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AI Driven Techniques for Effective Project Management

Dr.V.Harish*, Sadika B
Assistant Professor, PSG Institute of Management, PSG College of Technology,
II Year Student,PSG Institute of Management, PSG College of Technology
* Corresponding Author : vharish05@gmail.com

ABSTRACT

Artificial Intelligence has definitely changed the capability and quality of work across different sectors and industries as it has the ability for drastically altering the way that the projects are designed, carried out and completed, its incorporation into project management is therefore a crucial milestone. This paper explores the effects of incorporating AI into project management, emphasizing how revolutionary AI may be for projects of all sizes and the study establishes critical criteria and standards for evaluating artificial intelligence influence on project initiation, planning, execution and closing stages by examining prior research and empirical data. It highlights how artificial intelligence (AI) has the power for optimising resource allocation, reducing risks and making decisions with previously unheard-of accuracy and efficiency. The paper aims to detail the usage of AI in the process groups and knowledge areas and how they might act as a helpful aid to manage projects. The research aims to provide stakeholders as well as practitioners with practical solutions to successfully and ethically harness AI's potential, therefore influencing the future for managing projects in the digital era and this will be accomplished by clarifying the transformational power of AI for project management contexts.

Keywords: Artificial Intelligence, Project Management, Risk Management, stakeholders Management, predictive analytics

1.INTRODUCTION

1.1. PROJECT

A project is a short-term undertaking beginning with the objective to produce a special good, service, or outcome in project management and can be mentioned that it has an apparently defined start and finish and also certain goals, specifications and limitations(Pinto et al. 2022). Projects are different from continuing operations since they usually comprise a number of connected tasks that need to be finished within a given budget and time schedule, with the scope being unique

1.2. PROJECT MANAGEMENT

The systematic method of initiating, organizing, carrying out, monitoring and closing up projects for achieving particular objectives within well-established parameters is known as project management. To complete projects without delay, within budget and to meet the necessary quality standards, it entails managing resources, tasks, timeframes and stakeholders (Paulmakesh et al. 2021). From setting goals and parameters to controlling risks and guaranteeing a project's successful conclusion, project managers are essential in assisting project teams at every stage of the project lifecycle.

Project management is fundamentally about meeting stakeholder requirements and project objectives by effectively leveraging resources to produce value and to obtain the best project outcomes, it requires finding a balance between competing goals including scope, time, money, quality and risk (Patrício et al. 2021). Project managers work to minimize interruptions and deviations from the project objective while optimizing project success through efficient planning, implementation, (Silva et al. 2023)and monitoring and project management helps businesses accomplish their strategic objectives by skill fully handling projects as drivers for innovation and change

Technology is important in project management because it improves supervision, efficiency and communication and project management software is one example of a tool that helps with job organizing, resource allocation, & real-time collaboration (Tarawneh et al. 2024). These tools help teams stay on the leading edge of problems and take immediate action when necessary and advanced analytical and reporting instruments facilitate data-centric decision-making and enhance project outcome (Aleinikova et al. 2020). Routine procedures that are automated streamline workflows and

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increase overall productivity by reducing manual labour and error and by maintaining predictive analytics, automating complex procedures, (Narbaev et al. 2024) and providing intelligent insights, artificial intelligence and significantly transforms project management by empowering managers to make better decisions and predict possible obstacles .

1.3. ARTIFICIAL INTELLIGENCE

The establishment of computer systems to handle operations which requires human intellect, such as picking up patterns, making decisions and learning from experience, is called as Artificial Intelligence (AI) and this field includes robotics, natural language processing(NLP), machine learning and many more methods and techniques (Zhang & Lu 2021). AI technology powers cutting-edge technologies like virtual assistants and self-driving cars, as well as automating repetitive jobs in a variety of sectors and (Ahmed et al. 2022) while AI has great potential for increasing productivity, efficiency and creativity, it also brings up significant ethical and cultural difficulties, such as security concerns and job displacement and AI is a revolutionary force holds the power to drastically alter many facets of our lives and civilizations

1.4.AI TOOLS IN PROJECT MANAGEMENT

By automating monotonous processes and using predictive insights, AI solutions in project management greatly increasing productivity and decision-making. Task administration and interaction are streamlined by software like Asana Assistants and Wrike Assistant, (Nenni et al. 2024) which use chatbots and virtual assistants. Microsoft Project and Oracle Primavera are examples of predictive analytics systems that estimate project results and risks.

AI driven solutions, such as Liquid Planner, improve resource management by guaranteeing ideal distribution and balance and real-time reports are produced by data analytics systems like Tableau and Power BI, (Wang 2019) and project information is easily integrated with communication through collaboration technologies like Microsoft Teams and Slack.

CHAPTERS ORGANIZATION:

The first part of the article deals with a overview of the integration of artificial intelligence (AI) into project management, highlighting the transformative effects of AI on the planning, execution and closure phases of projects and the Introduction describes projects and project management, outlining key components including resource allocation, risk management & then the use of technology and then the next chapters have been organized to analyze AI's role at every stage of project management. Next, existing research on AI's use in project initiation, project planning, project monitoring as well as control phases are outlined in next part of the article, titled Literature Review where the particular AI tools and approaches are addressed in the subsequent chapters, with a focus on management activities like as stakeholder identification, project charter preparation, scope management and risk assessment. The PRISMA framework was then used to study AI applications as described in next section, titled Methodology. The next section details the Analysis part, explores how AI affects project phases like planning, initiation and monitoring and then the ability of AI to improve project results is finally addressed in last section titled Conclusion, finally each chapter advances the understanding of how AI helps with the automation and optimization of project management responsibilities.

2.LITERATURE REVIEW

2.1 INTRODUCTION TO AI IN PROJECT INITIATION & CLOSING PHASE

When AI is integrated with project initiation process, project management techniques enter a transformation phase, in which identification of stakeholders and feasibility assessment have historically depended on manual methods and subjective assessments which continuously dependent on supervision and human error. By the evolution of AI technology, organisations currently have the potential to use powerful tools that makes them to perform extensive feasibility studies with formerly unusual accuracy (Tarawneh et al. 2024). By using AI technologies, project managers can make better judgments from the beginning of the project by filtering large datasets and finding complex patterns. (Joshi 2024). AI enhances knowledge management, automates reporting and documents and does inspections for compliance, all of these helps in project closing phase (Bahroun 2023) which uses sentiment analysis for identifying

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stakeholder feedback and predictive analytics for anticipating any challenges. To provide a comprehensive and effective project closing (Taboada et al. 2023), AI optimizes the allocation of resources and evaluates project success against standards.

2.2 OVERVIEW OF AI IN PROJECT PLANNING

AI has completely altered the project planning techniques, providing a powerful toolkit of methods and strategies for enhanced decision-making and streamline procedures including scheduling, cost prediction and resource allocation (Mohite et al. 2024). With the application of AI methods and information analytics, project managers can accomplish levels which cannot be accomplished by traditional methods with high accuracy and efficiency and enabling the development of robust techniques which helps to mitigate risks and optimise results and finds hidden insights in large datasets, (Elmousalami 2021) AI enhances human knowledge and facilitates proactive solutions for issues and strategic choices throughout the project lifetime

2.3 OVERVIEW OF AI IN PROJECT MONITORING AND CONTROL

AI is an important tool in project monitoring and control with its extraordinary techniques in accurate scheduling, cost estimate and resource allocation which makes the business for exact prediction on project duration by past performance and current work by complex algorithms and understanding based on data (Tarawneh et al. 2024). Project managers can estimate delays, make proactive adjustments to timetables, (Elmousalami 2021)and maximizes resource utilization by using scheduling systems driven by AI and this helps to ensure that projects to remain on schedule and within budget

2.4 PROJECT MANAGEMENT CHALLENGES

In a project, allocation of resources makes sure that the necessary materials, costs and employees are accessible and can be used effectively, but it might face some challenges due to the project needs conflicts, minimum resources or imprecise assessment on resources (Menon 2024). Effective time management is necessary for project success as the delays may affects the stakeholder satisfaction, deliverables, (Elmousalami 2021) and the overall results and the problems in time management are caused by poor prioritisation on jobs, unexpected delays and unreliable project schedules

Risk management is the process of identifying, evaluating and reducing any risks to the accomplishment of a project and ignoring or underestimating risks, not preparing sufficient risk response, or failing to focus on and adjusting to shifting risk variables are some of the difficulties faced in managing risks(McGrath et al. 2020). Engaging and controlling the requirements of people or organizations with a stake in the project is defined as stakeholder management and it can be complicated by competing agendas, varying needs, or resistance to change

Planning, tracking and regulating project expenses are involved in budget management which ensures the project to stay within the allocated budget limit and unexpected costs, inaccurate budget estimations and delay in costs are the challenges in budget management. Change management is the regulated and precise handling of changes in the project requirements, (Elmousalami 2021) objectives or scope such as scope creep or insufficient change control procedures can cause issues to project managers

3.METHODOLOGY

The PRISMA (“Preferred Reporting Items for Systematic Reviews and Meta-Analyses”) approach is used in this study to conduct a methodical analysis of AI applications in project management.

3.1 Identification: A thorough literature search was conducted utilizing keywords such as “Artificial Intelligence,” “AI,” “Machine Learning,” “ML,” “Project Management,” “PM,” “Project Planning,” “Project Control,” “Project Monitoring,” and “Project Initiation” across databases including Scopus, Google Scholar, IEEE Xplore and ScienceDirect and the search concentrated on articles published from 2020 to 2024.

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This timeframe was selected for finding the most recent advancements and developments in the application of AI in project management, which indicates the current trends, technologies and methodologies that have emerged in the rapid evolution of AI techniques and project management methods in the recent years.

3.2 Inclusion and Exclusion Criteria: The study's main objective was including publicly available archives but excluding out publications that were compensated which excluded encyclopaedias, small reviews, news items and video articles and only considered research papers and reviews. Only English-language articles were included, leaving out publications and journals written in other languages for clarity.

3.3 Eligibility criteria: For in-depth analysis of AI applications in project management , a few chosen papers were examined, with an emphasis on those that provided a significant amount of information on AI methods, advantages and effects.

3.4 Results and Discussion AI helps with project management in a number of ways, including stakeholder analysis, feasibility, planning, scheduling, resource allocation, execution, risk management and closure with deliverables and documentation. Better judgments and efficiency are among the benefits; Research and practical application in project management both depend on insights.

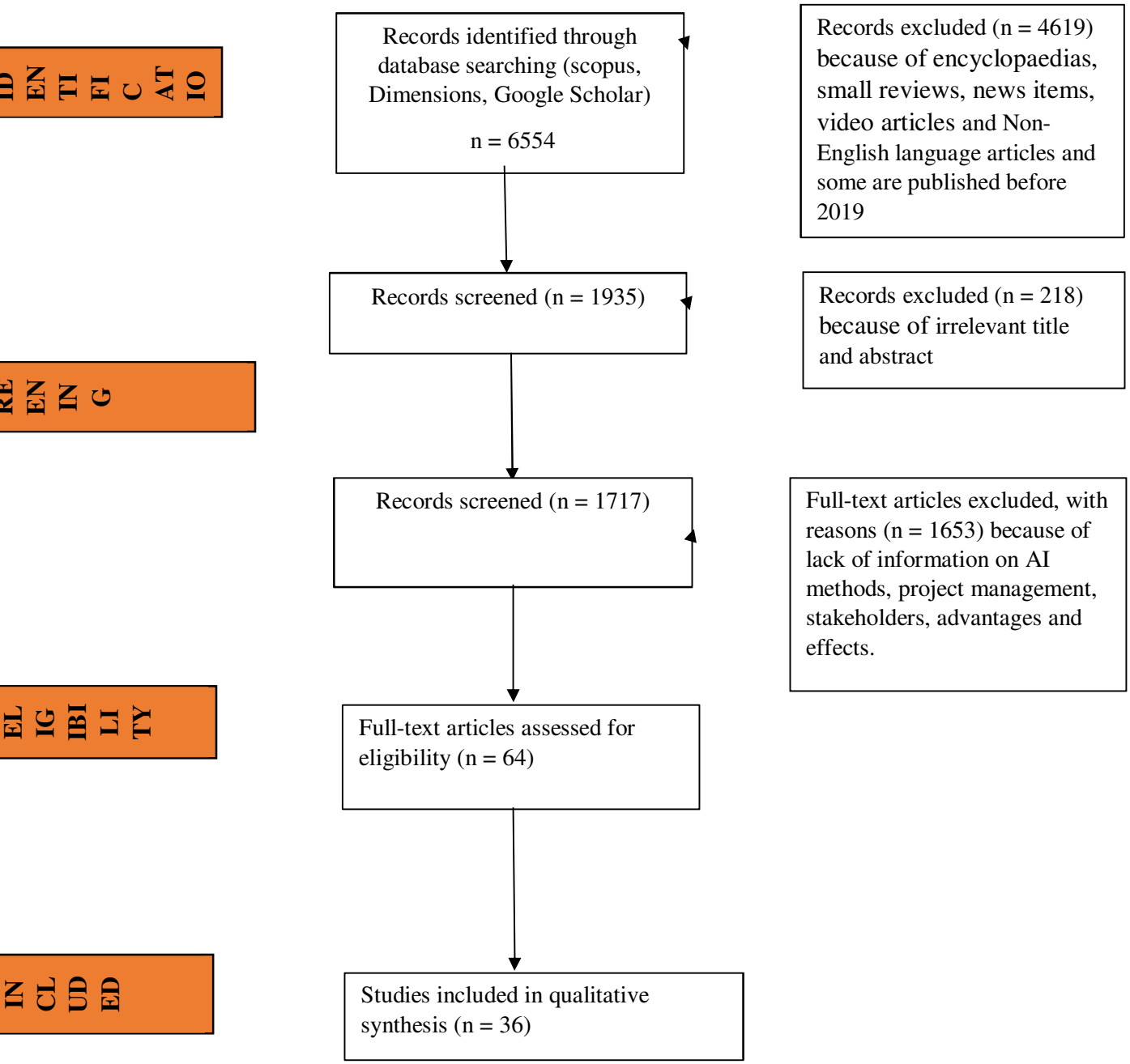

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Figure 3.1 PRISMA FRAMEWORK

4. OBJECTIVE

1. To identify the role of AI in project initiation and closing phase for effective project management.
2. To determine the impact of AI in project planning for accurate scheduling, estimating costs and allocating resources.
3. To examine the contribution of AI in project monitoring and controlling for effective project management.

5.ANALYSIS

A keyword analysis of the papers identified resulted in the following image which pointed out the major areas of focus namely AI, Risk reduction, planning, Project Management, Stakeholders, Resource allocation and Automation to name a few.

Fig No 1: Keyword analysis of identified papers

5.1 AI IN PROJECT INITIATION & CLOSING PHASE

Through findings from literature, the importance of AI in project initiation which includes using AI to identify stakeholders and create a project charter and project closing which involves using AI during the project closing phase is recognized.

5.1.1 Leveraging AI for Stakeholder Identification

In project management, identifying stakeholders involves identifying appropriate people and their influence on the project's outcomes and inadequate identification, changing requirements, barriers in communication and poor participation are the challenges faced by the managers (Shamim 2024).By automating data collection and analysis, AI provides solutions and also provides current stakeholder information and as natural language processing improves

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communication, (Miller 2022) AI's dynamic monitoring minimises the effects of shifting interests and attains improved project outcomes, AI-driven engagement and advanced analytics maximizes the stakeholder involvement and prioritization.

5.1.2 AI for Project Charter Creation

Developing project charter involves in the establishment of project objectives, scope and stakeholders which serves as the basis for project to start where creating balance with the stakeholders, managing stakeholders varying expectations, maintaining availability of resources, meeting project objectives with organizational objectives and setting clear limits are some of the difficulties(Bencsik 2021). AI leverages natural language processing (NLP) for determining project boundaries and facilitating stakeholder interaction and (Miller 2022) AI analytics promotes stakeholder coordination by solving conflicts and defining shared objectives and AI resource management increases the availability of resources for project implementation as machine learning integrates project aims with company objectives

5.1.3 AI in project closing phase

To close a project perfectly, all the activities need to be entirely completed and the challenges involved are to make sure the obligations are met, getting approvals and contract closures (Wawak & Woźniak 2020) AI solutions may help by expediting the closure process and attaining a successful project completion by automating documentation procedures, (Miller 2022) integrating machine learning to identify unfinished activities and giving predictive analytics for anticipating future closure concerns

Sections	Description
AI in Stakeholder Identification	AI automates data collection, better communication, optimizes stakeholder engagement.
AI in Stakeholder Identification	AI optimizes project charters by coordinating stakeholders and resources.
AI in Project Closing Phase	AI automates and streamlines project closure.

Table 5.1. AI in Project Initiation & Closing Phase

5.2 AI IN PROJECT PLANNING PHASE

Through findings from literature, AI's involvement in project planning which includes creating a project management plan as well as creative scope management is discovered, addressing precise scheduling, cost estimation or resource allocation.

5.2.1 Developing project management plan with AI

Developing project management plan involves creating a detailed document that must includes scope, schedule, materials and risk management methods and the challenges might be allocating resource, predicting areas that could become as risks, determining project scope and meeting stakeholders' requirements (Nijhuis 2023) Automating scope definition and examining inputs to meet stakeholder needs can be attained with AI (Gupta 2022) as it improves planning and AI-driven scheduling enhances resource coordination, in which predictive analytics promotes risk management as it also improves flexibility by continually tracking project factors and making real-time plan adjustments.

5.2.2 Innovative Scope Management with AI

Developing a scope management plan for a project entails deciding what aspects of the project are included and which are not to have a clear understanding of what is to be done and what is not to be done in which accurately collecting requirements, (Korhonen et al. 2023) avoiding scope creep, coordinating stakeholder expectations are the challenges (Popoola et al. 2024). AI solutions can be assisted by automating the collection of requirements, use predictive analytics

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for identifying possible scope creep, data analysis for achieving stakeholder expectations and sophisticated modeling approaches for ensuring thorough coverage.

5.2.3 AI-Driven Requirements Generation

In project planning process, identifying and recording the expectations of stakeholders for deliverables is critical process in requirements collection where the challenges includes conflicting stakeholder expectations, unclear and incomplete specifications and changing project demands. (Kanski et al. 2023) With natural language processing, AI can automate requirements collection, resolving disagreements by sophisticated data analysis, (Taboada et al. 2023) and adjusting to changes by predictive analytics and real-time feedback systems.

5.2.4 Using AI to Define Scope

To ensure everyone knows what is to be included and excluded in the project, defining scope during project planning stage encompasses defining the project's limits, deliverables and objectives where accurately recording of all the project requirements, controlling stakeholder expectations and preventing scope creep are the challenges. (Popoola et al. 2024) By automated requirement analysis, leveraging data-driven insights to align stakeholder interests and (David Jeong et al. 2023)applying machine learning techniques to identify and reduce any scope changes, AI solutions could be beneficial.

5.2.5 AI-Powered WBS Creation

In project planning process, Work Breakdown Structure is defined as breaking down the project as more feasible components or activities (Maphosa 2022)and to make sure all tasks are recognized and ambiguity in task specification are reduced. (Hindarto 2023) AI solutions helps by analysing past data for automating job identification process, ensuring through sophisticated algorithms and using predictive analytics to identify overlaps or gaps to provide a thorough and precise WBS.

5.2.6 Managing schedule with AI

Establishing the procedures and deadlines for project is the part of the planning schedule management stage of project planning, which ensures project completion on time and the challenges are accurately calculating timelines, (Gupta 2022) managing several projects and adjusting to changes (Castane et al. 2023) AI solutions may help by improving job coordination with sophisticated scheduling algorithms, utilizing scheduling algorithms for precise time prediction and dynamically modifying schedules in real-time in response to project developments and modifications.

5.2.7 AI powered PM activities

In project planning phase, defining activities involves determining and outlining tasks to complete the project and making sure all the processes are recorded, precisely assigning tasks and estimating schedules are the challenges. (Vial et al. 2023) AI solutions can be assisted by leveraging data analysis for automated job identification, sophisticated algorithms to optimize work sequencing and AI workflow automation are used for achieving precise time estimation.

5.2.8 AI-Driven activity sequencing

In project planning phase, maintaining logical workflows and achieving efficiency in projects can be attained by ordering the activities, which is known as sequencing in which managing complex task relationships, recognizing dependencies and adapting to changes are the challenges (Vial et al. 2023). AI solutions can be used for mapping and automatically recognizing linkages, using sophisticated algorithms to optimize work order and(Gama & Magistretti 2023) dynamically modifying sequences with changes in project needs and real-time data.

5.2.9 Estimating activity duration with AI

Predicting how long each job or activity will take to complete is known as activity duration estimation and it is done during the project planning phase in which accurately estimating work complexity, taking resource availability into account and (Merhi & Harfouche 2023)factoring in unanticipated delays are challenges. AI solutions may help by

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improving the accuracy and dependability of duration predictions by recognizing possible delays using sophisticated algorithms, improving the allocation of resources using machine learning and reviewing historical data to attain accurate duration estimates.

5.2.10 Using AI to design communication management

Outlining techniques for successful communication with stakeholders during the project lifecycle is part of planning communication management at the project planning phase in which managing the demands of many stakeholders, adjusting to communication constraints and attaining timely and pertinent information sharing are among the challenges. (Ahmed et al. 2023) In order to achieve effective and efficient communication amongst all the project stakeholders, AI solutions helps by automating communication procedures, (Ouyang et al. 2023)evaluating stakeholder preferences to personalize communication methods and employing natural language processing for addressing language obstacles.

5.2.11 Utilising AI to develop risk management

Identifying, evaluating and providing solutions to any risks which affects the project's goals constitute planning risk management throughout the project planning stage and the challenges is to thoroughly identify all potential risks, efficiently prioritize them and adapt to unanticipated circumstances. To improve a project's resilience and success, (Odejide & Edunjobi 2023) AI solutions may help by using risk scoring algorithms to detect possible risks, rank them according to likelihood and effect and suggest proactive mitigation techniques.

5.2.12 Recognizing risks with AI

In project planning phase, identifying risks involves methodically identifying and recording prospective occurrences or circumstances that influences project objective where accurate identification of potential risks, examining their impacts and making priorities are the challenges. (Wang 2022) AI provides solutions by predicting potential risks and uses machine learning algorithms for analysing and identifying patterns and using neural network for collecting risk-related information from multiple sources. These methods improve the processes involved in risk identification and management.

5.2.13 Using AI to perform qualitative risk assessments

In project planning phase, risks are examined subjectively rather than precisely using formulas by qualitative risk analysis that depends on the impacts and probability in which the challenges could be accurately prioritizing risks and dealing with inconsistent risk assessments. (Gemino et al. 2020) To enhance decision making process and risk management procedures, (Robert Picciotto 2020) AI can be used for providing criteria in assessing risks, utilizing sentiment analysis to analyse risk perceptions and offering data-driven insights for increasing consistency and accuracy of qualitative risk analysis.

5.2.14 Organizing risk responses with AI

In project planning phase, preparing for risk responses includes creating plans to mitigate risks that have been identified and the impacts of risks on project goals which includes finding the best reaction methods, weighing the costs and benefits of responses and ensuring that risks are effectively reduced (Afzal et al. 2021). AI automates response planning procedures to increase efficiency and effectiveness and strengthen the project's resistance to risks and (Ahmadi 2019) they can also simulate various reaction scenarios using scenario analysis and propose the best solution by analysing risk data

5.2.15 Applying AI to plan procurement management

In project planning stage, planning procurement management involves the methods for obtaining, hiring and overseeing project resources to accomplish project specifications in which identifying skilled suppliers, contract negotiations and(Khan et al. 2023) enhancing on-time delivery of products and services are the challenges (Jhurani 2020). In order to improve procurement efficiency and effectiveness, AI technologies can help by automating procedures for supplier selection, streamlining negotiating contracts through data analysis and uses predictive analytics to foresee demands and reduce risks in supply chain.

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5.2.16 Employing AI to plan stakeholder engagement

In project lifecycle, developing methods for communicating with stakeholders is a part in planning stakeholder engagement in which managing varying expectations, identifying multiple stakeholder interests and achieving meaningful interaction are the challenges (Orieno et al. 2024). Automated communication processes can be done by AI for enhancing stakeholders interaction and satisfaction, incorporating sentiment analysis to assess stakeholder perceptions and (Alami et al. 2021) examining stakeholder data to customize engagement strategies and all of these actions can improve stakeholder relationships and project success.

5.3 AI IN PROJECT MONITORING AND CONTROL PHASE

Through findings from literature, which focuses on improving effective project management, the role of AI in project monitoring and controlling is recognized. This role includes using AI to monitor and control project activity, implementing AI-powered integrated change management & validating and managing scope.

5.3.1 Leveraging AI to monitor and control project work

Tracking project performance, making sure the project plan is followed and providing corrective measures are necessary to meet project goals that are all part of monitoring and controlling the project's progress at this phase. Finding plan deviations, determining their underlying reasons and giving timely corrective action in place are challenging tasks (van der Aalst 2021). To enhance project supervision and decision making for better project results, AI solutions can help by automating data collecting and analysis procedures, (Aljawder & Karaghouli 2024) utilizing real time analytics to identify future errors and advising the best corrective steps determined by real-time project data

5.3.2 Executing AI-powered integrated change control

In project monitoring and control phase, maintaining alignment with project objectives, implementing integrated change management entails analyzing and approving variations to the project scope, schedule and resources and the challenges are prioritizing change requests, evaluating the effects of suggested changes and achieving project stability (Thotho & Macheso 2023). To streamline the procedure for managing changes and to improve project flexibility, AI automates change effect analysis, (Ebirim et al. 2024) uses machine learning to identify potential impacts and offers the best methods for change depends upon data-driven insights.

5.3.3 Validating scope with AI

During the project monitoring and control phase, validating scope entails making sure that all deliverables satisfy the specified acceptance criteria and have stakeholder approval in which uncertain approval standards, scope creep and stakeholders disputes are among the challenges(Josyula et al. 2023). To increase reliability and effectiveness in scope validation and reduce project risks, AI solutions may help by automating validation procedures, (Steidl et al. 2023) evaluating stakeholder comments to improve acceptance criteria and utilizing machine learning algorithms to detect potential scope adjustments.

5.3.4 Incorporating AI to manage scope

In order to avoid scope creep and to attain consistency with project objectives, controlling scope throughout the project monitoring and control phase entails managing scope changes in which identifying unapproved scope modifications, evaluating their effects and providing required corrective actions are challenging tasks(Zerfass et al. 2020). To improve scope management and reduce project risks, (Sharma et al.2022) AI technologies helps in automating the detection of scope changes, estimating scope deviations using predictive analytics and providing solutions for remedial measures based on data analysis.

5.3.5 Deploying AI to manage the schedule

During the project monitoring and control phase, controlling the schedule entails keeping updated on project progress, making comparison it to the schedule and taking corrective measures as necessary to ensure timely completion where finding schedule variations, determining their reasons and modifying the plan appropriately are challenging

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tasks(Oluyisola et al. 2022). In order to help with control of schedules and project effectiveness, (Abioye et al. 2021) machine learning algorithms can be utilised to identify delays and provides alteration in schedules by analysing data

5.3.6 Reducing cost using AI

Throughout the project monitoring and control phase, cost control is attained by controlling project expenses, comparing them to the budget, in which providing corrective measures in place to manage costs efficiently and finding cost overruns, examining their underlying causes and putting cost-cutting measures into place are challenging tasks (Javaid et al. 2022). Control of costs and project finance management may be improved with the use of AI solutions, which can automate cost monitoring procedures, forecast possible cost deviations using neural network, (Ruiz et al. 2021) and suggest the best cost-saving measures.

5.3.7 Adapting AI to control resources

During the project monitoring and control phase, controlling resources entails allocating project resources optimally to ensure effective use where the challenges includes shortages of resources, disputes over their distribution and unforeseen resource requirements (Abdeldayem & Aldulaimi 2020). In order to improve resource management effectiveness and project performance, AI solutions may help by automated resource measuring procedures, (Zerssa et al. 2020) forecasting resource demands using NLP and suggesting the best resource allocation techniques based on data analysis.

5.3.8 Monitoring communications with AI

Tracking and assessing the efficiency of communication with project stakeholders constitutes monitoring communications throughout the project's monitoring and control phase in which overcoming communication hurdles, (Tomazzoli et al. 2020) managing a variety of communication preferences and guaranteeing accurate and on time transmission are among the challenges (Zhu et al. 2022). In order to increase stakeholder involvement and project outcomes, AI solutions helps by streamlining communication monitoring procedures, evaluating communication patterns to pinpoint areas for improvement and utilizing natural language processing for improving communication

5.3.9 Mitigating risks by AI

To monitor risks, the project monitoring and control stage entails ongoing assessment and tracks risks that have been identified in which accurately estimating the effects of risks, identifying changing threats and modifying risk actions in response are challenging tasks(Afzal et al. 2021). In order to improve risk management efficiency and project resilience, AI helps by automating risk monitoring operations, (Robert Picciotto 2020) employing predictive analytics to foresee future hazards and providing appropriate risk response techniques based upon real-time data analysis.

5.3.10 AI-Powered Procurement Control

Managing supplier contracts, success and outcomes is part of controlling procurements throughout the project monitoring and control process and it helps to ensure that the project's specifications and budget are followed in which contract conflicts, problems with vendor performance and cost overruns are examples of difficulties (Guida et al. 2023). In order to improve procurement management and project success, AI technologies helps by automated contract monitoring procedures, (Allal Chérif et al. 2021) forecasting vendor performance using machine learning and suggesting the best contract management techniques based on data analysis

5.3.11 Integrating AI in monitor stakeholder engagement

Monitoring stakeholder engagement throughout the project monitoring and control phase entails evaluating the participation and involvement of project stakeholders (Alami et al. 2021). Monitoring divergent stakeholder interests, handling competing expectations and spotting unsatisfied stakeholders are challenges where the stakeholder involvement and (Orieno et al. 2024) project results may be improved by using AI technologies, which automates the collection of stakeholder feedback, analyze sentiment to determine stakeholder satisfaction and use predictive analytics to foresee stakeholder demands.

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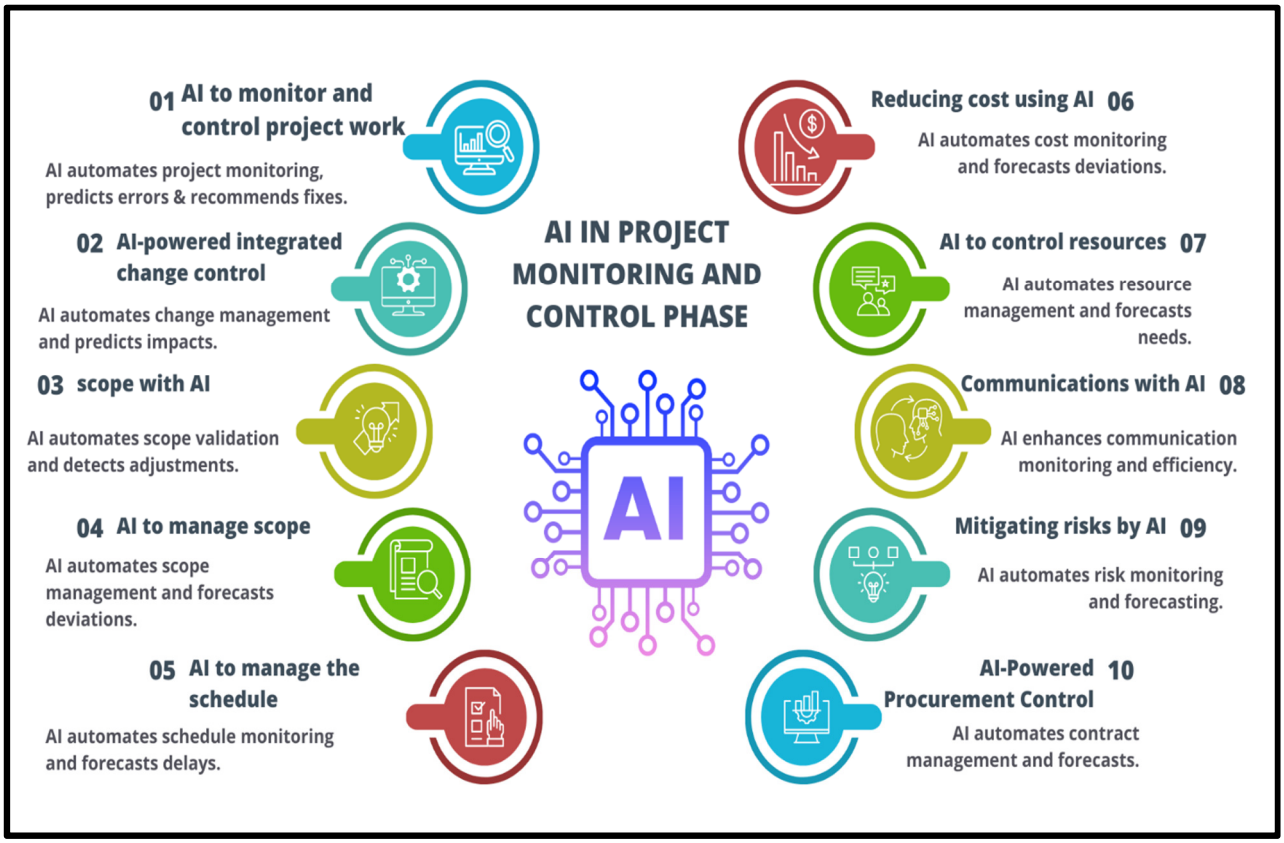

Figure 5.1 AI in Project Monitoring and Control Phase (author own source)

Project management Phase	Knowledge areas	AI Role	Literature Review
Project initiation	Developing project charter	AI-driven patterns and opinion are made available for increasing the speed for the process of developing project charters, that results in efficient outlining objectives, deliverables and scope	(Miller 2022).
	Identifying stakeholders	AI algorithms are used for examining social media and project data for identifying necessary stakeholders, their domains of influence and also the areas of interest.	(Takagi & Varajão 2022).
	Developing project management plan	Provides guidance and templates offered by AI to build detailed project management plans with schedules, costs and milestones	(Nijhuis 2023)
	Creating WBS	Ensures all the project activities are evaluated and organized with AI to develop and optimize a comprehensive WBS	(Korhonen et al. 2023)
	Plan schedule management	To effectively manage timelines and activities because of its flexibility in activities and project organization.	(Taboada et al. 2023)

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Project planning			
	Plan risk management	evaluates possible risks automatically uses past data, project specifications and industry standards.	(David Jeong et al. 2023)
	Plan procurement management	evaluates the market for finding suppliers and trends, explores the abilities and performance of suppliers, with the help of analytics to forecast budget, evaluates risks, recommend procurement strategies, administers contracts and keeps updated on performance of suppliers.	(Maphosa 2022)
Project monitoring and control	Monitor and control project work	Asana provides teams remain on schedule that can be attained by automating task management through real-time project progress updates.	(Aljawder & Karaghouli 2024).
Project closing	Closing project	Examines project documentation to ensure all deliverables are definite and well documented.	(Regona et al. 2022).

Table 5.2 AI Tools in Project management phase

6.CONCLUSION

In conclusion, the discipline of project management has significant transformation by integrating it with AI and its possible effects extend to every phase of the project's lifecycle, in planning phases to project completion and the ability of AI to automate monotonous processes like data processing and scheduling has several benefits as it provides relief to project managers of repetitive tasks, this enables them in focusing their skills on making strategic decisions and developing effective team leadership. Furthermore, AI's capability in examining huge volumes of project data enhances proactive risk management and it has the ability to significantly mitigate the risk of project failure by identifying possible problems before they become an issue and this proactive strategy ensures that projects remain within their budgetary and schedule limits, especially when paired with AI's ability for resource allocation optimization. It is crucial to stress that AI is not meant to take the position of individuals in project management rather it works as a strong assistant, provides project managers with insights based on data as it makes it possible for workflows to be optimized, which in turn promotes more effective and efficient project delivery where project managers may improve their performance and continually provide better project outcomes by utilizing AI.

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