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TRANSFORMING AGILE PROJECT MANAGEMENT THROUGH ARTIFICIAL INTELLIGENCE

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Abstract
In the context of the rapid transformations of the past decade, Artificial Intelligence (AI) is significantly reshaping processes across all industries, including – perhaps most notably – software development. This paper explores the multifaceted role of AI in transforming Agile project management practices, highlighting key innovations, challenges, and benefits. Based on a review of the literature combined with exploratory case examples from current industry practices, the study identifies AI-driven technologies that enhance decision-making and forecasting capabilities. While AI offers significant advantages – such as automating routine tasks and enabling predictive insights – its integration also presents critical challenges. These include concerns related to data privacy and security, overreliance on technology, limitations in integration, and the pressing need for project managers to develop new competencies in a rapidly evolving technological landscape. The paper aims to provide a structured perspective on how AI can be strategically embedded into Agile processes to enhance project outcomes. The findings suggest that AI not only boosts productivity but also redefines team dynamics and strategic decision-making, contributing to a deeper understanding of how AI can sustainably support modern project management.
Keywords: *agile project management; artificial intelligence; agile framework; machine learning; natural language processing.*
JEL Classification: O22; O33; L86; M15.

1. INTRODUCTION

The Agile methodology has gained significant popularity, particularly within companies engaged in software development. Its widespread adoption can be attributed primarily to its natural embrace of change and its emphasis on technical excellence (Shankarmani *et al.*, 2010). Grounded in four core values and twelve

principles, Agile software development has been adopted by numerous teams and organizations as an adaptive response to the dynamic evolution of technology.

Agile teams are typically small, with three to ten members, who generally develop products through short, fixed-length iterations lasting between one and four weeks. In some Agile frameworks, such as Kanban, delivery occurs on a continuous basis. Regardless of the specific framework adopted by the team, the overarching objective remains consistent: delivering high-quality functionality on time to meet customer expectations. While Agile practices are characterized by flexibility and the frameworks are fundamentally empirical, their high level of adaptability often presents challenges. Project managers must identify and select those practices that most effectively facilitate both team and project evolution over the long term. Consequently, they are required to demonstrate strong analytical skills and critical thinking abilities to identify and address obstacles that impede team performance- obstacles that are often subtle and difficult to detect.

The recent evolution of artificial intelligence (AI) offers significant opportunities to enhance project outcomes by automating various tasks, whether related directly to project implementation (e.g., code generation, automated testing, bug fixing, training of the team members) or to activities that support development (e.g., planning, estimation, team member selection). The integration of AI technologies can substantially reduce the time allocated to non-value-adding activities, streamline communication, facilitate decision-making, and improve responsiveness to the uncertainties inherent in Agile software development.

This paper examines the ways in which AI-driven transformations enhance the execution of projects implemented through Agile methodologies and improve team performance. The paper is structured as follows: Section 1 introduces the topic; Section 2 reviews the relevant literature on Agile project management and AI applications in project management; Section 3 presents examples of specific activities where AI supports transformation within Agile teams; and Section 4 offers concluding remarks based on the analysis conducted.

2. LITERATURE REVIEW

2.1. Background of agile project management

A substantial body of scholarly research has explored the challenges and advantages associated with software development using Agile methodologies. Formalized in 2001 through the Agile Manifesto, this approach sought to address the shortcomings inherent in traditional project management models – classified by the Project Management Institute as "predictive project management" – which required the development of highly detailed, upfront plans encompassing all intended functionalities of the final product.

Initially, Agile frameworks such as Scrum, Kanban, Lean Software Development, and Extreme Programming (XP) were designed to support small-scale projects. Over time, these frameworks have been expanded and adapted,

forming the foundation for large-scale Agile methodologies, including the Scaled Agile Framework (SAFe), Large-Scale Scrum (LeSS), and Nexus, to accommodate the needs of complex, enterprise-level initiatives) (Reddaiah *et al.*, 2016); Pieroni *et al.*, 2018; Neve and Agarwal, 2024).

Each framework is accompanied by a defined set of practices, roles, and events that the team adheres to in order to work in an Agile manner and deliver incremental value to customers (Bahi *et al.*, 2024). Among these, Scrum is the most widely adopted Agile framework. Teams applying Scrum develop products incrementally and iteratively by dividing the work into sprints, typically lasting between two and four weeks, with a two-week duration being the most common. Customer requirements are formulated as user stories, which are sufficiently small to be implemented within a single sprint or iteration (Alsaadi and Saeedi, 2022). At the end of each sprint, the team is expected to deliver only fully completed functionalities – designed, implemented, and tested – to the customer.

Formulating requirements whose scope exceeds the timeframe of a sprint would be against Agile principles and practices. Such requirements do exist, referred to as epics, but they must be decomposed into smaller, manageable user stories before being incorporated into a sprint. Estimation of user stories is most commonly performed using story points, which reflect the total effort required to complete a backlog item or another unit of work (Goswami *et al.*, 2016). The number of story points, often determined using the Fibonacci sequence, should simultaneously account for the complexity of the requirement, the volume of work necessary for its completion, and the associated risk or uncertainty.

Collaboration is a fundamental characteristic of Agile methodologies. In Scrum, communication is facilitated through four key events: (1) *Sprint Planning*, conducted before the start of each sprint to plan the work to be completed; (2) *Daily Standup (Daily Scrum)*, held daily to communicate progress and ensure team synchronization; (3) *Sprint Review*, at the end of the sprint, for presenting the deliverables and gathering stakeholder feedback; and (4) *Sprint Retrospective*, aimed at reviewing processes and identifying opportunities for improvement (Bahi *et al.*, 2024). The Agile approach promotes the formation of cross-functional, self-organizing teams, capable of delivering a potentially shippable product at the end of each iteration.

2.2. Background of artificial intelligence in project management

The evolution of AI in recent years has been remarkable, driven by significant advancements in the infrastructure underpinning information and communication technologies. Within project management, AI offers diverse opportunities for process optimization and overall performance enhancement at the project level (Cristaldo *et al.*, 2021). It is currently leveraged for a wide range of activities, including requirements formulation, predictive analysis, optimization of planning based on historical data, automation of repetitive tasks,

dynamic updating of project schedules in response to changes, cost estimation, risk prediction, detection of team overload and bottlenecks, monitoring team communication, and assessing team members' morale, among others (Chou *et al.*, 2013; Costantino *et al.*, 2015; Xu and Lin, 2015; Wauters and Vanhoucke, 2016; Hsu *et al.*, 2020; De Oliveira *et al.*, 2023; Taboada *et al.*, 2023). By relieving team members and project managers from routine tasks, AI enables them to allocate more time to strategic and creative activities. Moreover, it significantly reduces the likelihood of human errors.

In recent years, the advent of Generative AI (GenAI) has received widespread attention, particularly due to the availability of accessible tools such as ChatGPT, DeepSeek, and Gemini. GenAI can be employed across a broad spectrum of project management activities, from planning to monitoring and control, delivering remarkable results. Various tools are used to generate reports, create or refine requirements, perform real-time translations to eliminate communication barriers, draft or interpret messages, and more.

According to Felicetti *et al.* (2024), GenAI acts as both an enabler of efficiency and a driver of growth, reshaping competitive dynamics. Its adoption facilitates the identification of problems, opportunities, and threats at a level that surpasses conventional knowledge domains and traditional search routines. Despite the growing interest, the literature focusing on AI applications in project management remains relatively limited. Bahi *et al.* (2024) discuss how generative AI enhances workflow efficiency and mitigates challenges in software projects through activities such as code generation and predictive analytics. Similarly, they demonstrate how AI enables proactive risk anticipation and real-time collaboration through its predictive capabilities.

Other scholars have compared the expertise of human project managers with AI-driven systems, highlighting that AI, when effectively integrated, can significantly enhance decision-making processes during the project planning phase (Barcaui and Monat, 2023). Furthermore, Felicetti *et al.* (2024) analysed the factors influencing project managers' use of generative AI. Their findings reveal that an innovative attitude, peer influence, and good task–technology fit substantially affect the ways in which AI is employed – whether creatively or in unexpected manners.

3. APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN AGILE PROJECT MANAGEMENT

Both formally and informally, numerous Agile teams increasingly integrate AI into project-related activities. Within projects developed using Agile methodologies, AI can be employed to automate estimations and streamline sprint planning. Machine learning (ML) algorithms are leveraged to analyse historical project data and generate more accurate predictions regarding the time, costs, and resources required.

Estimation accuracy plays an important role in ensuring proper project planning. Estimation errors may lead to delayed product deliveries, suboptimal resource allocation, or budget overruns (Younas *et al.*, 2025). Over time, organizations accumulate substantial volumes of data related to estimated versus actual task durations, team members' expertise, the frequency of requirement changes, activity complexity and type, encountered bottlenecks, and more. By leveraging these datasets, ML models can be trained to learn the relationships between task characteristics and their actual completion times. Consequently, each newly added task can be automatically estimated based on learned patterns. Such capabilities enable more accurate scheduling, optimize resource allocation, reduce project risks, and enhance delivery predictability. To improve estimation accuracy and enable comparative analysis of outcomes, several applications have been developed that integrate ML techniques (Prasada Rao *et al.*, 2018; Raza and Espinosa-Leal, 2024) or Deep Learning approaches (Arachchi and Amalraj, 2023). Organizations may either adopt existing solutions, such as Forecast.ai – which can be integrated with Jira for advanced prediction capabilities – or develop customized solutions using platforms such as Azure Machine Learning, integrated with Azure DevOps.

Prioritizing the backlog constitutes another critical activity within projects developed under Agile methodologies. Business value is the principal criterion guiding the ordering of user stories; however, other factors also influence prioritization, such as dependencies among user stories, the impact on product quality, user experience, business objectives, and resource availability. AI-based systems can leverage historical project data to assign scores to each task, thereby suggesting an optimal implementation order. Natural Language Processing (NLP) techniques can be employed to extract keywords from user stories which, when correlated with project objectives, generate relevant insights for backlog prioritization.

Utilizing NLP and machine learning, Izhar *et al.* (2024) developed a model that systematically analyses and prioritizes user requirements based on their semantic significance, employing advanced text pre-processing, cosine similarity, Term Frequency-Inverse Document Frequency (TF-IDF), tokenization, log-likelihood calculations, and K-Means clustering. Automating the prioritization process enhances the Product Owner's ability to align development with stakeholder expectations and enables more efficient resource allocation.

The regular organization of meetings is a well-established practice within Agile methodologies. The use of virtual assistants and chatbots to facilitate daily stand-up meetings (for example, Standuply or Slack's Geekbot), to send reminders, centralize impediments, and provide answers to frequently asked questions (such as Workbot or Power Virtual Agents integrated with Microsoft Teams) represents another valuable application of AI. Such tools can significantly enhance team efficiency by delivering rapid responses and offering contextually

relevant suggestions to emerging issues. Moreover, they serve as useful instruments for familiarizing team members with Agile practices and for promoting the application of Agile values and principles across various domains (Mekic *et al.*, 2024).

AI-driven applications can also be employed to monitor team dynamics and sentiment, aiming to track the emotional well-being of team members, identify emotional bottlenecks, and prevent burnout or conflicts (Madampe *et al.*, 2020; Araque *et al.*, 2022). By analysing conversations among team members, these systems can send early warnings to Scrum Masters, enabling proactive interventions before disruptive events occur that could slow or derail project progress.

Furthermore, predictive models can be utilized to identify potential risks and bottlenecks, signalling likely delays, errors, or defects and offering preventive suggestions (Dam *et al.*, 2019; Orantes-Jiménez *et al.*, 2021). Agile project management applications may also be used to detect stagnating tasks, monitor key performance indicators, and apply predictive models to risk assessment.

In recent years, the adoption of GenAI has become increasingly widespread. The potential and effective use of GenAI across different phases of Agile project implementation has been explored by scholars such as Dhruva *et al.* (2024), Haidabrus (2024) and Cinkusz *et al.* (2025). Their findings reveal that GenAI can play a significant role in defining project scope, generating user stories and decomposing them into tasks, describing the roles and required competencies for task execution (knowledge, skills, experience), facilitating estimation, providing technical consultancy to avoid development blockages, assisting team members in familiarizing themselves with Agile processes, and tracking project progress.

As GenAI continues to become increasingly integrated into daily workflows, the accuracy of the information it produces is expected to improve. Nevertheless, ethical concerns persist, including the necessity of validating the information provided based on context, and the imperative to ensure data security. For example, sensitive information should not be shared with GenAI tools (Bahi *et al.*, 2024).

4. CONCLUSIONS

Many companies, particularly those operating in the software development sector, manage projects by applying Agile methodologies. Although Agile has evolved over time, the values and principles articulated in 2001 remain the foundation for Agile teams. AI has increasingly contributed to this evolution, supporting teams throughout all stages of project development – from the initial idea to launch, and subsequently during product updates and eventual decommissioning.

Despite significant progress, the maturity level of AI remains limited. Its potential is immense, and the extent of the transformations it may drive is difficult to fully anticipate. In the field of Agile project management, AI is currently

employed to support a wide range of activities, including the formulation of project goals, definition and testing of requirements, effort estimation, facilitation of team communication, and forecasting.

This paper provides a synthesis of the key activities and practices influenced by the evolution of AI, highlighting the transformations it is bringing to Agile project management.

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