

Creative AI in Software Project Management

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Abstract- Software project management (SPM), which comprises planning, supervising, and keeping track of software projects, is a sophisticated art. However, the complexity and needs of modern software development projects are usually impossible for existing SPM methodologies to handle. The research paper investigates how business process reengineering (BPR) and the strategic application of artificial intelligence (AI) may enhance the effectiveness, quality, and competitiveness of software development processes.

The development of artificial intelligence (AI) has the potential to transform project management practices by automating operations, enabling project analytics, and offering intelligent recommendations. This paper proposes a framework for managing agile projects, which are gaining popularity due to their speedy value delivery and minimal risk of project failure. Just a few examples of how AI might be incorporated into project management include automating administrative tasks, providing data-driven risk predictions, simplifying project planning, and producing actionable insights.

Software development is one of several businesses that has benefited from the popularity of Scrum and other agile project management methodologies. These methods are founded on a dynamic product backlog that consists of bug fixes and user stories. The specific issues that crop up when applying AI to project management are addressed using a five-step process. Using this method, which incorporates contextual considerations, problem-solution matching, and domain-specific implications, organizations can develop customized AI use cases.

Keywords— Key words: *Software Development Organization, Automation Technologies, Software Engineering Management (SEM), Software Project Management (SPM), Artificial Intelligence (AI), Agile Project Management, Project Analytics*

I. INTRODUCTION

The orchestration, supervision, and monitoring of software projects are all part of the complicated art known as software project management (SPM). However, the complexity and demands placed on modern software development processes are frequently greater than what the SPM approaches currently in use can handle. This study investigates the synergistic potential of business process reengineering (BPR) with strategic artificial intelligence (AI) deployment to improve the effectiveness, quality, and competitiveness of software development processes. The study emphasizes the paradigm shift brought about by artificial intelligence (AI), which offers process automation, project analytics, and intelligent recommendations that have the ability to totally transform project management methodologies. A framework for agile initiatives, which are renowned for their speedy value delivery and minimal chance of project failure, is presented in the paper. Through automated administrative activities, data-driven risk

forecasting, streamlined project planning, and the generation of actionable insights, the framework illustrates the incorporation of AI.

Scrum and other Agile Project Management techniques have gained popularity in a number of industries, including software development. A flexible product backlog with user stories and bug patches serves as the foundation for these methods. The specific challenges of applying AI in project management are addressed using a structured five-step approach. Through contextual analysis, accurate problem-solution alignment, and domain-specific considerations, this method will allow enterprises to create distinctive AI applications. The paper emphasizes the revolutionary potential of AI in project management and stresses the need to thoroughly examine prospective AI solutions in order to close the gap between current organizational barriers and them.

The research provides a cutting-edge, knowledge-based approach to assist project managers during the first scheduling stage while also shedding light on how challenging and resource-intensive it is to schedule software development projects. Using past information regarding staff productivity from earlier projects, the study makes an argument in favour of the viability of a knowledge-based genetic algorithm as a solution to the resource-constrained project scheduling conundrum. The numerous applications of AI in software engineering, such as software cost prediction, effort forecasting, and AI's critical role in project management, are comprehensively examined in the article. The potential of AI integration across all stages of the software development life cycle is underlined, despite the complexity of incorporating AI into software engineering procedures. The research also highlights the effects of Industry 5.0, a movement that stresses the integration of digital technologies used outside of manufacturing, such as artificial intelligence, big data, and project management. The paper demonstrates how AI can enhance project management performance across a range of factors and offers prospective lines of inquiry for further study in this dynamic area.

A. Research Objectives:

- Evaluate how integrating BPR and AI enhances contemporary software development processes.
- Develop a comprehensive AI-integrated framework for Agile Project Management.
- Propose a five-step AI adoption methodology for tailored project management solutions.
- Analyse the transformative impact of AI on software project management dynamics.
- Examine Industry 5.0's role in shaping AI-driven project management for software organizations.

II. LITERATURE REVIEW

Recent literature has paid a lot of attention to the use of artificial intelligence (AI) in project management, particularly in the sectors of construction and information technology projects. The promising advantages of AI in these fields are discussed by Taboada, Daneshpajouh, Toledo, and De Vass (2023), while Levitt and Kunz (1987) highlight the importance of conventional domain-independent planners for supporting comprehensive subtask planning. The study on AI-based project management has been widely disseminated throughout the last ten years across publishers, disciplines, and regions (2022). El Khatib and Al Falasi (2021) draw attention to the fact that AI applications improve data quality and integrity, which in turn increases decision-making efficiency and effectiveness in both single-project and multi-project scenarios. Both Munir (2019) and Auth, Jöhnk, and Wiecha (2021) agree that AI offers project managers a variety of benefits, including task automation, project analytics, and better decision-making. Dam, Tran, Grundy, Ghose, and Kamei (2018) explore the technological capabilities of AI in project management, outlining how it may automate jobs, provide project analytics for risk prediction and quantification, offer useful insights, and influence decision-making. By 2030, according to Taylor (2021), AI will have a profoundly transformative effect on project management, causing a shift in emphasis toward human-centered considerations. Despite AI's promise, Alshaikhi and Khayyat (2021) emphasize the indispensable aspect of human intellect and the special role that people play in project management.

By highlighting the pragmatic integration of AI into project management techniques, Skinner (2021) provides a practical component and supports the notion that AI is essential in transforming the profession. The body of research highlights the numerous benefits AI may bring to project management, while also pointing out its drawbacks and advocating a collaborative effort between human knowledge and AI capabilities. The project management industry is affected significantly by the quick development of AI technology across several fronts. The growing influence of AI breakthroughs on modern project management is highlighted by Holzmann, Zitter, and Peshkess (2022). Fridgeirsson, Ingason, Jónasson, and Jónsdóttir (2021) underline the value of AI in procedures when accurate estimation and planning are made possible by historical data.

According to Ong and Uddin (2020), anticipated improvements in technology applications are anticipated to help streamline industry-standard practices. Zeiner-Gundersen (2022) investigates the efficient management of project expenses and risks at various stages of development using AI-driven algorithms. According to Polonevych, Sribna, Mykolaychuk, Tkalenko, and Shkapa (2020), AI technology offers a distinct edge in complex projects requiring significant data processing. Further highlighting AI's contribution to improving project manager effectiveness is Prifti (2022). On the other hand, the assumptions behind the formulas used by the Earned Value Management model to track project progress are questioned by Kunnathur (2020). Mishra, Tripathi, and Khazanchi (2023) predicted the astronomical growth of the worldwide AI software market, projecting its expansion to \$126 billion by 2025 in a broader industry context.

Together, the reviewed literature highlights the transformative potential of AI in project management across a variety of domains, including improved estimation accuracy, effective decision-making, and streamlined processes, while also acknowledging significant challenges and potential growth areas within this changing landscape. Artificial intelligence's (AI) rapid development offers hope for ground-breaking uses in project management. The rising potential of AI integration in project management is explored by Auth, Jokisch, and Dürk (2019), who also explain prospective developments in this area. A problem-solution matrix is a similar idea introduced by Hofmann, Jöhnk, Protschky, and Urbach (2020), which makes it easier to connect AI features with certain domain settings. According to Rathod and Sonawane (2022), who examine AI's profound effects on the construction sector, this disruptive potential extends to initiatives in the construction industry. A more comprehensive viewpoint is provided by Gupta (2022), who emphasizes the beneficial interaction of AI-driven tools, data analytics, and agile techniques in enhancing project management practices. According to Skinner (2022), project management plays a crucial part in the economic landscape of the United Kingdom. However, according to Skinner (2021), specialized project management structures by themselves might not be sufficient to produce the best results. According to Skinner (2019), AI is the long-awaited answer to the problems in project management. According to Nemati, Todd, and Brown (2002), hybrid intelligence systems can be used to validate project estimates and anticipate the quality of deliverables, taking into account the historical background. Machine learning models are used by Ozgur, Tarhan, Komesli, and Tecim (2022) to assess project success and provide insights into project dynamics in educational environments. Although there have been improvements, Bahroun, Tanash, As'ad, and Alnajjar (2023) highlight the early stages of AI approaches for effective project scheduling, indicating a need for more research. The literature study as a whole emphasizes AI's expanding influence on project management, its wide possibilities across industries, and the shifting difficulties and chances it brings.

III. RESEARCH GAP

Despite a sizable body of literature highlighting artificial intelligence's (AI) transformative potential in project management across numerous domains, there is still a significant research gap in terms of a thorough investigation into the complex problems and potential solutions for integrating AI within project management practices. While previous research has focused on the advantages of AI, such as increased estimation accuracy, improved decision-making, and simplified procedures, there has been less attention paid to the specific difficulties and challenges that arise when applying AI-driven methodologies in actual project management scenarios. A lack of in-depth research detailing the contextual elements that affect the successful integration of AI into various industries and project types is another issue. While many writers discuss the broad uses of AI in project management, this research is lacking in this area. Few research focus on the nuances of tinkering with AI solutions to particular organizational and project-related difficulties, despite the fact that many studies highlight AI's strengths in automating tasks, assisting decision-making, and improving processes. This knowledge gap necessitates a deeper look at how AI may be efficiently tailored and integrated into

various project management settings to optimize its advantages. There are very few empirical studies that confirm and quantify the disruptive future that some authors see for project management, where AI will have a substantial impact. There is a dearth of empirical data that illustrates the precise effects of AI integration on project management techniques, performance measures, and overall project success because the majority of the material currently in circulation is primarily theoretical discussions and conceptual frameworks.

IV. RESEARCH METHODOLOGY

The study was an exploratory one that used methods for analysing secondary data, with an emphasis on text clouding, topic recognition, and content mapping in particular. The main goal of this study was to go further into the dataset in order to find any hidden themes, patterns, or linkages. Secondary data was gathered from a variety of reliable sources, including academic databases, business reports, and online publications, when it comes to data sources. These sources were chosen because they were pertinent to the study's goals. Prior to analysis, a thorough data cleaning process was carried out to remove any duplicate records, irrelevant data, or inconsistencies that could possibly impair the analysis's accuracy and dependability.

The data analysis process included a number of crucial elements. In order to illustrate the frequency and relevance of terms within the dataset, text clouding was first used as a technique. This made it easier to spot important themes and terms that frequently appeared in the dataset. Second, topic recognition was done using sophisticated algorithms like Non-Negative Matrix Factorization (NNMF) or Latent Dirichlet Allocation (LDA). To find latent subjects or clusters in the textual data, several methods were used to the dataset. This made the data's underlying structure more apparent and allowed for the discovery of connections between various subjects and ideas.

Last but not least, content mapping was used to produce graphic representations that showed the links and interconnections between the numerous subjects, keywords, or concepts found in the dataset, such as network graphs or thematic maps. The study gained depth and clarity thanks to this graphic representation.

V. DISCUSSION

TABLE I. TOPIC DETECTION:

Topic	Key References
AI in Project Management	Taboada, Daneshpajouh, Toledo, and De Vass (2023), Levitt and Kunz (1987), El Khatib and Al Falasi (2021), Munir (2019), Auth, Jöhnk, and Wiecha (2021), Dam, Tran, Grundy, Ghose, and Kamei (2018), Taylor (2021), Alshaikh and Khayyat (2021), Skinner (2021)
Advantages of AI in Project Management	Enhanced estimation accuracy, Efficient decision-making, Streamlined processes, Transformative potential
AI's Impact on Project Management Domains	Construction projects, Agile methodologies, Educational contexts
Challenges and Opportunities in AI for Project Management	Nascent stage of AI techniques for efficient project scheduling, Evolving challenges and opportunities
AI and Human	Promoting a symbiotic relationship between AI

Expertise	capabilities and human expertise
AI's Role in Project Progress Tracking	Concerns about Earned Value Management model's formulas
Global AI Software Market	Forecasted growth to \$126 billion by 2025
Historical Data and AI in Project Management	Historical data enabling precise estimation and planning, Project estimate validation and quality prediction of deliverables
AI's Role in Project Management in the United Kingdom	Skinner (2022) emphasizing the role of project management in the UK's economic landscape

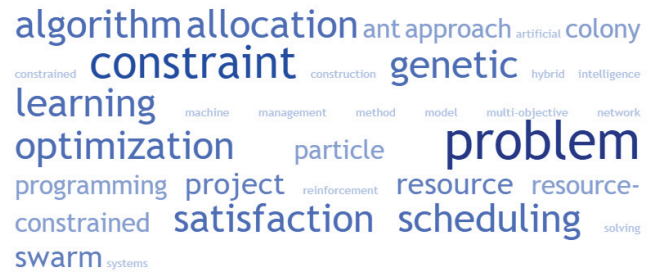


Fig. 1.

The rapid evolution of artificial intelligence (AI) technologies holds significant implications for the realm of project management, influencing various dimensions. Holzmann, Zitter, and Peshkess (2022) highlight the burgeoning impact of AI developments on project management within contemporary contexts. Fridgerisson, Ingason, Jónasson, and Jónsdóttir (2021) emphasize the utility of AI in processes where historical data enables precise estimation and planning. The ever-advancing applications of technology are anticipated to contribute to the optimization of conventional industry procedures. Ong and Uddin (2020) discuss the potential of sophisticated technology applications in streamlining existing practices. Zeiner-Gundersen (2022) explores how AI-driven algorithms can effectively manage project costs and risks during diverse developmental stages. In projects characterized by complexity and substantial data analysis requirements, AI technology offers a distinct advantage. Polonevych, Sribna, Mykolaychuk, Tkalenko, and Shkapa (2020) underscore AI's efficacy in intricate projects that necessitate data-intensive decision-making processes. Prifti (2022) further underscores AI's role in enhancing project manager efficiency.

Contrasting traditional methods, Kunnathur (2020) raises concerns about the assumptions and simplifications underlying the Earned Value Management model's formulas used for tracking project progress. In a broader industry context, Mishra, Tripathi, and Khazanchi (2023) forecast the exponential growth of the global AI software market, estimating its expansion to \$126 billion by 2025. Collectively, the reviewed literature underscores AI's transformative potential in project management across various domains, encompassing enhanced estimation, efficient decision-making, and streamlined processes, while also pointing out key challenges and areas of growth within this evolving landscape.

A. Entity analysis and content mapping

Entity analysis involves identifying and categorizing entities (such as names of people, organizations, dates, and

locations) within a text. Content mapping involves visually representing the relationships between these entities and the topics they are associated with. Here's an entity analysis and content mapping for the provided text:

B. Entity Analysis

1) People and Authors:

- Taboada, Daneshpajouh, Toledo, De Vass
- Levitt, Kunz
- El Khatib, Al Falasi
- Munir
- Auth, Jöhnk, Wiecha
- Dam, Tran, Grundy, Ghose, Kamei
- Taylor
- Alshaikh, Khayyat
- Skinner
- Holzmann, Zitter, Peshkess
- Fridgeirsson, Ingason, Jónasson, Jónsdóttir
- Ong, Uddin
- Zeiner-Gundersen
- Polonevych, Sribna, Mykolaychuk, Tkalenko, Shkapa
- Prifti
- Kunnathur
- Mishra, Tripathi, Khazanchi
- Auth, Jokisch, Dürk
- Hofmann, Jöhnk, Protschky, Urbach
- Rathod, Sonawane
- Gupta
- Skinner (UK)
- Skinner (2019)
- Nemati, Todd, Brown
- Ozgur, Tarhan, Komesli, Tecim
- Bahroun, Tanash, As'ad, Alnajjar

2) Dates:

- Various years mentioned throughout the text (e.g., 1987, 2021, 2022, 2023, 2030, 2002, 2025).

3) Topics and Concepts:

- AI in Project Management
- Advantages of AI in Project Management
- AI's Impact on Project Management Domains

- Challenges and Opportunities in AI for Project Management
- AI and Human Expertise
- AI's Role in Project Progress Tracking
- Global AI Software Market
- Historical Data and AI in Project Management
- AI's Role in Project Management in the United Kingdom
- AI Integration in Project Management
- Economic landscape
- Project estimate validation
- Quality prediction of deliverables
- Educational contexts

C. Content Mapping

Content mapping typically involves creating visual representations of the relationships between entities and topics. Below is a simplified textual representation of the content mapping for the provided text:

D. AI in Project Management

[Authors]: Taboada, Daneshpajouh, Toledo, De Vass, Levitt, Kunz, El Khatib, Al Falasi, Munir, Auth, Jöhnk, Wiecha, Dam, Tran, Grundy, Ghose, Kamei, Taylor, Alshaikh, Khayyat, Skinner, Holzmann, Zitter, Peshkess, Fridgeirsson, Ingason, Jónasson, Jónsdóttir, Ong, Uddin, Zeiner-Gundersen, Polonevych, Sribna, Mykolaychuk, Tkalenko, Shkapa, Prifti, Kunnathur, Mishra, Tripathi, Khazanchi, Auth, Jokisch, Dürk, Hofmann, Jöhnk, Protschky, Urbach, Rathod, Sonawane, Gupta, Skinner (UK), Skinner (2019), Nemati, Todd, Brown, Ozgur, Tarhan, Komesli, Tecim, Bahroun, Tanash, As'ad, Alnajjar

- [Advantages]: Enhanced estimation accuracy, efficient decision-making, streamlined processes, transformative potential
- [Impact on Domains]: Construction projects, Agile methodologies, Educational contexts
- [Challenges and Opportunities]: Nascent stage of AI techniques for efficient project scheduling, evolving challenges, and opportunities
- [AI and Human Expertise]: Promoting a symbiotic relationship
- [AI's Role in Tracking]: Concerns about Earned Value Management model's formulas
- [Global Market]: Forecasted growth to \$126 billion by 2025
- [Historical Data]: Precise estimation, project estimate validation, quality prediction
- [UK's Economic Landscape]: Project management's role
- [AI Integration]: Emerging possibilities, alignment with domain contexts

Monday.com	A visual project management tool that uses AI to help teams stay organized and on track.
Nifty.ai	A project management tool that uses AI to help teams plan, track, and manage their projects.
Planview	A PPM tool that uses AI to help organizations manage their projects across multiple departments and locations.
Prometheus	A project management tool that uses AI to help teams identify and resolve risks.
Rally	A PPM tool that uses AI to help organizations improve their decision-making and optimize their processes.
Smartsheet	A cloud-based project management tool that uses AI to help teams automate tasks, collaborate more effectively, and track progress.
SpiraPlan	A PPM tool that uses AI to help organizations manage their projects from start to finish.
Wrike	A project management tool that uses AI to help teams plan, track, and manage their projects.
Workfront	A PPM tool that uses AI to help organizations improve their project delivery and get results faster.

TABLE III. IT PROJECT MANAGEMENT AND APPLICATION AREAS

IT project management area	How AI is used to automate the process
Initiating	AI can be used to help identify and prioritize projects, as well as to create project charters and plans.
Planning	AI can be used to help create and optimize project schedules, as well as to identify and manage risks.
Executing	AI can be used to help track progress, manage resources, and resolve issues.
Monitoring and Controlling	AI can be used to help monitor project performance, identify deviations from the plan, and take corrective action.

TABLE IV. SCRUM PROCESS

Scrum process	How AI is used
Sprint planning	AI is used to help the team prioritize the work in the sprint backlog, as well as to estimate the time and resources needed to complete each task.
Daily stand-up	AI is used to track the team's progress and identify any blockers.
Epic	AI is used to help the team break down epics into smaller, more manageable tasks.
Work breakdown	AI is used to help the team create a detailed plan for each task, including the steps involved, the dependencies, and the resources needed.
Backlog	AI is used to help the team manage the product backlog, including prioritizing the work, estimating the time and resources needed, and tracking progress.
Product leadership	AI is used to help product leaders make better decisions about the product roadmap, features, and user experience.

TABLE V. CREATIVE AI TOOLS AND AGILE PROJECT DOMAINS

Creative AI tool	Agile project management domains
Chatbots	Daily stand-up, sprint planning, backlog management
Machine learning	Work breakdown, risk management, issue tracking
Natural language processing	Requirements gathering, user feedback, documentation
Computer vision	Quality assurance, testing, user experience design
Generative AI	Design, prototyping, content creation
Collaborative AI	Teamwork, communication, decision-making

VI. CONCLUSION

A. Managerial Perspective

The fusion of artificial intelligence (AI) with business process reengineering (BPR) has had a profound impact on software project management (SPM). This paradigm change poses a number of important managerial considerations and opportunities, including:

- **Efficiency Enhancement:** Adding AI to project management has the potential to significantly increase efficiency. Project managers can concentrate on making strategic decisions and coming up with innovative solutions to problems by automating administrative work with AI-powered tools. Faster project completion and resource optimization may result from this.
- **Data-Driven Decision-Making:** AI gives project managers access to current analytics and insights into their projects. Throughout the project lifetime, this data-driven approach enables better informed decision-making. Managers are better able to spot bottlenecks, foresee dangers, and distribute resources.
- **Agile Project Management:** Scrum and other agile approaches are gaining popularity because of their adaptability and iterative process. By automating sprint planning, easing daily stand-up meetings, and improving backlog management, AI can be a key component of agile project management. This enables teams to quickly provide value.
- **Customized AI Integration:** The suggested five-step technique for adopting AI highlights the significance of adjusting AI solutions to particular project management difficulties. When integrating AI, managers should take into account contextual considerations, problem-solution alignment, and domain-specific effects. By being customized, AI solutions meet organizational objectives.
- **Human-AI Collaboration:** Even if AI is capable of automating a variety of jobs, it is important to acknowledge the value of human expertise. A symbiotic relationship between AI capabilities and human decision-making should be encouraged by project managers. While AI improves managerial abilities, human intuition and judgment continue to be highly valuable.
- **Risk Mitigation:** Project managers can greatly benefit from AI's capacity to forecast and manage hazards. AI can help with proactive risk mitigation by examining historical data and spotting potential issues. This proactive strategy raises the success rates of projects.
- **Market Dynamics:** Managers need to be aware of the broader market dynamics, like the anticipated expansion of the international AI software market. The use of AI and the investment in project management systems can both be informed by an understanding of these trends.
- **Change Management:** Organizational culture must change in order for AI to be used in project

management. To ensure that teams are trained and ready for AI integration, managers should take the lead in change management initiatives. It is crucial to communicate the benefits and expectations clearly.

- **Continuous Learning:** AI technology is advancing quickly. Project managers need to make a commitment to lifelong learning and remaining current on AI developments. This enables them to fully utilize AI and adjust to shifting environments.
- **Ethical Considerations:** As AI is more thoroughly incorporated into project management, ethical concerns around bias, data protection, and responsibility are crucial. To preserve trust and openness, managers need to be cautious in how they handle these ethical issues.

B. Research Perspective

A game-changing potential exists for the field of software project management (SPM) with the incorporation of artificial intelligence (AI). The goal of this study is to close the gap between the requirements of modern software development projects and the limitations of classic SPM approaches. AI has the potential to improve SPM's effectiveness, standard, and competitiveness. AI has the power to completely change how SPM is carried out by automating administrative processes, generating data-driven insights, and offering predictive analytics.

The requirement for a thorough framework for incorporating AI into Agile Project Management is one of the important viewpoints that this research has shown. AI can help Agile approaches become even more effective as they become more and more well-liked for their adaptability and flexibility. This architecture can include daily stand-ups, backlog management, product leadership, and AI-driven sprint planning. It offers firms a road map for effectively utilizing AI's capability in Agile contexts.

This study also emphasizes how critical it is to understand the mutually beneficial link between human expertise and AI capabilities. While AI can automate processes and offer insightful data, human judgment and subject-matter expertise are still essential. The advantages of AI in SPM can be maximized by effective collaboration between AI technologies and human project managers.

C. Future Scope

The study of AI in SPM is ready for more development and investigation in a number of areas:

- **Guidelines for AI Adoption:** It is critical to develop policies and best practices for businesses intending to implement AI in SPM. This includes taking ethical, legal, and responsible AI use into account.
- **Expanding the use of AI in risk management inside SPM is AI-Driven project risk management.** AI can assist in identifying potential dangers, forecasting their effects, and proposing mitigating measures.
- **More empirical research should be done to confirm the efficiency of AI in actual SPM scenarios.** This will show demonstrably how AI affects a project's success.

- **AI-Enhanced Collaboration:** Investigating AI-driven collaboration technologies that improve communication and teamwork, particularly while working remotely or in distributed teams.
- **Investigating how AI may help with project closure,** including automating documentation, collecting lessons learned, and enabling a smooth transition to maintenance and support.
- **Addressing the governance and legal issues raised by AI in SPM,** particularly those relating to data security and privacy.
- **AI for SMEs:** Investigating how AI might be adapted to the unique requirements and limitations of SMEs working on software development projects.
- **AI-Enhanced Decision help:** Developing AI algorithms to offer project managers more complex decision help, such as scenario analysis and optimization.
- **A roadmap for progress is provided through the creation of AI Maturity Models,** which evaluate an organization's readiness and maturity level for using AI in SPM.
- **Examining how AI might be incorporated into hybrid project management strategies that include aspects of Agile, Waterfall, and other systems.**

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Appendix

Python code for Entity relationship

```
import networkx as nx
import matplotlib.pyplot as plt
```

Create a directed graph

```
G = nx.DiGraph()
```

Define the entities (People/Authors, Dates, Topics/Concepts)

```
people_and_authors = [
```

```
"Taboada", "Daneshpajouh", "Toledo", "De Vass",
"Levitt", "Kunz", "El Khatib", "Al Falasi", "Munir",
"Auth", "Jöhkn", "Wiecha", "Dam", "Tran", "Grundy",
"Ghose", "Kamei", "Taylor", "Alshaikhi", "Khayyat",
"Skinner", "Holzmänn", "Zitter", "Peshkess",
"Fridgeirsson", "Ingason", "Jónasson", "Jónsdóttir",
"Ong", "Uddin", "Zeiner-Gundersen", "Polonevych",
"Sribna", "Mykolaychuk", "Tkalenko", "Shkapa",
"Prifti", "Kunnathur", "Mishra", "Tripathi", "Khazanchi",
"Auth", "Jokisch", "Dürk", "Hofmann",
"Jöhkn", "Protschky", "Urbach", "Rathod", "Sonawane",
"Gupta", "Skinner (UK)", "Skinner (2019)",
"Nemati", "Todd", "Brown", "Ozgur", "Tarhan",
"Komeshli", "Tecim", "Bahroun", "Tanash", "As'ad",
"Alnajjar"
]
```

```
dates = ["1987", "2021", "2022", "2023", "2030", "2002",
"2025"]
```

```
topics_and_concepts = [
```

```
"AI in Project Management", "Advantages of AI in Project
Management", "AI's Impact on Project Management
Domains",
"Challenges and Opportunities in AI for Project
Management", "AI and Human Expertise",
"AI's Role in Project Progress Tracking", "Global AI
Software Market", "Historical Data and AI in Project
Management",
"AI's Role in Project Management in the United
Kingdom", "AI Integration in Project Management",
"Economic landscape", "Project estimate validation",
"Quality prediction of deliverables", "Educational contexts"
]
```

Add nodes for each entity

```
G.add_nodes_from(people_and_authors,
entity_type="Person/Author")
```

```
G.add_nodes_from(dates, entity_type="Date")
```

```
G.add_nodes_from(topics_and_concepts,
entity_type="Topic/Concept")
```

Define relationships between entities

```
relationships = [
```

```
("Taboada", "AI in Project Management"),
("Daneshpajouh", "AI in Project Management"),
("Toledo", "AI in Project Management"),
("De Vass", "AI in Project Management"),
# ... (add more relationships as needed)
]
```

Add relationships to the graph

```
G.add_edges_from(relationships)
```

Create a layout for the nodes

```
layout = nx.spring_layout(G)
```

Draw the nodes with different colors based on entity type

```
node_colors = {
    "Person/Author": "lightblue",
    "Date": "lightgreen",
    "Topic/Concept": "lightcoral",
}
```



```
colors = [node_colors[G.nodes[node]["entity_type"]] for
node in G.nodes]

# Draw the graph
plt.figure(figsize=(12, 12))
nx.draw(G, pos=layout, with_labels=True,
node_color=colors, node_size=3000, font_size=10)
plt.title("Entity Relationship Diagram")
plt.show()
```