TRANSFORMATION OF PROJECT MANAGEMENT THROUGH INTELLIGENT CHATBOT TOOLS

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Abstract: The paper explores the impact of Artificial Intelligence (AI) on the field of project management. It proposes a model for integrating AI across different phases of the PM^2 methodology, as well as the dependence of project managers on current chatbots. The aim of the paper is to understand how artificial intelligence can affect project implementation, as well as to consider new approaches and strategies that can be applied to achieve greater efficiency in project management, including automated activity management, data collection, and support for team coordination on projects. Additionally, the paper focuses on researching practical applications of artificial intelligence tools in projects and how these applications can be integrated into existing methods, tools, and templates for project management to improve results, resource optimization, and mitigate negative project impacts while fitting into the project triangle. The expected contribution of the paper is to provide insight into the potential transformation of project management using intelligent chatbots, as well as to identify specific tools that artificial intelligence can offer project managers in their daily activities, and to provide a basis for further research in this area.

Keywords: Artificial Intelligence; Chat Bots; Project Management; PM^2

1. Introduction

The impact of artificial intelligence has been rapidly expanding over the past year and a half, with the integration of cutting-edge technologies becoming a key advantage driving innovation and project implementation efficiency. Artificial intelligence emerges as a transformative catalyst for projects, transforming traditional project implementation approaches and paving the way for future agile projects. This paper explores the impact of AI on the project management domain, examining the symbiosis between project teams and modern chatbot tools. It is essential to approach project agility correctly and assess the benefits that artificial intelligence brings. Tools, techniques, templates, and procedures that have been essential for efficient project implementation have been used by project managers, enabling them to execute and monitor projects more easily. Today, there are specialized chatbots that, based on input

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or prompts from project managers, can define project plans, timelines, resource allocations, and some more advanced ones can even define the entire project budget. The question arises: is this direction of artificial intelligence development beneficial for project managers, how efficient is it, and it also raises ethical concerns regarding projects themselves. Research conducted in this field precisely addresses these and numerous other questions concerning the direction of artificial intelligence development and how it can be leveraged in a way that contributes to the efficient operation of project-oriented organizations. The paper aims to deepen understanding of how AI, as intelligence continuously learning through data, influences the dynamics of project implementation. It also seeks to consider new approaches, tools, and strategies utilizing AI resources, focusing on improving the efficiency and effectiveness of project management. Furthermore, the paper expands its scope by examining practical applications of AI in project management and how continuous changes can be seamlessly integrated into existing project management methods and tools.

2. Transformation of Project Management Through Intelligent Chatbot Tools

Artificial intelligence is increasingly taking the lead in the field of project management, bringing with it the potential for a revolution in how projects are planned, executed, and monitored. It has gained momentum with extraordinary discoveries over the past decade (Davenport, 2018). Using advanced analytical and predictive capabilities, AI enables project managers to better consider the decisions they need to make, identify potential risks, and more efficiently manage resources on the project. Artificial intelligence enables the automation of routine tasks, such as data collection and processing, which can significantly speed up reporting processes and reduce the risk of potential human error, thereby saving time during this lengthy data analysis process.

The main question that arises is whether the direction in which artificial intelligence is heading regarding project management is the right one (Zhu et al, 2022). When it comes to repetitive activities that are somewhat similar from project to project, AI can be very useful in terms of freeing up time for more critical tasks on projects. Project management in the era of artificial intelligence presents a key challenge and opportunity for project-oriented organizations worldwide. Integrating artificial intelligence into project management processes enables faster decision-making, better risk prediction, resource optimization, and many other improvements in the operations of these organizations. This technology enables the automation of routine tasks and activities, freeing up time and resources for more creative and strategic aspects of the project (Oviedo-Trespalacios et al, 2023). However, successful project management in the era of artificial intelligence also requires careful analysis of ethical and security issues to ensure responsible use of this technology. Through the integration of artificial intelligence, organizations have the opportunity to improve efficiency, effectiveness, productivity, and gain a better competitive advantage in their projects (Wang, 2019).

3. New Horizon of Efficiency

Project management in the era of artificial intelligence brings a new horizon of efficiency that revolutionizes the way projects are initiated, planned, implemented, and controlled. Artificial intelligence provides benefits for analyzing large amounts of data and making better fact-based decisions, helping project managers better understand and

manage project activities (Hill-Yardin et al, 2023). Additionally, artificial intelligence tools can identify patterns in projects that have been implemented to improve future plans and resource allocation - learned lessons. Through the automation of repetitive processes, artificial intelligence can significantly accelerate task execution, reduce costs, and increase productivity. For example, chatbots and virtual assistants can handle written communication with teams, facilitating coordination and reducing the need for manual interventions, which also carries a certain risk in terms of chatbots sometimes not knowing the answer to project team questions, so they may offer alternatives that do not necessarily provide the answer the project team needed at that time. In addition to this, artificial intelligence can identify potential problems that may arise in the project, enabling timely reaction and minimization of negative impacts on the project. This helps project managers to be proactive rather than reactive in addressing challenges encountered in the project (Todorović, & Obradović, 2018). Project management in the era of artificial intelligence also requires careful attention to ethical and security aspects (Deng, & Lin, 2022). Organizations must ensure responsible use of data and algorithms, as well as address privacy and data security issues of their stakeholders, which means that project management in the era of artificial intelligence opens the doors for more efficient, faster, and smarter project management, but requires a balanced approach that encompasses both the technical and ethical aspects of this revolution (Rukavina, 2023).

The increasing expansion of artificial intelligence may impact the elimination or complete cessation of activities and functions in certain phases according to the PM^2 methodology. Some of the activities threatened by artificial intelligence include reporting, administration, project progress monitoring, reporting on current status, and stakeholder communication. As the world moves towards greater digitization and automation of repetitive and administrative tasks, there is a possibility that artificial intelligence will completely replace some of the activities carried out within project management phases. If a new way of working is introduced or if the market becomes highly volatile, chatbot tools should demonstrate their agility and adapt to changes as quickly and effectively as possible. Organizations should use available applications to facilitate easier monitoring of project performance metrics, including dashboards for clearer data visualization. Additionally, they should establish a constant balance between innovation and the current state within the organization and understand the direction in which the application of artificial intelligence tools is heading, applying them in cases that can free employees from tasks that consume too much time and are the same for every project.

All aspects of project management are created through technology (Rakhra et al, 2021). In order to improve project management efficiency with the help of artificial intelligence (Nikolić et al, 2023), several examples where AI can be of great benefit in project management are cited. Predicting time and costs when AI can analyze data from past projects and use it to accurately predict how much time and resources will be needed for similar future projects. This helps in setting realistic expectations and proper planning. Automating routine tasks regarding taking over routine administrative tasks such as managing documentation, updating schedules, or sending reminders, one example for these tasks is Trello with its new built-in chatbot tool. This allows better focus on the more creative and strategic aspects of projects. When it comes to risk analysis, AI can analyze large amounts of data to identify potential risks that may occur during project implementation. Based on the analysis, strategies for managing or preventing their occurrence can be proposed. In addition to risk analysis, artificial

intelligence assists project managers in optimizing the necessary resources for projects in terms of dynamically allocating resources based on analyzed project needs. For example, it can automatically adjust the allocation of workforce or resources in real-time to ensure the greatest efficiency of the ongoing project (Lang, & Laurenz Müller, 2021). One example that helps in resource scheduling is MS Project Online, which has a chatbot implemented in it that automatically assigns resources to activities. AI could predict equipment failures in projects involving the use of physical equipment, i.e., sensor data could be analyzed to predict possible breakdowns (Nascimento et al, 2023). This allows preventive maintenance and reduces project downtime. AI can track project progress and generate real-time reports, informing all stakeholders about the current status of projects. This enables project managers to react quickly and timely to changes that occur. In addition to this, some other benefits that AI offers include analyzing individual team members' competencies and preferences to provide personalized recommendations for task allocation or training, thus improving team productivity. Chatbots and virtual assistants can provide quick support to project team members, answering questions and solving problems without the need for human intervention, especially those chatbots trained based on learned lessons and previous projects. Additionally, communication within the team can be analyzed to assess the level of engagement and satisfaction of team members (Thorp, 2023). This helps in identifying potential issues and making corrective actions when needed. Creating evaluation forms and providing feedback on employee satisfaction with the project is another benefit that artificial intelligence can provide to the project.

Using artificial intelligence through these examples, organizations can significantly improve project management efficiency, reduce risks, and achieve better results. With the help of intelligent chatbots, project leaders can effectively plan, organize, implement, and control project management strategies. These chatbots enable instant information exchange among team members, reducing the time needed for coordination and increasing project productivity. The integration of intelligent chatbots into the project management process brings multiple benefits (Onal, & Kulavuz-Onal, 2023). These digital "collaborators" can automatically analyze data, identify potential risks, and suggest optimal preventive and reactive problem-solving strategies. Through this approach, project leaders can make constructive decisions and quickly respond to changes in the project environment that could potentially jeopardize the project's progress. Essentially, transforming project management through intelligent chatbots not only optimizes processes but also enables teams to focus on more concrete tasks that artificial intelligence cannot handle. This innovative technology sets new standards in efficiency, providing leaders and team members with a solid foundation for achieving successful project outcomes. Some specific applications used in the context of integrating artificial intelligence into project management include:

- MS Project Online and Wunderlist for planning project tasks, resource allocation, and creating Gantt charts.
- Slack or MS SharePoint, which utilize suggested templates for filling out actions and initiatives that project managers later analyze.

3.1 Integrate Chatbots in Phases for Project Management According to the PM^2 Methodology

Achieving the integration of artificial intelligence into project management requires a holistic approach, combining theoretical knowledge and practical experience in this

field. Key for project managers is to explore how AI can enhance various phases of the project, including planning, organizing, implementing, and controlling. One practical application could involve using machine learning algorithms to analyze historical project data, leveraging lessons learned from similar projects to identify patterns and predict potential issues on future projects. Integrating AI can be accomplished through adaptable platforms that support project management technologies such as planning and resource allocation tools like MS Project, Trello, Asana, etc. Developing tools that utilize machine learning techniques and collect data throughout the project enables assistance during project activities.

The entire integration would not be possible without training teams on the applications of AI in projects. Training employees to use new technologies and adapting work processes is crucial for the successful integration of artificial intelligence. Additionally, collaborating with experts in the field of artificial intelligence can provide additional support in implementing new technologies (Obradović et al, 2023). These technologies have tremendous potential, but it is also important to consider privacy and data security issues. When expanding the database for AI tools, it is almost certain that these tools collect vast amounts of confidential data that should not be transparent to third parties. However, there is always a risk of data disclosure due to system breaches, where the entered data may be distributed through other platforms, leading to data leaks, which is not in the interest of any organization in its operations.

Achieving AI integration in project management requires research, education, adaptable technologies, and careful change management. This approach can significantly improve project outcomes, optimize resources, and mitigate negative impacts on the project, making project management more efficient and adaptable.

PM^2 (Project Management Methodology) is a project management methodology developed by the European Commission for managing projects to improve the implementation of projects funded by the European Union (PM², 2021). This initiative supported by the European Commission for project management focuses on eliminating mistakes that have occurred in the past on the same or similar projects implemented to eliminate errors on future projects by applying templates as recommendations. The purpose of this methodology is for projects to learn from mistakes and not to repeat the same mistakes that would lead to budget overruns or planned time. Table 1 summarizes the recommendation for implementing AI activities in each phase of the PM^2 project management methodology. It is important to emphasize that the specific methods of integration may depend on the specific needs of the project and the resources available within the organization and that the integration of artificial intelligence mentioned is only a recommendation that project managers can use when implementing projects according to PM^2. In each of the 5 phases of the PM^2 methodology, it is possible to utilize artificial intelligence in some way, emphasizing that in the initial phases such as initiation and planning, the impact of artificial intelligence is greatest because plans, analyses, routine activities, data processing, etc., are involved. After the initial phases, intelligent chatbots can be integrated even in the closing phase when it is necessary to monitor realized project activities using parameters and previous achieved targets on the same or similar projects and generate a project closure report based on the information available.

Table 1. Integration of artificial intelligence according to the PM^2 methodology

PM^2 Phase	**Recommendation for Possible Integration of Artificial Intelligence**
Initiation	*Project framework analysis* - AI analyzes historical data and project context to identify key parameters and propose optimal strategies based on learned lessons, suggesting possible frameworks during project initiation.
Planning	Time and resource estimation - AI utilizes machine learning algorithms to analyze similar projects from the past for better estimation of time and resources. It automatically assigns tasks and allocates resources based on skills, previous experience, and project priorities.
Execution	Team workflow optimization - AI analyzes team member's work habits to suggest task scheduling optimizations and improve efficiency.
Control	Risk analysis - AI analyzes data to identify potential risks and propose strategies for their management, enhancing plans and reducing risk.
Closing	Progress monitoring - AI automatically tracks and analyzes project progress, identifying delays or problematic areas based on actual results and objectives. Report generation - AI automates the process of generating project completion reports, providing deeper analysis of achievement and obstacles data.

Recommendation for integrating PM^2 (Project Management Methodology) and AI (Artificial Intelligence) through different project management phases following the PM^2 methodology (PM², 2021):

Initiation Phase - Artificial Intelligence plays a crucial role in the initiation phase of project management as it can identify priority projects, requirements, goals, and strategies that assist organizations in identifying projects that will contribute to achieving defined objectives. By integrating AI into the PM^2 methodology, it offers a framework for project initiation, including defining project plans, objectives, stakeholder analysis, risk analysis, various analyses of internal and external environments, as well as defining the basic elements for writing a business plan, which would help project managers to carry out their activities more easily according to PM^2.

Planning Phase - Artificial Intelligence can ensure that projects are properly planned and integrated and aligned with the organization's strategic objectives. By monitoring resources, budgets, and project timelines based on previously entered data, using the PM^2 methodology, the project can encompass guidelines for creating a detailed plan, including defining activities, schedules, resources, success criteria, and monitoring and control mechanisms adopted by the European Commission for project management, which are of interest for planning projects in the public sector.

Implementation Phase - By integrating AI tools, the project will be monitored and coordinated to ensure that goals are met and resources are spent efficiently and in accordance with the planned project budget. While functioning according to PM^2, it can provide guidelines for project management during implementation, including change

management, risk management, quality management, and stakeholder engagement if needed.

Closing Phase - AI tools will monitor the completion of projects and ensure that all results and documentation (reports) are archived to be used as lessons for future projects based on lessons learned. The project management methodology will provide guidelines for formally closing the project, including assessing achieved results, reporting on performance, and evaluating achieved goals, which can help project managers effectively close the project.

Control and Monitoring - As an essential phase of every project according to the PM^2 methodology to provide mechanisms for continuous monitoring of the project, including monitoring key performance indicators, adjusting plans, and taking corrective actions if necessary, project managers will help conduct regular control and monitoring of all projects within the organization to ensure that projects proceed as planned and to timely respond to any issues and failures that may be caused by human error.

PM^2 is a project management methodology based on agile principles, innovation, and adaptability. Considering the rapid growth of artificial intelligence transformation, PM^2 and AI can be interconnected through adaptability and agile principles in several ways. As artificial intelligence often evolves in a project environment where requirements can change from day to day, an agile approach enables project teams to quickly respond to changes and iteratively improve their projects. Artificial intelligence is a technological advancement and a revolutionary discovery that requires continuous innovation and transformation. The PM^2 methodology fosters innovative practices and continuous improvement, which can be crucial in projects integrating artificial intelligence, where technology is constantly evolving. The ability for continuous and flexible learning can be reflected in the PM^2 methodology through adaptable learning strategies, allowing the team to adapt to new information and challenges during the project (Pantouvakis, 2017). The project management methodology promotes teamwork and interdisciplinary collaboration, which is particularly important in projects implementing chatbot tools where knowledge from various fields such as computer science, mathematics, statistics, business analytics, etc., is required. Relying on an iterative development cycle, integrating artificial intelligence into the PM^2 methodology, and continuously improving model performance through testing, analyzing results, and adjusting algorithms can address constant market needs. Fig. 1 illustrates how artificial intelligence can be integrated into the PM^2 project management methodology.

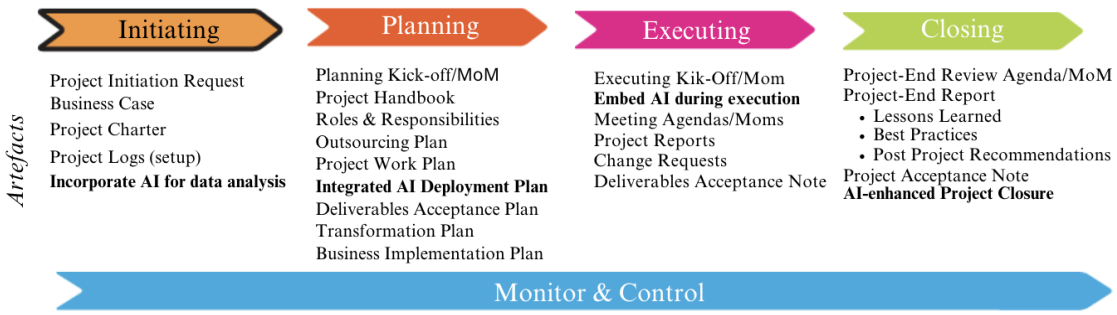

Figure 1. Integration of AI through phases for project management (According to PM²-project-management-methodology https://op.europa.eu/en/publication-detail/-/publication/0e3b4e84-b6cc-11e6-9e3c-01aa75ed71a1)

3.2 Proposal for a Chatbot Tool for Easier Project Management

Automatic task assignment can utilize machine learning algorithms, such as classification algorithms, to analyze competencies, previous experience, and preferences for task allocation within a project team. Tools that have already begun integrating artificial intelligence include Jira Align, Asana, Trello, which support task assignment process automation. Applying artificial intelligence data analysis algorithms can be used to identify cost patterns and propose budget optimizations. Tools such as Microsoft Power BI, Tableau are used for data visualization and analysis, where these project management software integrate project cost analyses. Regression algorithms based on previous deadlines and factors such as team size and resources predicting deadlines, like Monte Carlo simulations in tools such as Microsoft Project, Primavera P6, can also be utilized. The use of machine learning algorithms through artificial intelligence application can be employed to identify potential risks based on historical project data. There is an increasing number of tools implementing chatbots for risk management, such as Risk Watch, Palisade Decision Tools Suite, risk management software utilizing data analysis with AI. Recently, AI implementation is used for productivity data analysis, work quality, and team satisfaction monitoring to track team performance. Tools such as Microsoft Power BI, Slack for team performance tracking, employee performance management tools are employed. Utilizing change tracking systems and implementing AI for data analysis and identifying relevant changes in the project environment, such as Agile tools like Jira, Kanban card systems, and change management software, are also crucial. The mentioned tools represent just some examples, and the choice depends on the specific project needs, organizational characteristics, and available resources. It's important to adapt tool and method selection to the project's specific requirements to achieve the best results.

4. Conclusion

Project management in the era of artificial intelligence presents a challenge for project managers. Artificial intelligence tools enable organizations to achieve greater precision in planning, faster response to changes, resource optimization, and better decision-making if utilized properly. Efficiency is ensured through the automation of routine tasks, analysis of vast amounts of data, and better prediction of problems before they arise in the project, constantly implementing reactive response strategies to potential issues. Artificial intelligence can precisely identify potential project problems based on learned lessons, thus allowing project managers to be more creative in activities that require creativity. However, to reach new horizons of efficiency, organizations must consider ethical issues, data privacy, staff training, and compliance with legislation when integrating artificial intelligence. The proposed model of the PM^2 methodology, which incorporates artificial intelligence, can be further developed as a basis for future research. However, it's important to note that artificial intelligence is not a universal solution and requires a well-thought-out approach to project management. Through the integration of artificial intelligence into their projects, organizations can create new horizons of efficiency and achieve sustainable competitive advantage in an increasingly demanding business environment.

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