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AI for project management: Revolutions, trends, and challenges

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1 Introduction

As the world accelerates into the era of the project economy, the number, scale and complexity of projects are increasing significantly, with growing demands for cross-disciplinary collaboration, agile response and risk resilience. Meanwhile, the persistent issue of low project performance remains widespread. The pervasive technological wave of ‘AI for Everything’ is giving rise to a new productivity paradigm, with AI as the driving force. In this landscape, project management field is faced with new opportunities. AI helps to reduce operational costs and promote product innovation (Babina et al., 2024); it enhances human creativity and problem-solving skills to support the decision-making process (Jia et al., 2024). Generative AI (GenAI), in particular, serves as a transformative tool for creative problem-solving through its collaboration with human and its capacity to provide innovative solutions (Boussioux et al., 2024).

We aim to illustrate the application scenarios of GenAI in project management, investigate how it can assist organizations in achieving objectives more efficiently, and explore the dynamic interaction between project managers and this technology. Moreover, future trends,

research directions and challenges will be proposed for GenAI implementations in project management, offering forward-looking insights for its development in this field.

2 Evolution of AI in project management

From the widely spreads of software like Oracle Primavera P6, which relies on traditional scheduling and optimization algorithms, to the emergence of today’s AI-driven project management platforms like Monday.com, AI significantly reduces human’s involvement in repetitive tasks through automation, intelligent decision-making and real-time collaboration, enabling them to focus on strategic planning and more critical decision-making. Meanwhile, the widespread implementation of AI is reshaping human-AI interaction mode in project management, driving a shift from static scheduling to dynamic adaptability, enhancing workflow visualization, strengthening team collaboration, and further improving the efficiency and resilience of a project.

Today’s AI can be classified as discriminative and generative. Discriminative AI involves knowledge level synthesis derived from large amounts of data and information, to support decision-making, analysis and predictions for new scenarios. GenAI automatically generate new content based on data, information and knowledge at the logical level. In terms of the way AI interacts with humans, it can be categorized as three types including embedding-mode, copilot-mode, and agent-mode. In embedding-mode, humans take the lead and AI acts as a tool to execute human commands; in copilot-mode, AI is more like a knowledgeable partner; in agent-mode, AI has stronger decision-making power and autonomy that humans only act as supervisors and evaluators.

3 Typological map of human-AI interaction scenarios in project management

A typological map was constructed to systematically

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explore the multidimensional impact of AI for project management. Based on a systematic review of existing literature and empirical cases, we selected 50 typical project management scenarios as samples for analysis. Utilizing a structured questionnaire tool, quantitative grading data regarding the classification of AI and human-AI collaboration modes in specific scenarios were collected by target invitation from project management experts in academia and industry worldwide. The results of the questionnaire analysis are presented in Fig. 1: Horizontal axis represents different human-AI interaction modes; vertical axis indicates the types of AI technologies. Size of the circle reflects the concentration of expert opinions; a larger circle indicates a higher degree of expert consensus. Colors correspond to the eight functions associated with projects (Project Management Institute, 2021).

The distribution of the circles shows a general tendency toward the upper right. From the perspective of human-AI interaction, circles are concentrated in copilot-mode. Compared to the autonomous agent-mode and the passive functioned embedding-mode, it provides a more balanced model of human-AI collaboration that can fully exploit the benefits of AI while maintaining human control and

supervision of the project. Scenarios in embedding-mode are more basic but crucial, such as complex conflict management, which requires more human power in making the key judgements and final decisions; in agent-mode, tasks such as automated meeting minutes, rely on highly autonomous AI, which act as virtual assistants to the project team to complete repetitive tasks. From the perspective of AI types, scenarios of discriminative AI are mainly concentrated in copilot-mode, while GenAI spans all human-AI interaction modes. In terms of the concentration of expert opinions, higher level of consensus among using GenAI in scenarios which often involves high value-added tasks relevant to generate new content, design solutions and solve sophisticated problems. GenAI has significant advantages in handling complex and creative tasks and has greater potential in project management.

4 Status Quo and potential of GenAI-driven project management

The typological map shows that GenAI is considered applicable to all types of human-AI interaction modes,

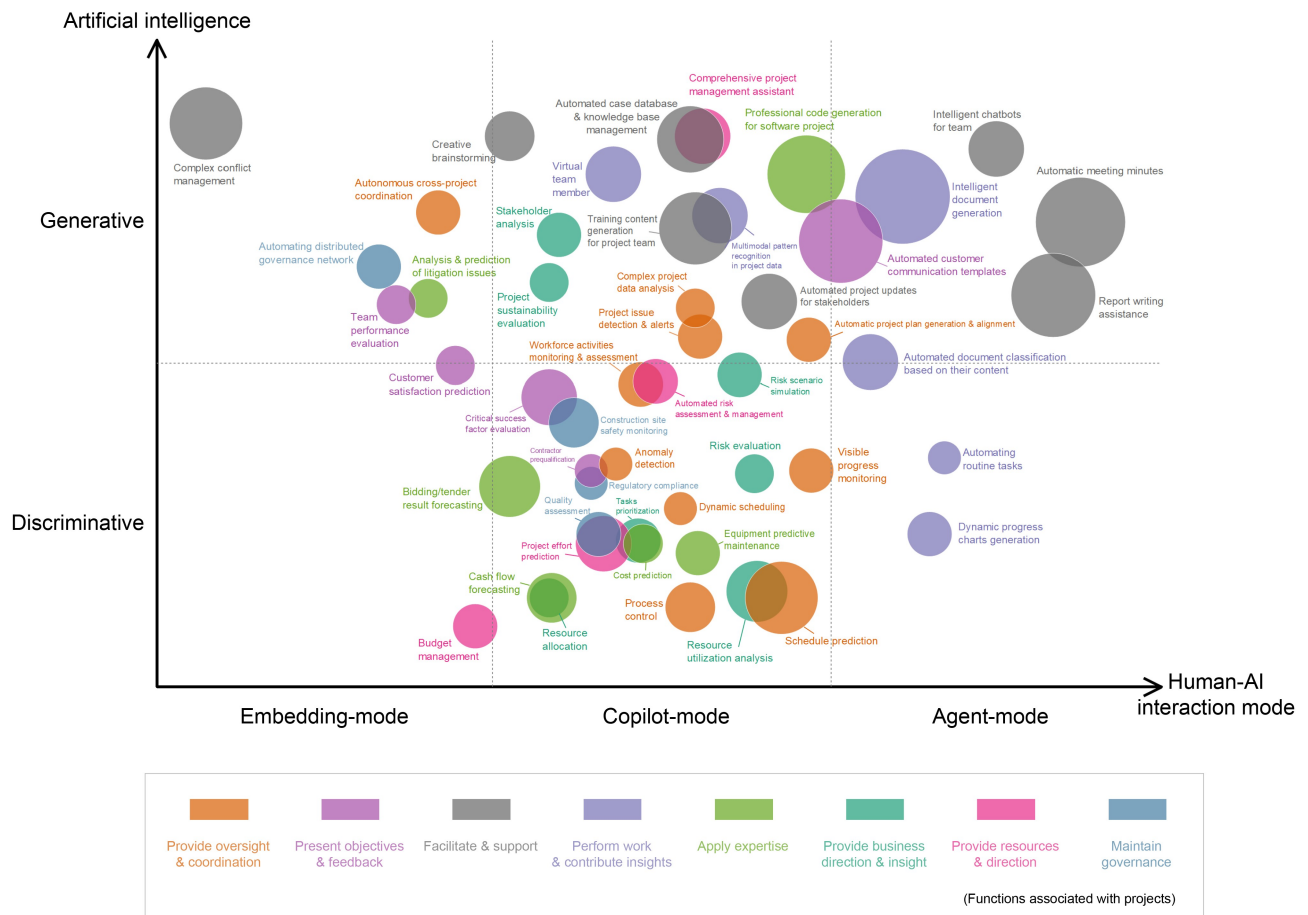


Fig. 1 AI in project management scenarios.

especially in contexts with high complexity and innovation density. This section specifies typical scenarios where GenAI is currently being implemented in project management field.

4.1 Problem diagnosis and risk assessment

Several rounds of team brainstorming are always conducted to gather collective wisdom, for a thorough diagnosis of problems in a project. Industry experts are crucial to these gathering meetings; however, coordinating discussions' formats and time, and ensuring every one of the participants are on the same page could always be challenging. GenAI applications, like ChatGPT, offer solutions by enabling smooth communication anytime and anywhere, with different languages. Performing as experienced experts with large knowledge base, they deliver much broader insights (Stokel-Walker and Van Noorden, 2023), not only save time but also prepare project teams a solid foundation for more in-depth, detailed and efficient discussions. They also help project teams identify risks, expand insight, evaluate projects in a prudent and comprehensive manner, which would better enhance the foresight and responsiveness of project management. Companies like Nodes & Links offer GenAI-based products that accelerate the quantitative schedule risk analysis, run simulations and automatically generate Gantt charts, helping project managers take proper actions to prevent risks.

4.2 Decision making, planning and controlling

Effective decision making, planning and controlling play key roles in the operation of projects under uncertainty (Hazar, 2015). Such decisions are generally based on project managers' intuition, experience, limited historical data analysis, feedback and conclusions from previous cases. As project team members are getting younger and less experienced, overlooking or misleading may happen, which result in the failure of decision making. Smarter integration of information and broader output of analytics is where GenAI excels. It generates responses based on large data sets, predict optimal project schedules, and guide project timelines. Furthermore, unexpected events may happen, leading to variance of disruptions of following schedules, even failure. Supported by huge computing power, GenAI applications can monitor and detect anomalies in real time, provide appropriate adjustments and timely feedback. It takes over much of time-consuming and mundane routine activities such as data entry, progress monitoring, recovery plan, and provides global insights to project teams, helping save time and focus on what really matters, such as making critical decisions.

4.3 Documentation and reporting

Extensive documentation and report writing are important

both during the project and after its completion. Project managers may suffer from repetitive data collection, image gathering and lengthy report writing. Moreover, different types of reports need to be prepared for stakeholders or regulators involved in projects. GenAI applications can quickly generate accurate real-time reports including text, images and videos according to customized requirements. For project teams, automated report generation reserves time and cost for members for more creative work (Yu and Gong, 2024). A study showed that ChatGPT in particular, increased the ability and willingness of project managers in the professional world (Noy and Zhang, 2023). For stakeholders, automated-generated report enables them to access data, recordings and anything related to projects they're caring about anytime and anywhere. This facilitates more effective monitoring of project progress and gets timely feedback.

4.4 Collaboration and governance

Among today's project management practices, cross-organizational collaboration has become ordinary, aimed at achieving project goals through the integration of collective wisdom and resources globally. Outsourcing has always been adopted by project teams to increase work efficiency, reduce operational costs, and address talent shortage issues in some countries. Diverse outsources and involvement of third parties will add to the complexity and cost increases of projects. GenAI applications, however, facilitate the efficient governance and accountability mechanisms in such complicated situation. With this technology, spatial distances, time differences and language barriers are no longer limitations to project teams, talents from global sites can be recruited and make specific efforts to the project. A study shows that using GenAI tools help increase workers' productivity by 15% on average (Brynjolfsson et al., 2025). Project leaders keep track of their teams at their convenience, especially remote teams, to monitor progress, evaluate performance and ensure that current achievements are aligned with the original goals. Real-time feedback and effective communication with remote teams could be delivered to facilitate the operation of the project.

4.5 Leadership

Project leaders are critical to the success of a project. They are responsible for issues addressing, progress monitoring, reports writing, performance management, and communication with stakeholders. However, even the best project leaders cannot handle all the challenges simultaneously, and they have no idea to recall historical data as quickly and accurately as computers, build models in their heads and calculate precise outcomes manually. GenAI applications could obviously alleviate

the workload of project leaders by acting as virtual assistants or team administrators (Felicetti et al., 2024). For example, in remote project team meetings, Microsoft Copilot can automatically take notes, summarize discussions, and suggest follow-up actions; Google Teammate AI can help analyze task structure, monitor project progress and assess team workload, providing all meeting participants an easily accessible intelligent tool. With the gradual automation of tools and techniques that previously required manual operations in traditional project management, project leaders have been able to free themselves from tedious and repetitive tasks, allowing them to focus more on creative and effective team management and stakeholder interaction.

5 Future and trends of GenAI in project management

From the widespread use of ChatGPT to the recent breakthrough performance of DeepSeek, the development of post-training and iteration of reasoning capabilities in the AI era will facilitate the implementation of more vertical applications, presenting brand-new opportunities for the project management field.

5.1 A new paradigm of project management

Traditionally, the project management paradigm consists of templates, techniques, and implementation methods. The most glamorous but challenging part is ‘tailoring’, as every project is unique. This leads to inevitable new issues when building replicable project management process. The complexity of project, environment of delivery and interactions of stakeholders increase significantly, requiring advanced project management guidelines and tools. Imagine the project management framework as a magical toolbox full of templates, techniques and methodologies needed to successfully deliver a project. GenAI is definitely a key component today in that toolbox. Not only is it capable of efficiently and accurately processing data, modeling and assisting in various tasks, but also be able to communicate and interact with users like human professionals, generate new things and provide feedback accordingly. GenAI is therefore not just a fancy tool. It will promote the development of project management theory, and future research can focus more on the new paradigm transition of project management and the systemic transformation it may bring.

5.2 Extensive automation tools in project management process

The advancement of intelligent project management tools is an important direction for future research. Although core theories and paradigm of project management are

universally applicable, the specific applications, technical tools and skills required vary greatly among different industries. For example, management practices in IT projects significantly differ from those in the construction projects. With more adoption of AI technologies, especially GenAI applications, the integration and development of project management tools is expected to break down some industry barriers and enable participants to quickly acquire knowledge and skill in new areas. Additionally, AI can make a huge difference to project management, making it more initiative, data-driven and green. The integration of artificial intelligence algorithms with traditional project management logic and tools, or even the complete disruption and transformation of tools in project management process, is expected to create not only automated but also innovative project management solutions, which in turn will significantly improve the effectiveness and efficiency of project managers.

5.3 Data management and vertical large model in project management

Unlike industries such as biomedicine and manufacturing, where first-handed, long-term, and standardized data are relatively easy to collect, the project management is usually employed in the B2B sector and deals with manual data records that are subjective and difficult to obtain. Quality of input data will have direct impact on the training of AI models, result in illogical, undefined and meaningless outcomes (Wang et al., 2023). Standardizing the collection of data and ensuring normalization to minimize ‘garbage-in, garbage-out’ occurrences is a valuable research topic of project management in the GenAI era. Another important research direction is how to build vertical large models (VLMs) specific to project management. As a field that focuses on providing high-quality and tailoring services and has a high cost of trial-and-error, project management has unique characteristics, non-natural language syntax, expressions and techniques. Whether and how these terms, expressions, syntax and specific data can be implemented to build VLMs, which is exclusively designed for project management professionals is very much worth exploring.

5.4 Skills improvement of project management professionals

The role of project managers will significantly change, as technical but repetitive work are replaced by AI. Areas that are less susceptible to AI, such as leadership, team management, and interaction with stakeholders, will become increasingly important. Meanwhile, the rapid development and updated iteration of GenAI implementations, from ChatGPT to recent Agent AI within only a short period of years, forces users to quickly learn and master the proper way of using these tools. In the future,

new skillset like ‘prompt engineering’ would be fully introduced to industry, or even project management companies will set brand new positions, recruit individuals who are knowledgeable in AI, or train specialized staff to handle AI-related work. An AI-driven Project Management Office (AI-PMO) is likely to become a major trend to accelerate digital transformation.

6 Challenges and concerns

While GenAI applications will bring disruptive changes to the project management field, they also present challenges and risks.

6.1 Privacy, safety and ethical concerns

Given the disruptive potential of GenAI, standards and ethical guidelines should be developed for those implementations in project management. Key topics to be debated include information transparency, data safety, stakeholder rights protection, project originality and accountability. The uniqueness of a project indicates that each project cannot be perfectly replicated, making the project key information and real data increasingly important. GenAI applications may introduce inaccurate information, biased opinions, unauthorized plagiarism, and even fabricated statements without any proper sourcing (Epstein et al., 2023). Additionally, conversational data entered by users into GenAI applications can be incorporated into its database, which could lead to chatbots quoting and sharing with other users without authorization or crediting the original source. Moreover, when building and training VLMs specific to project management, whether large amounts of training data can be adequately protected, especially when stakeholders such as government is involved, ethics, data security, project transparency, and potential moral hazard should be taken into special consideration.

6.2 Reliability and potential risks

Although GenAI applications help to eliminate language barriers, broaden horizons of users and complete mundane work in various scenarios, attention should still be carefully paid as they cannot always produce results based on reliable and scientific-sounding evidence or logical inference (Grimes et al., 2023). Large language models build statistical correlations by training on massive amounts of data and generating coherent responses, but these seemingly intelligent outputs can sometimes be based on AI hallucinations - fictional associations that the model constructs on its own, randomly generating biased or even false information, which may mislead users. Meanwhile, the integration of GenAI technology with traditional project management tools is still challenging. AI solutions may not perfectly

integrate with frequently used project management tools and systems. Upgrading or even replacing these systems requires long-time and repeated testing of their reliability and stability, which can be costly and inefficient. Once minor errors happen in AI systems, or data loss happen in the back-end database, it may be difficult for human users to detect and take actions in time; when such small failures accumulate to systematic outbreak and damage, the loss is often tragic.

6.3 ChatGPT is fun, but not a professional

From the promotion of GenAI applications to Agent AI, repetitive work and traditional techniques in project management will gradually being automated. However, a chatbot is just a machine, not a real person. It can neither interact with emotions and autonomous thinking in the same way as a human, nor can it be held accountable for its answers and work. Human resources form the core elements of project management, human-centralized activities cannot be fully replaced by automated processes or machines. GenAI applications can generate well-crafted text, images and videos, they may fail to produce original insights since they lack a deep understanding and perceptual experience of the real world, a rational motivation and a thoughtful process, or even moral constraints. If we focus only on performance and output, the human contribution will be blurred as AI develops and being implemented. Therefore, project management professionals need to balance the trade-off between AI generation and the loss of human creativity, originality and potential.

6.4 AI divide and suitability

In the context of global development acceleration and application of information technology blooming, a divide between the technology pioneers and the technology laggards has gradually emerged. GenAI implementations are supported by powerful computing power, massive data sets and complex algorithms. Uneven distribution of resources may further exacerbate the divide between different groups, making it difficult to reach consensus among project teams working across countries, areas and organizations. In addition, AI technologies do not perform equally well in all types of project management scenarios. Compared to much larger, complex projects with longer durations, smaller, relatively simple projects with shorter durations may struggle to provide a large enough database for GenAI applications training and verifying the validity of the model within the limited project duration. Project leaders must carefully consider whether it is necessary to invest in resources and time to enforce the implementation of AI tools and ensure that these investments yield appropriate returns and efficiency improvement.

7 Conclusions

We comprehensively explore the potential application scenarios of GenAI and emerging trends in project management, especially in the context of the global development and constantly evolving relationship between human project managers and AI. We provide a map of current application scenarios in project management and highlight the dynamic interaction between project professionals and AI technologies, which fostering collaborative partnerships that leverage and balance the benefits of human experience and technological advancements. As AI technology increasingly introduced to meet complex social needs in projects, future research should also focus on overcoming challenges to ensure the effective and safe implementation in project management.

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