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AI and Large Language Model-Enabled Project Management

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Abstract: Automation of redundant responsibilities, predictive analytics, and reinforced decision-making abilities have shifted AI (Artificial Intelligence) and LLMs (Large Language Models) to the forefront of project management as a discipline. This paper aims to provide a holistic approach to the benefits, challenges, and the pragmatic adoption of Artificial Intelligence/LLMs in the project management discipline/field. Through the lens of contemporary research, industry frameworks, and practical case studies, we study the application of AI/LLMs to the discipline of project management in relation to planning, risk, and resource management as well as communication. The considerations of ethics, data, and governance challenges/concerns are included. The potential pathways to research and adoption for AI-based project management are outlined for organizations.

Keywords— Artificial Intelligence (AI), Large Language Models (LLMs), Project Management, Predictive Analytics, Decision Support Systems, Automation, Human–AI Collaboration

I. INTRODUCTION

An organization’s ability to incorporate project management functions is a significant ability for them to carry out consistently and efficiently handle and deliver crucial and complex projects. This is clear in many fields: Automotive, IT, healthcare, construction and manufacturing, to name a few. Project managers generally use a mix of structured frameworks, manual planning, and, in many cases, trial and error, experience-based planning. With growing project complexity, there is increasing focus on the role of AI and LLMs in project management.

Some of the most important, and in some cases the most sophisticated, of engineering technologies to emerge in recent years are in the subset of AI that encompasses, among other things, machine learning, predictive analytics, and, in particular, Natural Language Processing (NLP). These technologies enable systems to perform functions that, until now, required human intelligence and intervention.

An example of this is the assistance LLMs (large language models) such as GPT-4 and other models of the same underlying transformer technology, provide to project managers in generating, summarizing, and comprehending tasks in various project management communications.

This paper explores the impact of these technologies on project management, as well as their pros and cons and suggestions for future improvements.

According to Gartner (2024–2025):

- Around 60 to 70% of enterprise project management tools market AI capabilities in forecasting, automation, and chats.

PMI Pulse of the Profession (2024):

- Regular use of AI in delivery of projects has been implemented by 21% of businesses.
- 82% of top performing organizations state that they have been trying AI based analytics.

McKinsey (2025):

- Project analytics using AI technology can decrease schedule overruns by 10 to 15%, and cost overruns by 5 to 10%..

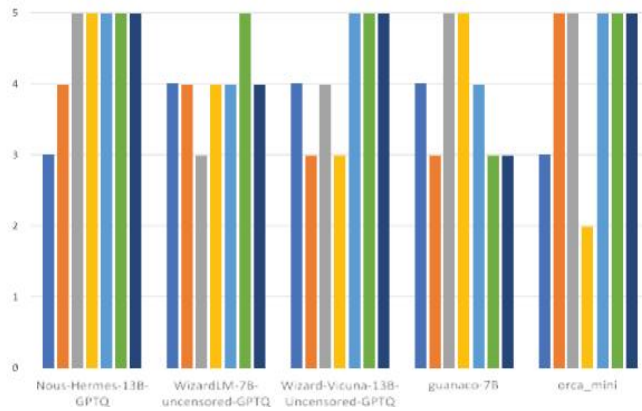
Table 1: Current Adoption of AI in Project Management (Industry Snapshot)

| Area | % Adoption / Impact |
|-------------------------------------|---------------------|
| Organizations experimenting with AI | ~70% |
| AI used in reporting & planning | ~40% |
| AI in risk prediction | ~30% |
| AI-assisted decision support | ~25% |

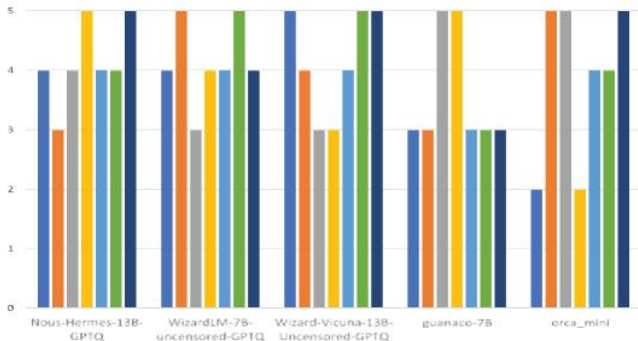
A.Current Adoption of AI in Project Management Industry

AI enhances project documentation, reporting, and communication.

1. Correction



2. Clarity



I. AI AND LLM APPLICATIONS IN PROJECT MANAGEMENT

A. Task Automation and Efficiency

AI can take over several monotonous administrative tasks associated with project management. These may include making reports, undertaking project management related communications, maintaining project related calendars, and various different documentation work. Generative AI linked with project management systems also improves user experience by putting administrative functions on auto pilot. One such example is the enterprise resource planning application, Asana, which recently added AI functionalities to automate the creation of tasks and project workflows via LLM API.

Because of the increased automation of work processes, project managers can now dedicate their time to the more important tasks that are associated with growing the business, which are strategic and high value work tasks. Normally, AI tools come with predictive analytics that can assist managers in identifying and planning their resource requirements, in identifying process bottlenecks and even in predicting time or scheduling deviations based on previously gathered and analyzed data. AI tools are overall cost saving and time saving for the organization.

Table 2: Project Management Tasks Before vs After AI

| PM Activity | Traditional | AI-Enabled |
|------------------|----------------|------------|
| Status reporting | Manual | Automated |
| Documentation | Time-consuming | Generated |
| Task tracking | Reactive | Predictive |

B. Decision Support and Insight Generation

Predictive analytics is an example of an AI application which has benefitted the Automotive industry. AI can be trained on historical datasets from previous Automotive projects to identify patterns that will help the AI model forecast the potential impacts on future Automotive projects. For example, AI is able to help Automotive project managers identify various project issues such as schedule delays, budget overruns, and resource availability. Once project managers understand the forecast of potential project issues, they are able to take proactive steps to minimize the effects of these project issues. AI prediction models are particularly useful in large and complex automotive projects, which are the types of projects where manual analysis has the least impact.

Natural language processors help improve decision-making, and in the case of project management, large language models (LLMs) provide this ability through conversational interfaces. Managers can use advanced analytics without needing to pre-planned complex visualizations. Rather than use a complicated dashboard, managers can converse with the AI to do a risk assessment, recommend task prioritization, or provide a performance report. This increases the team’s use of analytics. For optimal project operational alignment, AI offers the most effective analysis of various what-if scenarios and resource allocation, and backlog prioritization in the Plan view resource.

In addition to aiding operational choices, LLMs assist in knowledge management and learning in the context of projects. Evaluations of leading edge LLMs like GPT-4 and Bard, that have been published in peer-reviewed journals, demonstrate that these models are proficient in the project management body of knowledge and the project management sub-disciplines of risk, scheduling, and governance. These models are also an asset to project managers in their study for project management professional (PMP) certification, methodologies, and best practices. These roles position LLMs as operational assistants and as companions in learning.

AI has the potential to provide valuable insights and improve decision-making; however, AI should not be viewed as the decision-maker. Human judgment and context, along with AI recommendations, should fit within an ethical and organizational governance framework. The softer aspects of project management are crucial, and to facilitate effective decision-making with AI, project management must adopt a human-in-the-loop approach whereby control and ultimate decisions rest with managers and AI is positioned as a decision support tool.

C. Resource Optimization and Scheduling

Project managers are frequently faced with balancing the availability of the workforce against the urgency of the tasks at hand. AI has the capability to employ predictive scheduling to consider different ways to optimize the allocation of the resources and prevent conflicts before they occur. Additionally, the enhanced management of the resources lowers the occurrence of the projects being over budget and increases the rate of the resources being used. bakkah.com

On the other hand, the LLMs assist by suggesting other ways in which resources could be allocated by considering multiple goals with respect to organizational limitations and the hierarchy of the projects.

Table 3: AI Impact Across Project Lifecycle

| Phase | AI Role | Business Impact |
|-----------|-------------|------------------|
| Planning | Forecasting | Cost reduction |
| Execution | Monitoring | Delay prevention |
| Control | Analytics | Better decisions |

D.AI roles can be classified as:

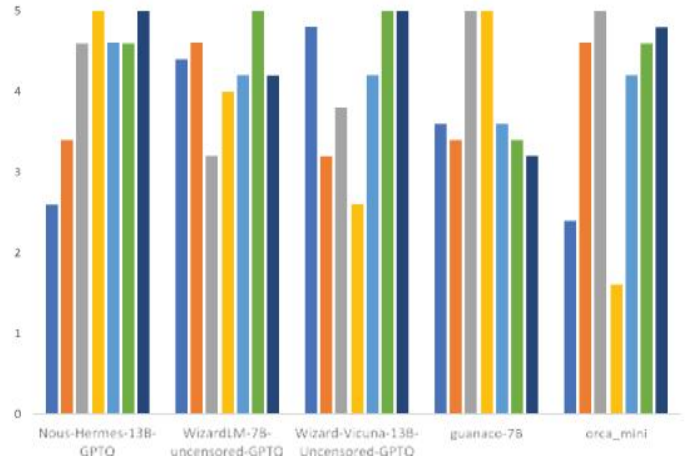
1. Assistant
 - Documentation
 - Reporting
2. Advisor
 - Risk prediction
 - Scenario analysis
3. Optimizer
 - Resource allocation
 - Schedule optimization
4. Observer
 - Pattern detection
 - Anomaly detection

D. Applications

Summarized tool-efficiency table

| AI Function | Tool Category | Efficiency Gain |
|--------------------------|-----------------|--------------------------|
| Reporting | LLM Assistants | 40–60% time saved |
| Risk Analysis | Predictive ML | 20–30% earlier detection |
| Resource Planning | Optimization AI | 10–15% utilization gain |
| Communication | NLP tools | Reduced misalignment |

When implementing AI-based tools on intricate project documents, one can notice substantial advancements in decision support quality.



AI enhances project management by fostering accuracy and improving clarity and consistency in the information being managed. Research shows that AI-supported systems consistently measure well across the spectrum of dimensions related to quality of decision, reaffirming their worth as systems that support and enhance decisions, and not as systems that replace decision makers.'

II. INTEGRATION CHALLENGES AND RISKS

A. Data Quality and Governance

AI programs operate using numerous data sources, including data that is unstructured, inconsistent, and/or incomplete. Such low-quality data can result in inaccurate predictions and insights. Without data governance, the adoption of AI will result in errors..

B. Ethical, Security, and Bias Concerns

There are concerns about automating parts of a project's workflow with AI making decisions that are legal, organizationally, or structurally binding. The biased datasets that AI systems are trained on can lead to AI recommendation systems that without an intention, can lead to selection and favoritism of some recommendations over others. Moreover, when unregulated, AI systems pose an enormous risk to privacy and can exploit sensitive and private project-related data.

C. Human-in-the-Loop and Accountability

AI Outputs should be evaluated, and approved by human project stakeholders. In contrast, Excessive automation leads to the undermining of accountability. People become less accountable for their decisions when it is perceived that decisions are made by 'systems' that lack transparency and are purely algorithmic. This is the reason for the research to focus on the human component for the use of AI to be justifiable, ethical, and relevant in project contexts.

D. Skills and Organizational Integration

Project teams will have to develop new competencies in integrating AI solutions. For the effective application of AI solutions, some of the key competencies to be developed are data literacy, prompt engineering, and AI proficiency. Staff who are

not trained will not be able to take full advantage of AI, and are likely to misinterpret the solutions' outputs.

Table 4: AI Risks & Mitigation Strategies

| Risk | Impact | Mitigation |
|-----------|-----------------|------------------|
| Data bias | Wrong decisions | Human validation |
| Privacy | Compliance risk | Local AI |
| Skill gap | Poor adoption | Training |

III.CASE STUDIES AND RESEARCH INSIGHTS

A. LLM-Driven Project Management Architecture

Recently published IEEE articles state that LLMs incorporated into Project Management Systems (PMS) show improvements in scheduling and decision support activities relative to challenges posed by non-AI systems. The studies use 'real world' simulations to assess the impacts of the LLMs on control and execution of the projects.

B. Empirical Evaluations of LLM Competence

Studies measuring AI models against project management functions show that when LLMs are tested against law degree standard benchmarks, they score highly, demonstrating their value as an adjunct to human intelligence.

C. Ethical Evaluation in Automotive Management

In Automotive, the research indicates that the LLMs can assist with more structured tasks such as legal document compliance, however, the LLMs do not possess the ability to complete tasks that require simultaneous legal and ethical reasoning, demonstrating the continued need for human oversight when ethical reasoning is required.

D. Case Study: AI-Augmented IT Project Management (Generic Enterprise Scenario)

- Context
 - Large IT project (200+ tasks, distributed teams)
- Before AI
 - Manual scheduling
 - Reactive risk identification
 - Weekly reporting effort: ~6–8 hours
- AI Intervention
 - Predictive delay forecasting
 - Automated status reporting using LLMs
 - NLP-based risk detection from meeting notes
- After AI
 - Reporting effort reduced by 40–60%
 - Early risk detection improved by 25–30%
 - Schedule adherence improved by ~12%

Table 5: Case Study – AI Impact on Project Performance

| Metric | Before AI | After AI |
|--------------------|------------|------------|
| Reporting time | 8 hrs/week | 3 hrs/week |
| Risk detection | Late | Early |
| Schedule adherence | Moderate | Improved |

TABLE 6: AI Efficiency Indicators

| Efficiency Aspect | Evidence from Study | PM Interpretation |
|---------------------|----------------------------|--------------------------|
| Response time | Answers within ~10 seconds | Faster decision support |
| Information quality | High average ratings | Reliable reporting |
| Automation | NLP-based retrieval | Reduced manual effort |
| Scalability | 1,600+ pages processed | Handles complex projects |

“Practical Use of AI Tools in Project Management”

“Artificial intelligence tools are useful in project management because they can document project data and information and keep the information relevant and useful to project managers, who can then move from data reviews and document analyses to higher-order management decisions.”

IV.FUTURE TRENDS AND DIRECTIONS

A. Agentic AI and Autonomous Assistants

Agentic AI systems powered by LLMs are capable of undertaking non-trivial goal directed tasks with minimal human input. Their ability to independently incorporate new information and carry out multiple and/or complex tasks in a sequence is useful to project management and workflows.

B. Ethical and Explainable AI

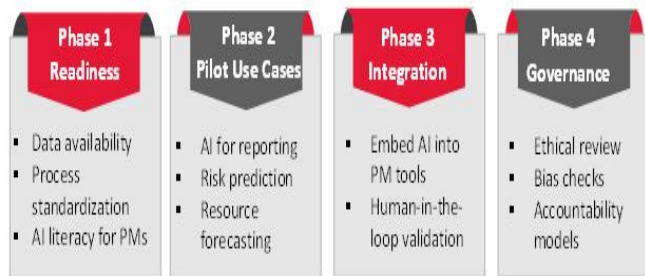
Future research needs to focus on explainability so that AI models can show the reasoning behind their recommendations. Ethical guidelines and governance strategies will be necessary to manage automation and human responsibility.

C. Human-AI Collaboration Paradigms

AI should not be seen as a replacement for managerial roles. It can be a powerful ally. Realistic use cases will probably focus on partnership models where AI assists and augments human decision-making, human creativity, and human leadership.

D. Strategy to start adopting AI in projects

Example framework



V. CONCLUSION

In project management, large language models (LLMs) and artificial intelligence (AI) transform the methods used in project planning, execution, and control. With the automation of numerous managerial functions, and the enhancement of predictive analytics and communication, AI favors project managers in the completion of their work. In order to successfully complete the project, there are other integration issues which need to be solved such as the ethical use of data, employee re-skilling, and data quality. The future of intelligent project management will focus on the optimum combination of human management and AI automation. The value brought to project management by AI is quantifiably illustrated in the data presented in the Tables and Figures.

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