reliability.
4	Development	AI/ML-based code generation and automation	Sprint Execution, Continuous Integration	Code generation, auto-documentation, developer task allocation, low-code/no-code support	***Accelerated Development Cycles:*** ML-driven code generation reducing timelines, enabling rapid iteration and time-to-market. ***Real-time Development Insights:*** Continuous analytics offering feedback on code quality and team productivity.
5	Testing	Automated testing, AI-driven bug detection	Automated Testing, CI Pipelines	Defect detection, test case generation, regression analysis, QA reporting	***Predictive Defect Prevention:*** Analytics anticipating potential defects, improving reliability before formal testing. ***Intelligent Quality Gate Automation:*** Real-time generation and evaluation of test cases, speeding up quality assurance.
6	Implementation	AI-assisted deployment, CI/CD integration	Continuous Deployment, Release Planning	CI/CD optimization, deployment orchestration, AI-assisted release notes	***AI-Driven Deployment Optimization:*** Algorithms dynamically refining deployment strategies to reduce downtime and user disruption. ***Automated Compliance Assurance***: Real-time monitoring of deployment adherence to standards, minimizing regulatory risk.
7	Maintenance	Predictive monitoring, proactive maintenance	Sprint Review, Retrospective, Monitoring	Predictive maintenance, anomaly detection, resource reallocation based on system usage	***Proactive AI-driven Maintenance:*** Predictive monitoring to reduce outages and maintenance costs. ***Continuous Customer Experience Enhancement***: Learning systems that adapt based on user interaction, increasing satisfaction and loyalty.

This comparative mapping not only clarifies the technical alignment of GenAI within the SDLC but also highlights its contextual utility across different PM paradigms. In Agile contexts, it envolves into a responsive tool for continuous adaptation and real-time decision-making. An initial pilot case study was conducted, which constitutes a baseline use case for the ongoing research on the PM integration model with GenAI.

4. Discussion, Conclusions and Future Work

Preliminary pilot studies conducted in earlier research [14], provide a qualitative basis for the further validation of the GenAI–PM Integration Model into real-world ISD projects, tracking performance indicators over multiple project cycles, and refining the model based on empirical feedback. Qualitative validation is a necessary next step in assessing the applicability and impact of the proposed model.

In summary, the GenAI–PM Integration Model serves as both a conceptual foundation and a call to action. Its true potential will emerge through iterative validation, cross-methodological analysis, and continued co-creation between human stakeholders and intelligent systems. The next stage of this work involves translating the model from theory into practice—through larger case study testing, methodological diversification, and cross-sectoral application—shaping the future of intelligent and co-creative digital project delivery. This transition requires not only rigorous validation through real-world implementation, but also the cultivation of organizational readiness, stakeholder trust, and ethical governance frameworks.

Through collaborative efforts between academia and industry, this model can guide the development of project environments that are not only more efficient and data-driven, but also more inclusive, transparent, and responsive to the human values at the heart of information systems development.

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