“Enhancing Project Risk Management Through Ai-Driven Predictive Analytics: A Comparative Analysis with Traditional Methods”

Abstract

This paper examines the application of AI-based predictive analytics in risk management in projects, their effectiveness in comparison to the conventional approaches to risk management, including SWOT analysis and Risk Breakdown Structure (RBS). This paper discusses the challenges, possibilities and strategies that apply to the introduction of AI tools in project risk management through qualitative interviews with the project managers in the construction, IT and manufacturing industries. The results indicate that AI systems, like IBM Watson and Microsoft Azure, have substantial benefits of detecting and forecasting risks real-time, which contributes to the efficiency of the decision-making process and operations. Nevertheless, the work also states a number of barriers to AI implementation, such as the quality of the data, integration of old systems, and organisational resistance to change. Nevertheless, despite these obstacles, AI-based tools have been identified to have a performance advantage over traditional ones in operational risk forecasting, but the traditional approaches are also useful in strategic risk management. The research comes up with a conclusion that a hybrid models a combination of AI and the conventional ones is an all-encompassing solution to the problem of project risk management. Practical suggestions to practitioners and prospects of future research are also addressed in order to enhance the effective adoption of AI in project management practises.

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CHAPTER 1: INTRODUCTION

1.1 Background of the Study

The growing complexity of world supply chains, introducing new means of control, and the large range of stakeholders have intensified doubts and risks of projects to a great extent (Taheri Khosrow, 2024). Consequently, risk management is now more than ever a crucial factor. There was a heavy reliance on previous strategies in the industries, especially taking SWOT analysis and Risk Breakdown Structure (RBS), which primarily were based on qualitative opinions and past information. Nonetheless, these traditional tools are not effective in the current fast-evolving and dynamic environments whereby technological progress, market dynamics, and dynamic alliance continue posing new risks that cannot be effectively tackled by the traditional approach. Therefore, more dynamic, creative risk management solutions are required by industries particularly those in other sectors such as IT and construction.

Technologies in artificial intelligence (AI), especially machine learning algorithms and predictive analytics are altering the process of project risk management by detecting complex risk patterns that more traditional approaches may overlook (Javaid, 2024). Artificial intelligence tools like IBM Watson or Microsoft Azure ML are able to analyze large volumes of data in real time to help perform risk measurement more effectively and promptly. Removing the biases that are inherent to a manual assessment, AI promotes decision-making upon the basis of the data-driven insights, thereby contributing to the overall efficiency of the project risk management (Hannemann, 2024). Regardless of the possible potential of AI in theory, there is still a knowledge gap in terms of empirical studies on its use on real-world projects and its comparison with the traditional approaches to use in practice. Not many studies have analyzed the application of AI tools by project managers to the current risk management systems and the daily challenges and advantages related to this application (Diameh et al., 2025).

The given research is especially timely in the light of the current digital transformation in all types of industries, as well as in the context of the increased risk management strategies in the post-COVID project delivery setting. With industries like IT and construction coming under a lot of pressure to achieve sustainability goals, AI-based solutions are more efficient and adaptive in risk management, thereby enhancing the project results worldwide. The project managers, especially in the field of IT and construction, interested in the implementation of AI in risk management, are

the target audience of the proposed study. The study is internationally applicable, as it provides information about AI efficiency in different industries, and the needs to examine those that undergo fast shifts.

1.2 Research Problem

Despite the acknowledged potential of AI in transforming project risk management, its practical application among project managers remains limited due to gaps in understanding and implementation frameworks. Despite not being able to handle the challenges presented by today's project environments, companies still lean on time-honoured techniques for risk management (Diameh et al., 2025). The gap between what AI can accomplish and how well it is put into practise by managers makes the effectiveness of AI tools for mitigating risks and improving projects somewhat uncertain. Literature currently shows that there is not much qualitative research about what project managers face when adopting AI. Some of the major documented problems are bad data and separation which reduce how precisely AI systems predict results. Also, many project professionals do not have enough knowledge in AI and machine learning, so its benefits are hard to enjoy (Hannemann, 2024). The expensive process of buying, setting up, training and recruiting the right talent for AI is challenging for companies of any size. Few pieces of research have systematically understood how these various obstacles shape the approach companies take to use AI in their risk management projects (Foster et al., 2021). It is vital to deal with these gaps to ensure project managers use strong support plans that reduce obstacles to adoption, let them forecast risks precisely, make decisions based on data and enhance the accuracy of outcomes for various projects.

1.3 Research Aim and Objectives

To critically investigate how project managers in the UK construction sector integrate AI-driven predictive analytics into risk management processes, and to identify the key organisational, technological, and behavioural challenges compared with traditional techniques.

- To examine the current level of AI adoption and predictive analytics use in project risk management within the UK construction industry.
- To identify organisational, technological, and human factors influencing the adoption of AI-driven tools.

- To compare the perceived and actual effectiveness of AI-driven risk management techniques with traditional approaches.
- To develop recommendations for improving project managers' capabilities in applying predictive analytics for proactive risk management.

1.4 Research **Questions**

RQ 1: How do project managers in the UK construction sector perceive and integrate AI-driven predictive analytics in project risk management, and what key barriers influence its implementation compared with traditional methods?

1.5 Significance of the Study

This study offers original qualitative insights into how project managers put AI-driven predictive analytics into their practise of managing project risks. The study improves existing theories about technology experimentation in risk management by highlighting how people use these technologies in practise (Boinapalli, 2023). It connects the discussion on AI strengths, the processes involved in organisational changes and aspects of employee trust, expertise and resistance. By using this approach, the research enhances the study of the role of cutting-edge technologies in handling difficult aspects of project work, leading to a clearer view of AI's impact and challenges in tackling shifts in risks (Atkinson and Delamont, 2010). The study provides targeted, useful tips for project managers, risk advisors and strategists working on AI adoption challenges. It teaches best approaches for incorporating AI into how risks are managed, putting importance on handling data properly, assisting in change and training staff. In addition, the results inform policymakers and developers about the practical challenges users face and the needs they have in using AI, so that risk management systems can be made relevant to all (Taheri Khosroshahi, 2024). Because construction, information technology and manufacturing are struggling with swiftly changing risk situations, this research promotes improved risk planning, regular monitoring and flexible responses needed for projects to survive and succeed in changing environments.

1.6 Scope and Delimitations

This study explores three key industries construction, IT and manufacturing where managing project risks is not easy and using AI is starting to happen. It investigates the use of AI-based predictive tools compared to usual risk management processes such as SWOT and RBS. This study

utilises qualitative methods by speaking with 10 to 15 project managers who both know AI and have worked with standard risk management approaches. The scope helps explore in detail how practitioners approach their tasks in many risky and important project contexts (Boinapalli, 2023). The findings may only be helpful to a particular group because the sample is not large enough. Limited accessibility may restrict what kinds of geographic and organisational diversity are available (Javaid, 2024). The analysis can be less detailed if secondary information like project documents and risk records is used only sparingly.

1.7 Structure of the Dissertation

- **Chapter 2: Critical Literature Review**

  Comprehensive review of traditional and AI-driven risk management methods, challenges in AI adoption, and identification of research gaps.

- **Chapter 3: Research Methodology**

  Explanation and justification of qualitative research design, participant selection, data collection via semi-structured interviews, and thematic analysis approach.

- **Chapter 4: Results and Discussion**

  Presentation of thematic analysis results from interviews, highlighting patterns in AI adoption strategies, challenges, and comparative insights. Interpretation of results in relation to literature, theoretical implications, and practical significance for project risk management.

- **Chapter 5: Conclusion and Recommendations**

  Summary of key findings, contributions to knowledge, practical recommendations for stakeholders, research limitations, and directions for future research.

1.8 Chapter Summary

Here, the foundation for using AI-driven predictive analytics in project risk management is developed for construction, IT and manufacturing sectors. It underlines that SWOT and Risk Breakdown Structure, traditional risk management practises, do not solve the new issues and complicated risks in modern projects very well. The research stands out for giving academic writings on technology adoption evidence and suggesting practical advice for practitioners,

policymakers and developers. This study looks at qualitative data from a group of 10–15 project managers and recognises the boundaries and limits involved. At the end, the chapter explains how the dissertation is organised to help readers follow the upcoming analysis and findings.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In this chapter, the literature on using AI-driven predictive analytics in project risk management for construction, information technology and manufacturing industries is thoroughly reviewed by Allouzi and Aljaafreh (2024). This evaluation is created to examine three research questions: how project managers use AI, what challenges they encounter and how the use of AI compared to standard risk approaches. This review is divided into three linked sections: (1) traditional risk management methods can fail in rapidly changing projects because they are based on inflexible data and assessments, (2) AI-aided predictive analytics can improve detection of risks, accuracy in predictions and quick decision-making in projects and (3) still, people are debating whether AI is actually better than traditional techniques in terms of smoothly fitting into organisations and achieving solid outcomes (Arinze et al., 2024). The absence of relevant primary research on project managers and AI is clearly emphasised by the literature, indicating the need for this research. At the end of the chapter, specific steps for guiding future research and the type of qualitative method used are discussed. The way the topics are laid out aids in analysing the main issues shaping the use of AI in project risk management.

2.2 Theoretical Framework

By using combined project risk management theories and models for adopting technology, this research analyses the link between AI and risk management practises (Thirumagal et al., 2024). The RBS and SWOT analysis provide well-structured ways to identify and categorise risks. RBS allows managers to cheque different risk categories one by one, while a SWOT analysis addresses both risks within the organisation and those originate externally (Sundaramurthy et al., 2022). Put simply, today's dynamic project settings show these techniques to be increasingly less effective. Because they work with fixed, old data and the opinions of experts, they have trouble responding to new and complicated dangers in the construction, IT and manufacturing industries. Therefore, these models work best where changing conditions are not a priority and predictions require detailed attention. Traditional methods of detecting and managing risks are improved by AI which looks at data in real time to help better identify and manage risks (Nguyen &Vo, 2024). An RBS framework is provided which AI systems then develop further by learning continuously and spotting patterns automatically to deal with flaws in fixed models.

To make sense of AI adoption, this analysis uses widely accepted theories about technology adoption. According to TAM, how useful and easy-to-use an AI platform looks to project managers is a key reason they choose to use it. Because AI is complicated and novel, the way people see it shapes how widely it is adopted. In addition, Diffusion of Innovation Theory highlights that using AI technologies in organisations grows if companies are ready, have clear communication methods and look at innovation characteristics including whether the tech fits and is simple to test (Kiani, 2024). Integrating AI with a company's culture, how things are done and the staff's skills is crucial for AI to fulfil what it promises. Overall, AI integration is understood in these theoretical models as involving technology, human behaviours and company practises. By using this framework, researchers study the influence of managers' views, an organisation's preparation and technical opportunities on the use of AI in risk management of projects. Using qualitative methods, the research explores how project managers respond to these factors within currently used risk management processes.

2.3 Review of Relevant Studies

In this section, relevant studies are evaluated and grouped by the research aims to confirm their thematic compatibility (Chhikara et al., 2025). It summarises current approaches to integrating AI, discusses the difficulties of implementation and assesses how proof of AI can measure up to earlier methods of managing risk, forming the basis for the study's main analysis.

Risk management in various industries (construction, information technology (IT), and manufacturing) is undergoing changes in the form of AI-based predictive analytics (Kiani, 2024). These sectors show that effective AI adoption strategies in project management should consider the interaction of technology, organisational structure, and human factors to deal with issues. The key to this success lies with organisation preparedness that requires a strong leadership structure, an overall vision and strategies to cope with change. The research of Enemosah (2025) discovered that the companies that designed properly organised AI integration plans (pilot projects supporting their human resource and including their workforce) reported less opposition to the AI integration. This will promote experimentation and thus the employees will learn and adapt and overcome the challenges that will emerge during the implementation of AI. Moreover, it is necessary to implement AI in a more comprehensive digital transformation framework. According to Goyal (2023), in cases where the AI is implemented as a part and parcel of the overall digital innovation

initiative of the organisation, it receives executive support, gets the required funding, and creates the cross-departmental collaboration, especially in the manufacturing setting, which requires coordination. This comprehensive strategy helps to make AI not a single tool but the centre of its strategic model of the organisation, which provides an opportunity to contribute to the long-term success.

Simultaneously with the organisational support, acquisition of the corresponding skills through training is the most important thing. As Otoko (2023) claims, IT project managers frequently use such platforms as IBM Watson and Microsoft Azure ML to incorporate AI into their projects. Nevertheless, these platforms require thorough knowledge of data handling and have been exposed to the threats that will occur in the execution of the project. As Badmus (2023) points out, it is important to build trust in AI predictions and secure their application, and it is best done through continuous training, starting with core workshops and furthering to professional development courses and team learning activities. The inability to utilise AI tools without proper training means that their potential and benefits are underestimated and exploited, leading to ineffectiveness and increasing opposition to its use (Badmus et al., 2024).

The other important aspect that is critical to the success of AI is incorporation of effective data management systems. In production, such as the case with manufacturing, companies have started to create hybrid data infrastructures, which unite sensor data, past project records, and market analytics, thus enabling organisations to predict risks better and promptly update (Kiani, 2024). There are however a few critical barriers. Data silos, inconsistent data practises, inadequate data quality, and lack of credibility in AI models render the application of AI models in organisations challenging because organisations cannot completely trust AI-based insights. According to the authors, effective companies using AI have made the main focus of their AI integration efforts to ensure good data governance, which guarantees consistency and accuracy in data to the AI systems. Nevertheless, the issue of these frameworks still remains in many organisations and decreases the confidence of managers towards AI and delays the general adoption process. There continues to be a strong preference among project managers to utilise hybrid models that involve the use of AI and conventional risk management models, including Risk Breakdown Structures (RBS) and SWOT analysis.

Although AI might have a promising future as an early risk recognizer and predictor, project managers still use their own judgement and traditional approaches to interpret risks, involve stakeholders, and find solutions with them (Nenni et al., 2024). According to Goyal (2023), a combination of eye-opening technologies and human interpretation is essential when raising the question of the unclear processes of opaque AI decision making. This will assist in winning the trust of the stakeholders and guarantee the sustainability of AI implementation. The literature however indicates that the consequences of adoption of AI differ greatly among organisations. Sundaramurthy et al. (2022) point out that the factors that determine the success of AI adoption include organisational culture, practises of the management, resources at hand, and the nature of the projects targeted. An example is that there might be organisations that are not eager to embrace AI although they possess the required technology because of fear of change and taking risks. Conversely, companies that appreciate flexibility and innovation have a higher likelihood of adopting AI as they appreciate the innovativeness and ability to develop.

Formal organisational structures and social and cultural factors are of vital importance in influencing the adoption of AI. According to the authors, the conventional adoption paradigms tend to disregard the human factor, namely, the everyday lives of project managers who have to navigate the process of AI implementation with their teams (Badmus et al., 2024). The origin of resistance to change does not necessarily lie in the ignorance; in other situations, it may be a fear of job loss, disempowerment, or even ethical issues. Thus, the AI adoption strategy should not ignore these issues, and the adoption of AI should be viewed as an empowering and collective process instead of a disruptive threat (Bushuyev et al., 2024). Moreover, with the speed of the AI development, the organisations have to be quick in adjusting their strategies to be in line with the technological possibilities and changing organisational demands. The rigid adoption systems that pay much attention to the technical and organisational components are unable to work in this dynamic environment.

To sum up, the implementation of AI-based predictive analytics can be of great use in the context of risk management, but the process must be approached as multifactorial and specific attention should be paid to the organisational culture, leadership, data infrastructure, and readiness of the workforce. Project managers can overcome the issues of AI adoption complexity by using

holistic strategies that incorporate technological, organisational, and human-based approaches and attain sustainable success.

2.3.2 Objective 2: Examine key challenges faced by project managers integrating AI-driven risk management

Project managers working in the construction, information technology (IT), and manufacturing industries are faced with a range of complicated issues in their endeavours of integrating AI-based predictive analytics in project risk management (Arinze et al., 2024). These issues cut across technical, organisational, financial, and socio-cultural fronts and tend to act simultaneously to slow down development, especially in sectors like the uptake of blockchain.

One of the major technical barriers is making data that is utilised in AI systems reliable and available. The accurate, complete, and reliable data used in AI models need massive amounts of data to produce effective risk predictions. In certain industries, however, such as construction and manufacturing, data has been dispersed in different systems, including sensors, scheduling software, vendor software, and financial departments, which form silos (Chhikara et al., 2025). The fragmented data environment leads to inconsistencies, as old software and different data formats make the work of the AI model even harder. Due to this, much effort should be focused on data cleaning and integration, which may slow down AI implementation and reduce the belief in the accuracy of its forecasts. According to Enemosah (2025), the further integration of AI and the increased confidence in the forecasts provided by the data is smoother in organisations with a strong data governance framework, and not all construction teams possess the requisite expertise in AI and machine learning (Thirumagal et al., 2024).

Besides, AI preparation among project managers has a gap that further exacerbates the situation. Most project managers are not well acquainted with AI tools, which prevents the interpretation of AI outputs and how to properly manage AI-driven tasks. To address this void, organisations often turn towards external consultants which is a costly strategy that restricts the knowledge sharing and collaboration amongst teams within an organisation. Although training is usual, their focus is usually on skills rather than applications in managing risks, which results in a poor utilisation of AI tools (Enemosah, 2025). Badmus et al. (2024a) also claim that AI tools are not utilised to the fullest extent, which minimises the expected benefits. To have an effective

adoption of AI, project managers need to engage in interactive and long-term learning activities (e.g. workshops and development events) to build engagement and trust towards the technology.

Another severe obstacle is financial issues, especially regarding small and medium-sized enterprises (SMEs). Besides the significant initial capital investment of AI software and infrastructure, SMEs will also have to deal with the continual expenses on the staff training, system maintenance, and AI knowledge (Arinze et al., 2024). These high costs make most SMEs unable to cope with the development of AI, making them technologically behind. The financial riskiness of the delayed nature of the return on investment (ROI) that is commonly linked to AI projects contributes to financial caution, resulting in hesitation and, in most instances, the termination of the project (Nguyen and Vo, 2024). The fear of losing a job is the other cause of resistance to change besides financial strain. Project managers who embrace a conventional approach to risk management can also consider AI a challenge to their position, which will delay its uptake. This problem is exacerbated by slow decision-making which is based in a culture that does not tolerate risk, leading to stifled innovation and reticence in adopting solutions driven by AI.

Technical and financial problems are connected with cultural resistance and form a chain of reluctance. The unwillingness of project managers and employees to interact with training and technological improvements might be linked to the doubt about the usefulness of AI and the changes it may introduce to their functions. To reduce this, Thirumagal et al. (2024) suggest considering the end-users in a decision-making process as far as selecting AI tools are considered, effectively communicating the advantages and the drawbacks of AI, and ensuring high executive support. These plans are capable of building trust within the stakeholders and facilitating the integration process. Nevertheless, the issue of trust is rather an important barrier, particularly when it comes to the black box nature of AI systems. Project managers and other stakeholders will not be able to adequately comprehend the reasoning behind AI-generated risk evaluation because the process of AI-based decisions is obscured (Allouzi and Aljaafreh, 2024). The issue of access to the data, algorithmical bias, and the moral issues of automated decision-making also make AI implementation more complex (Nenni et al., 2024). The ethical application of AI in risk management requires that these ethical concerns are addressed using good governance and efforts to reduce discrimination.

Even though there is scarce empirical literature on these subjects, the available literature brings out important insights. Badmus et al. (2024a) note that the absence of project managers involvement in the decision-making process of AI and the training programme being too technical often contribute to the resistance to AI in manufacturing. To eliminate such obstacles, AI developers and end-users should engage in close collaboration, which will help them make sure that the technology will address user requirements, facilitate interaction, and be implemented in practise successfully.

To conclude, AI-based predictive analytics have a great potential in improving risk management, but their application to project management is fraught with a variety of challenges. It is necessary to overcome technical, organisational, financial, and cultural barriers by adopting a complex strategy, which will include a powerful data governance system, extensive training, funding, and attention to the ethical aspects. It is the only way that project managers can use the power of AI fully to reduce the risks and facilitate the future success of the project..

2.3.3 Objective 3: Compare effectiveness of AI-driven predictive analytics with traditional risk management methods

The efficiency of AI-based predictive analytics in project risk management has been extensively researched, and researchers have analysed critical factors such as the accuracy of prediction, the speed at which risks are detected, the ability to adapt to evolving circumstances, and cost-effectiveness (Badmus, 2023b). A general agreement among the research states that AI-driven approaches provide a better solution to the traditional ones, including Risk Breakdown Structures (RBS) and SWOT analysis across a range of risk management tasks. Precisely, machine learning, such as presented by Kiani (2024) in construction projects, can establish risk interdependencies, which according to Kiani (2024) is a domain where conventional methods, which are highly based on historical data and human judgments, fail to deliver on their promises. On the same note, Nenni et al. (2024) suggest that AI systems, with the provision of real-time lessons of the production chain, can help manufacturers to detect and address risks at a much earlier stage, and improve the overall efficiency of risk management.

Among the main strengths of AI compared to conventional risk management approaches, there is the possibility to analyse a vast amount of data and offer a full-time, real-time monitoring of risks. Recent examples of platforms, as IBM Watson and Microsoft Azure ML, will give instant

access to project managers to identify upcoming risks (Hasan, 2024). This real-time feature enables rapid changes in dynamic sectors such as IT that have rapid dynamics of a project. Nonetheless, Hannemann (2024) warns that excessive reliance on AI-based alerts without the human interpretation can result in the so-called alert fatigue, when important signals are disregarded or misunderstood. Conventional approaches, that usually rely on predetermined criteria and recommendations by professionals, are more susceptible to progress in the rapidly changing environment, as they are not as prone to the abrupt alteration of the conditions of the project (Javaid, 2024). Conversely, AI-based models are constantly updated and modified as new information is added to them, which appears to be more adaptable to changing conditions.

Although these benefits are present, Bushuyev et al. (2024) emphasise that the success of AI models depends on the high quality of data and the ability to update the models on a regular basis. The constant need may be an overwhelming issue to most organisations particularly in less-developed data management sectors. The choice of the cost-effectiveness of AI implementation remains complicated. Although preliminary costs of AI technology may be enormous, especially in the construction sector, the research indicates that the expenses are compensated by the long-term gains, including minimised risk exposure, less rework, and enhanced project results (Erinjogunola et al., 2025). The same thing has happened in manufacturing companies where fewer product defects and delays have been experienced since the introduction of AI. Nevertheless, SMEs may not readily see the need to go to great lengths to cover the initial and current costs of installing AI technology to justify the expenditure (Foster et al., 2021). This is more complicated by the hidden costs of cost maintenance and updating AI systems.

Along with cost and technical-related issues, AI has an influence on decision-making and interaction with stakeholders. According to Yazdi et al. (2024), despite the fact that AI offers data-based insights, the project manager still needs to use his judgement to interpret the results. Such a partnering strategy enables teams to optimise AI forecasts, which enhances communication and mutual risk perception between stakeholders. Nevertheless, one of the notable tendencies in the literature is that AI methods can be most effective when used in combination with other conventional risk management strategies (Javaid, 2024). Given that artificial intelligence has the potential to greatly enhance the critical thinking of project managers, they can utilise the power of

analytics and the current processes to ensure that AI is used to enhance skills instead of displace them.

Although the research on the use of AI in project management is growing, it is important to note that there is still a significant gap in knowledge regarding the experience and management on the ground of AI and traditional risk management approaches. Individual studies, as noted by Bushuyev et al. (2024), have put a lot of emphasis on the technical efficiency or cost-efficiency of AI models, without paying much attention to social and psychological aspects that shape the way AI models are embraced and used. As an illustration, the effect of organisational culture and beliefs of users on the use and acceptance of AI is under-explored (Hannemann, 2024). The future studies should thus focus on the larger human and organisational factors concerning the AI adoption as a factor that should not be isolated to ensure successful risk management results.

To sum up, despite the obvious benefits of AI-based predictive analytics compared to conventional risk management solutions in terms of speed, accuracy, and flexibility, the issue of data quality, cost, and human factors should be considered to implement it successfully. It seems that the fusion of AI and the current risk management systems is the best step that will combine the advantages of two methods and maximise the project risk management..

2.4 Literature Gap

Critical analysis of existing research findings demonstrates the limitations in the existing knowledge of the AI-based predictive analytics in project risk management. Although the past studies mostly concentrate on the numerical accuracy, cost analysis, and performance indicators (Boinapalli, 2023), the studies do not pay enough attention to practical issues that project managers might have to face regarding the implementation of AI (Hannemann, 2024). In particular, social, organisational, and behavioural elements of implementing AI have not been studied, especially with regard to trust, resistance, and skill development. Although the technological frameworks and cost analysis have been extensively covered, the human aspect of the matter, including the way project managers overcome the obstacles and gain skills in the field of AI usage, have not been fully investigated (Bushuyev et al., 2024).

Additionally, little has been done to understand how AI-based methods used in predictive analytics can co-exist with the traditional risk management methods. The fast-paced industries of the construction and IT industry require further research into the role of the integration of these

concepts to support the dynamism of risk in the complex projects (Yazdi et al., 2024). The common adoption models also do not consider any vital organisational aspects such as managerial attitudes, cultural influences, decision-making style, and staff competencies, which are essential factors in successful AI adoption (Savio and Ali, 2023). The resulting gap suggests that the research that is able to evaluate the technical, economic facets of AI and also focus on the social, cultural, and organisational dynamics of AI adoption is necessary. Through the interviews, the project managers in major industries will help address these gaps as the study will provide information on what can determine the adoption of AI and eventually improve the risk management practises of various industries.

2.5 Empirical Framework

2.5.1 Research Questions Development

Referring to the theory and analysis from prior research, the study creates focused research questions to inspect the use of AI-driven predictive analytics in project risk management for managers. They respond to the main findings of previous research concerning practical issues and challenges. Firstly, the study asks:

RQ: "How do project managers adopt AI-driven predictive analytics for project risk management?"

It looks into what approaches are taken, what organisational elements influence adoption and how decisions are made. It understands adoption as having many aspects influenced by technology and how organisations work.

Secondly, it inquires:

RQ: "What are the main challenges and barriers project managers face during AI adoption?"

This question aims to identify concrete obstacles including data quality problems, lack of AI expertise, financial constraints, resistance to change, and ethical or trust issues. Emphasis is placed on understanding these barriers as experienced in practice, providing nuanced insights beyond theoretical assumptions.

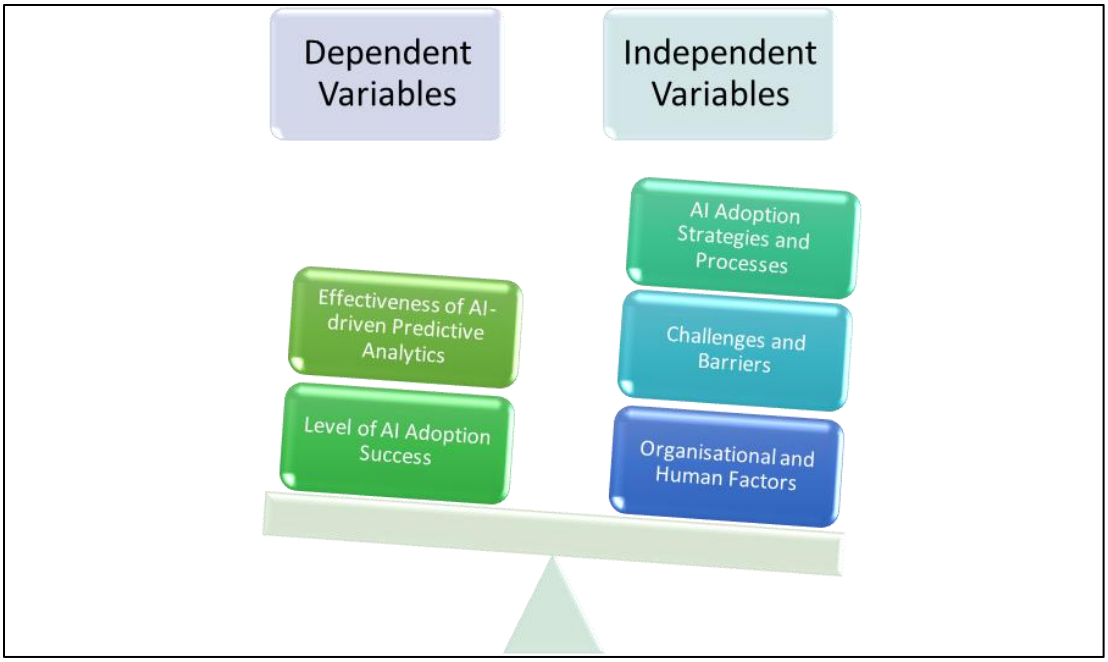
Finally, the study investigates:

RQ: "How does the effectiveness of AI-driven predictive analytics compare with traditional risk management methods from project managers' perspectives?"

It seeks to know about the experienced pros and cons, looking at what matters to people in addition to statistical results.

2.5.2 Variables Definition and Measurement

This research uses a qualitative process to understand the main factors behind the use of AI predictive analytics in project risk management. Researchers achieve measurements by analysing interview responses for meaning, rather than just counting things off. AI-driven Predictive Analytics Adoption describes the various methods, approaches and technologies that team leaders use to add AI to their risk workflows (Allouzi and Aljaafreh, 2024). This requires pilot testing artificial intelligence solutions, interacting with stakeholders, setting up training programmes and using IBM Watson or Azure ML. Research considers adoption to be a flexible process that changes with an organisation's environment and industry routines. The second variable, Challenges and Barriers, involves technical concerns such as poor data quality, not having enough information and difficulties combining systems; problems with people's skills and hesitancy to accept changes; and financial difficulties and ethical concerns for the organisation (Boinapalli, 2023). Explicit hurdles (lack of training) as well as implicit challenges (unspoken doubt) are found by reviewing the data during coding. Effectiveness includes project managers' perceptions that AI leads to better identification of risks, more accurate assessment of risks, decreased expenses and better decision making. It looks at and addresses the real restraints and challenges raised by those concerned.



2.6 Chapter Summary

Detailed knowledge has been shared in this review showing how AI-assisted predictive analytics excel over traditional qualitative techniques when applied in project risk management. It proves that AI helps organisations predict risks more precisely, quickly and easily by also pointing out notable issues such as the presence of data silos, short supply of qualified personnel and high costs, together with opposition from some organisations to change. The paper also underlines the advantages of mixing AI with standard approaches which supports more complete and useful efforts to manage risks. The combination of connecting risk management theories and technology adoption models and the areas where research is lacking, explains why the study used primary qualitative methods. It is important for recognising the social and technical elements behind AI adoption which quantitative studies often miss in managerial situations. By being closely related to the research goals, this chapter establishes a stable starting point for understanding how project managers respond to challenges of AI adoption. As a result, Chapter 3 details a qualitative research strategy that uses semi-structured interviews to gather clear, meaningful information to fill the gaps and answer the questions.

CHAPTER 03: RESEARCH METHODOLOGY

3.1 Research Approach

Reaching the main research question, this study uses qualitative research to examine how project managers apply AI-based predictive analytics to risk management and what difficulties they encounter compared to beforehand practises (Atkinson and Delamont, 2010). In agreement with Chapter 1, industries such as construction, IT and manufacturing deal with rising project risks and this research aims to investigate how AI-based predictive analytics are included in present risk management systems. Qualitative methods help a lot with this research as they reveal the different challenges and strategies behind using AI and applying it to common tools like SWOT analysis and Risk Breakdown Structure (RBS) which are detailed in Chapter 2. Even though many people still rely on traditional techniques, they often fail to deal with the fast-changing dangers in modern tasks. Adopting qualitative methods allows this work to offer useful details about how AI is used, why it fails or succeeds and what obstacles project managers encounter (Balnaves and Caputi, 2001). Using this approach supports the study's main idea which is to evaluate AI methods and conventional approaches by interviewing professionals while they are doing their jobs. By doing qualitative inquiry, the study will discover the general effects of using AI and will help add to knowledge about technology in project risk management.

3.2 Data Collection Methods

Semi-structured interviews will be used to gather data since this method is flexible enough to explore the different and complex aspects of AI in managing project risks. The researcher will be able to pay close attention to specific issues, ideas or plans while still having similar and structured meetings with all interviewees.

Rationale for Semi-Structured Interviews

Described in Chapter 2, literature exploring how AI is used in risk management is not extensive, especially in terms of case studies looking at the problems and successes with AI in practise. Using semi-structured interviews, the researcher can change some questions in order to fit what each person shares, but still talk about the main themes of the research. Thanks to this method, the study acquires useful and detailed information, allowing it to understand the struggles of using AI in standard risk management.

Interview Structure

You should expect the interviews to take around 45 to 60 minutes and they will focus on important topics related to the research questions and objectives. The storey explores the following topics:

- Integration Challenges: Questions in this theme will focus on understanding the obstacles project managers face in integrating AI tools with existing risk management frameworks.
- Comparison with Traditional Methods: Participants will be asked to compare the effectiveness of AI-driven methods (e.g., machine learning, regression models) against traditional methods like RBS and SWOT in terms of predicting and managing project risks.
- Adaptation to AI: This theme will explore the strategies used by project managers to adopt AI technologies, including training, organizational change, and overcoming resistance to change.
- Perceived Benefits: Questions will focus on the perceived advantages of using AI in risk management, such as improved forecasting accuracy, efficiency, and decision-making.
- Barriers to Adoption: This theme will probe the challenges that prevent broader adoption of AI-driven tools, including issues like data quality, lack of expertise, and costs.

Method of Data Collection

If the person interested in taking part lives locally, the interview can happen in person. Otherwise, it will be done online. One person will be included in the pilot test to test the questions and whether the interview guide works correctly. This strategy will help the researcher to collect suitable data that will address the AI-related objectives in project risk management.

3.3 Sampling Strategy

The researchers will utilise purposive sampling to choose around 10-15 project managers who are part of construction, IT and manufacturing industry. It is right to follow this sampling style which allows people to apply AI and regular risk management together, so their performance can be checked and compared.

Selection Criteria

The participants will be selected based on the following criteria, directly aligned with the research questions and objectives:

Selection Criteria	Details
Industry Experience	Project managers from industries such as construction, IT, and manufacturing. These sectors face complex project risks where AI is gaining traction in risk management, and traditional methods like RBS and SWOT are still widely used.
Experience with AI	Participants must have at least 2-3 years of experience using AI tools for project risk management to ensure they can provide practical and informed insights into the challenges and benefits of AI integration.
Project Scale	Participants will be selected from medium and large-scale projects. These projects have more complex risk profiles, making AI integration particularly beneficial. A variety of project scales will provide insights from different contexts and risk levels.

This approach makes sure that different people's opinions and experiences are included which helps the study cover all the issues, pros and methods linked to using AI in managing project risks.

3.4 Data Analysis Methods

Interview data will be analysed using thematic analysis which is a well-known method for finding, studying and reporting patterns (themes) found in the answers. Using thematic analysis, it becomes easier to look into the details and challenges of AI usage in managing project risks, based on the research questions.

Stages of Thematic Analysis

STAGE	***DESCRIPTION***
1. Familiarisation with Data	Transcribe the interview recordings verbatim and read the transcripts multiple times to gain a deeper understanding of the data. This will immerse the researcher in the data, essential for generating meaningful themes.
2. Initial Coding	Identify and code significant statements, phrases, or responses that are relevant to the research questions. This will help identify key themes

	related to integration challenges, benefits, and the comparison of AI with traditional methods (RBS and SWOT).
3. Developing Themes	Group similar codes together to form broader themes. For example, challenges such as data quality, lack of expertise, and resistance to change may form one theme, while the benefits of AI tools like improved forecasting may form another.
4. Interpretation and Comparison	Interpret the themes based on the research questions and objectives. Compare the perspectives of different project managers to explore similarities and differences, linking back to the research aim of comparing AI with traditional methods.

Thematic analysis allows the researcher to identify both expected and unexpected patterns in the data, which will provide comprehensive insights into the integration of AI in project risk management.

3.5 Ethical Considerations

This research centres on ethics to make certain that rights and privacy of the participants are secured at all times. Ethical approval from the relevant ethics committee at LJMU will be obtained and all actions taken will stick to the university's ethical standards.

Key Ethical Considerations

- Informed Consent: People will be told everything about the interview and its purpose before it takes place. The participants will get an information sheet detailing the purpose of the study, what they have to do and any possible risks. All participants will give their written agreement before they join the study. By going through the consent process, volunteers are told that they can withdraw from the study at any moment without facing any penalties.
- Confidentiality: All the information gained from the survey will not identify the participants. All people involved will be referred to by alternating names for transcription and results. All sensitive data connected to the project will be withheld to keep it private and confidential. The project will meet data protection rules and handle and store data in a secure way.
- Voluntary Participation: People are free to decide whether to take part in the study and their participation or lack of participation will not influence their professional ties. The right to drop out of the study at any moment will be highlighted for the participants.

- Data Security: All interviews are recorded and the recordings and transcripts will be kept safe and encrypted. Those involved in the research project are the researcher and supervisor; they are the only ones who can access the data.

Thanks to these ethical safeguards, people taking part in the research will be respected and their privacy will be respected in line with LJMU's research ethics guidelines.

3.6 Chapter Summary

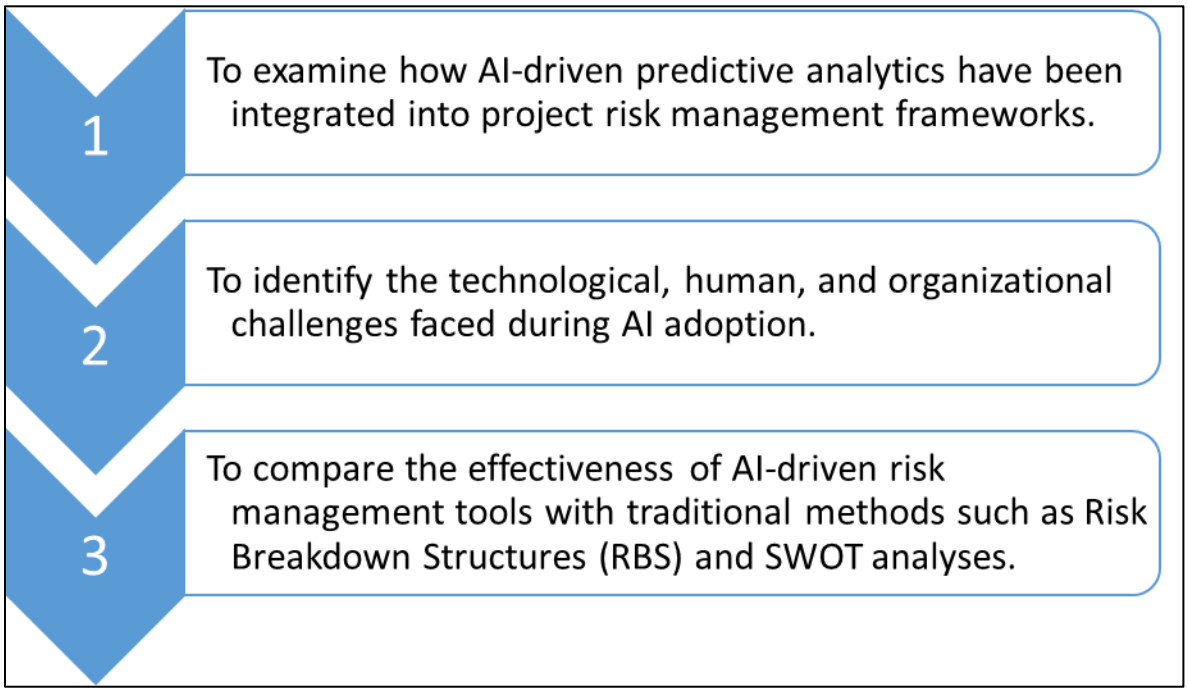
The framework offered in this methodology chapter makes sure that the study is well aligned with its aims and objectives. This researcher explores the impact of AI on project risk management by analysing interviews, making themes out of the results and using qualitative analysis. Following ethical rules and selecting appropriate participants makes it possible for the research to discover insights about AI adoption compared to old methods which is what the research sets out to achieve in Chapters 1 and 2.

CHAPTER 04: RESULTS AND DISCUSSION

4.1 Introduction to the Chapter

The present chapter reveals findings of the in-depth interviews with the practitioners in the field of project-risk management in the construction, information technology (IT), and manufacturing industries with the intention to explore the issue of integration of Artificial Intelligence (AI) in project-risk management, the challenges that the process of adoption presents, and the level of effectiveness of AI-based tools compared to the conventional ones. The respondents in the three industries mentioned that AI is being applied in terms of primarily enhancing risk-identification procedures, facilitating the way of decision-making, and streamlining risk-assessment procedures. Among the mentioned problems in the adoption of AI, such issues include access to training and expertise, cognitive biasness, and informational security and transparency issues. The findings further indicated that although AI-based tools may be handy in terms of offering substantial benefits in some of the aspects of risk management, they are not always superior to the traditional ones that are effective in most cases. Altogether, the data shows that it is a complex world in which risk management enabled by AI is a new yet required aspect of contemporary practice.

The research objectives guiding this inquiry are threefold:



These objectives are addressed through qualitative insights gathered from professionals actively engaged in risk management roles. Their experiences provide a nuanced understanding of AI's role in contemporary risk management practices.

The structure of this chapter aligns with the research questions. The subsequent sections delve into:

- **Integration of AI in Risk Management**: Analyzing how AI tools have been incorporated into existing risk management frameworks and the strategies employed for their integration.
- **Challenges and Barriers**: Talking about the complex challenges of the AI adoption, including technical, human, and organizational aspects.
- **Effectiveness Comparison**: Comparing the work of AI-based tools to conventional strategies of risk management, outlining the points of strength and weakness.

By synthesizing these findings, this chapter aims to contribute to the evolving discourse on AI's impact on project risk management, offering practical insights for professionals navigating this transformative landscape.

4.2 Overview of Interview Respondents

Industry	Years of Experience	Role
Construction	15	Senior Project Manager
IT	10	Project Manager
Manufacturing	20	Operations Manager
IT	12	Senior Risk Manager
Manufacturing	18	Project Manager
IT	8	Project Risk Manager

Construction	25	Director of Risk Management
Construction	18	Risk Management Consultant
Construction	22	Director of Risk Management
Manufacturing	20	Head of Project Risk Management

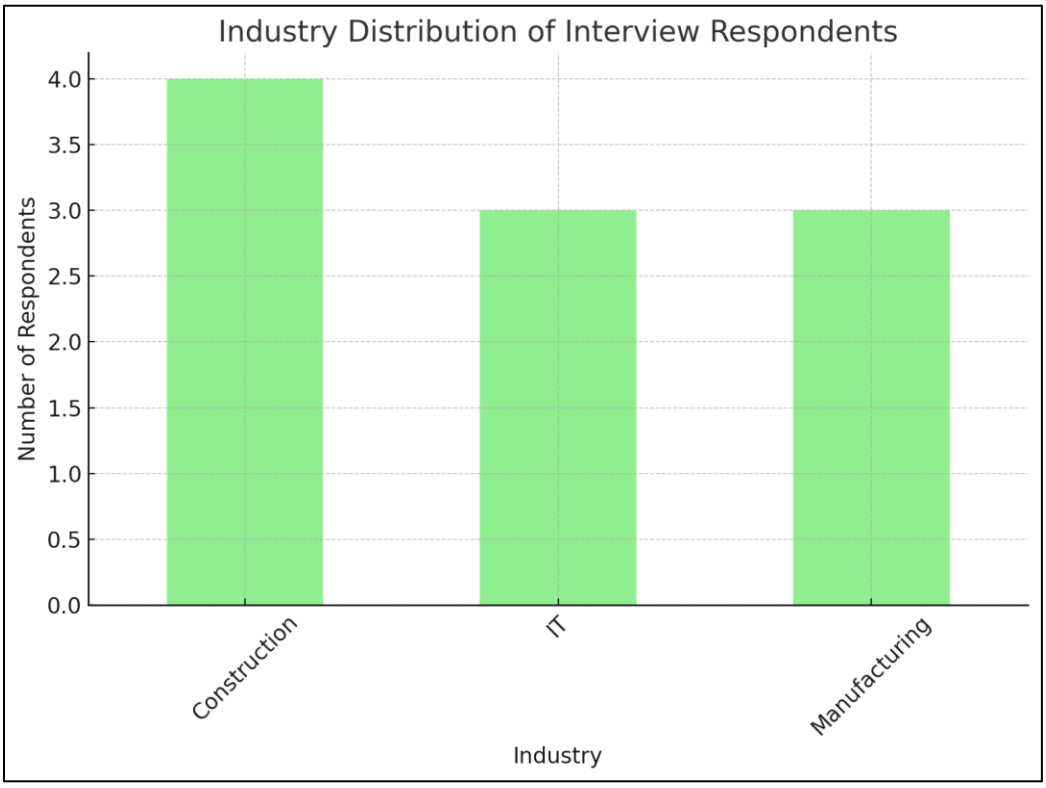
The three participants of this interview belong to three different industries, such as construction, IT, and manufacturing, their roles are different, as well as their years of experience in project risk management. The selection of the respondents was done to give a balanced view on how AI is being integrated in the risk management in various sectors.

The interviewees have different backgrounds demographically as some are professionals with a range of experience of 8 years to 25 years. They are senior positions as Senior Project Managers, Project Risk Manager and Directors of Risk Management, both at the strategic and operational level. This is a diverse experience in the profession and this is why the study will have the opportunity of capturing the tactical and managerial perspective of AI integration in risk management.

Its sampling technique was purposive sampling whereby the participants were chosen on the basis of the imminent participation in AI-based risk management tools or the vast knowledge in the traditional practices in the same areas. This selection criterion is needed to insights that are directly relevant to the research questions (especially concerning the adoption of AI, its integration problems, and its possible comparative effectiveness to conventional approaches).

The broad range of industries and the various roles of the interviewees provide a good basis to the discussion of the research questions. The fact that the study takes into consideration the insights of two different industries, technology-intensive, such as IT, and less advanced, such as

construction, makes sure that the study would have a broad view of AI in project risk management in various settings.



4.3 Presentation of Key Findings

The following section will outline the main results of the interviews of the professionals working in the sphere of construction, IT industry, and manufacturing. Findings are presented under the key themes which are related to the study question: how to integrate AI-driven predictive analytics into risk management, what challenges arise during the integration, whether AI-driven tools are more effective than traditional approaches to risk management, and what perceptions of the benefits of AI in project risk management exists.

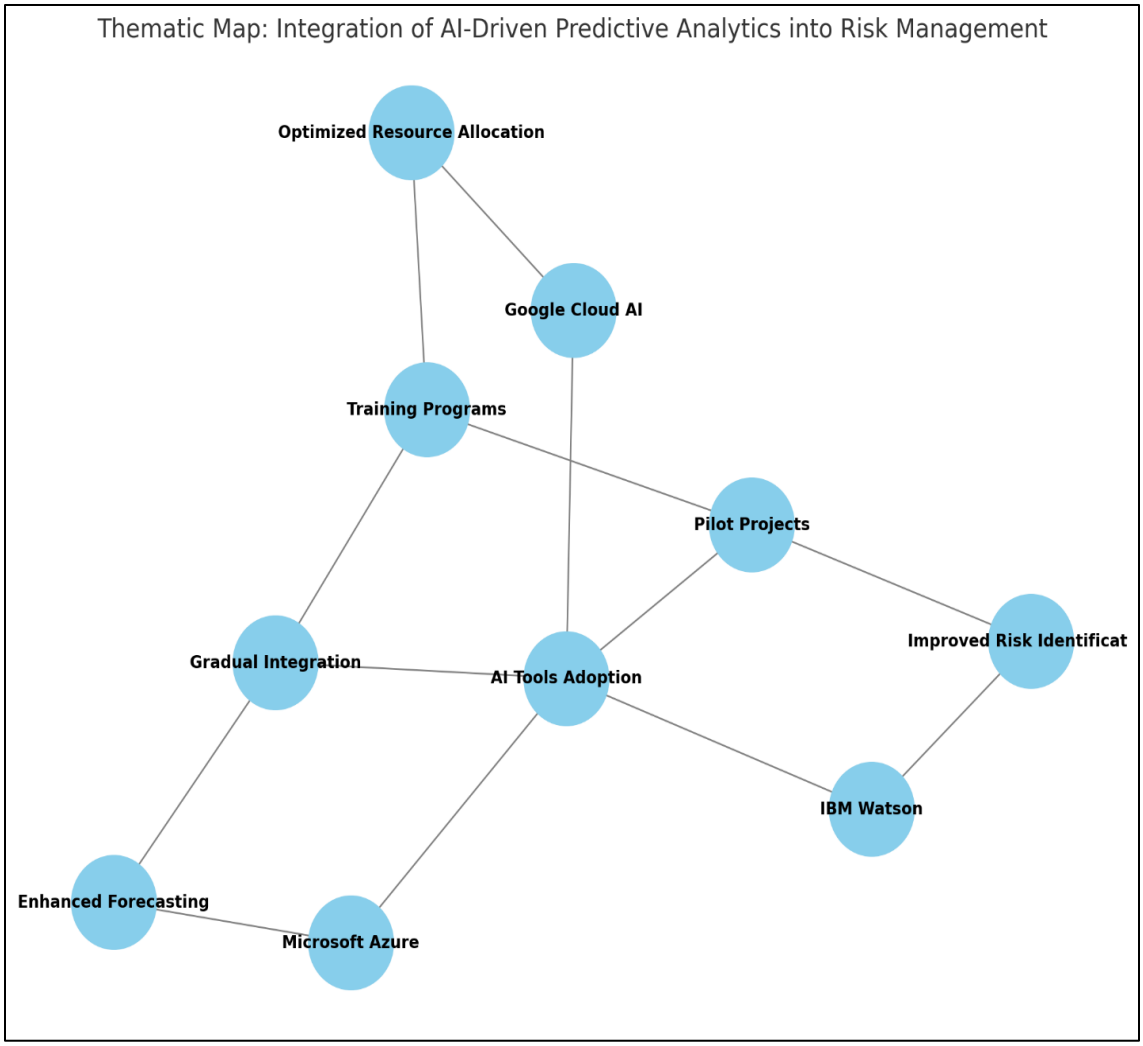
4.3.1 Integration of AI-Driven Predictive Analytics into Risk Management

The incorporation of predictive analytics with the help of AI into project risk management has become an important development in the industries under investigation. The respondents mentioned using AI devices such as IBM Watson, Microsoft Azure, and Google Cloud AI to enhance risk forecasting and decision-making processes. These tools utilize the use of big data and apply machine learning algorithms to identify patterns and predict possible risks at the highest

degree of accuracy. As an example, the cognitive abilities of IBM Watson were used by a number of respondents to anticipate the disruption of the supply chain, and the machine learning algorithms of Microsoft Azure were utilized to optimize resource distribution and reduce delays.

The interviewees talked about various modes of integration. Adoption of AI by most respondents started with pilot projects, where the AI tools would be applied on smaller and less complex projects to demonstrate their utility and scalability. The approach provided organizations with the opportunity to discover any errors of integration and to adapt the technology to it and subsequently apply it to bigger, high-risk projects. Due to pilot projects, the respondents also gave more emphasis on the role of training programs that would equip the project managers and staffs with the skills that they require to utilize AI tools. One of the respondents adds that the gradual implementation of AI tools combined with a gradual increase in their usage enabled us to define the obstacles in the initial phases and optimize our procedures.

The use of AI in the risk management processes resulted in the dramatic improvements in the field of risk identification and forecasting. The processing and analysis of real-time data were identified to be especially influential in the case of proactive risk mitigation with the use of AI. Using the example of one of the respondents, the AI models enabled the respondent to anticipate potential scheduling issues based on external factors such as weather conditions and political un-stability which could otherwise not have been predicted using the traditional models. Moreover, the ability of AI to optimise resource allocation through predicting resource shortages or bottlenecks was considered a significant benefit compared to old risk management methods. As one respondent pointed out, AI has greatly minimized the need to make decisions based on manual control and made them more strategic and data-driven."



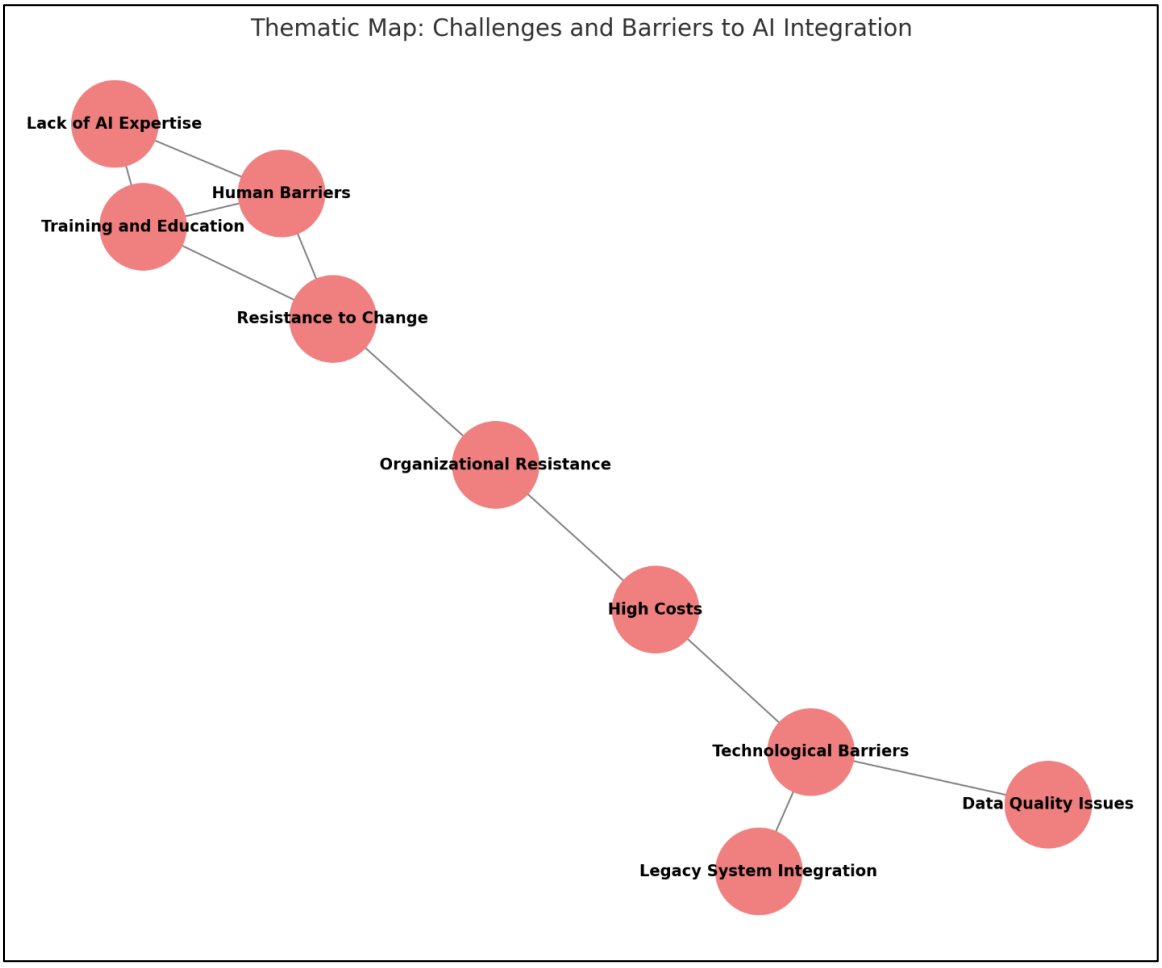
4.3.2 Challenges and Barriers to AI Integration

Even though AI has many potentials, the integration process is not without a fee. The technological barrier was also ranked among the greatest barriers. Majority of the respondents experienced certain difficulties in integrating the AI systems into their existing IT system particularly in the cases of old systems which were not aimed at supporting such complex data requirements of AI systems. According to one of the respondents, we spent a lot of time and resources to make sure that our legacy systems would work on the AI platforms. We had a more complex integration than we had originally thought.

The data quality was also a significant issue. The AI systems rely on good and precise data to work effectively. Many of the respondents revealed that poor predictions were a major issue due to poor quality of the data or disunity in the data sources which would have otherwise produced

favorable outcomes of AI integration. One IT respondent said, "One of the reasons why we needed to spend a lot of money to clean and consolidate data was to make sure that the AI tools would provide us with reliable insights.

The resistance to change was the most participated barrier on human side. Many project managers initially were not confident in AI and were not ready to rely on the findings of the machine learning models. The fact that people were not well informed about AI technologies and were afraid of job loss was often the basis of such opposition. One respondent recalled, "At first, there was a great deal of reluctance from team members. The idea of AI making decisions was unsettling for some, and we had to work hard to build trust." To eliminate this resistance, it was necessary to conduct extensive training sessions and practice constant communication to help show how AI could add value to and not overtake human decision-making. Some of the respondents expressed that the process of gradually engaging the employees in the process of integrating AI eased their fears.

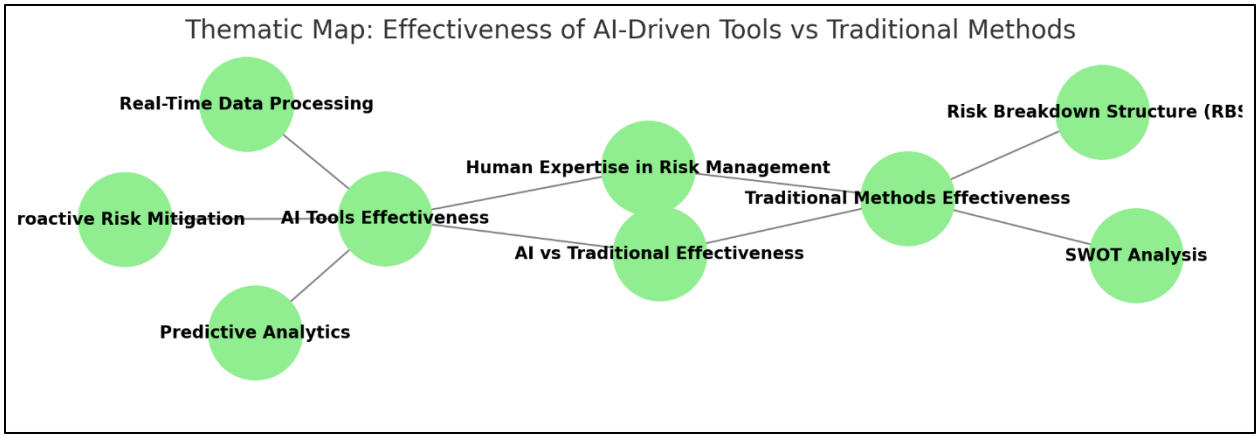


4.3.3 Effectiveness of AI-Driven Tools vs. Traditional Methods

The comparative study of AI-based tools and conventional risk management solutions showed the strengths of both approaches and a drawback of each of them. Tools based on AI, especially those that apply the machine learning algorithms, were discovered to be quite effective in terms of real-time processing of risk. Those tools would be able to examine large quantities of information in different sources, such as internal project data, external market conditions, weather forecasts, and others, and based on that information, determine risks with an accuracy level that could not be achieved in the past. As an example, the AI tools such as IBM Watson were employed to predict cost overruns, project delays by detecting the emerging risks early in the project life cycle, which permitted the corrective steps to be taken before the problems became serious. As one respondent stated, "AI's ability to predict delays before they become obvious allowed us to adjust our schedules proactively, which is something traditional methods like RBS simply can't do."

Conversely, the older techniques, like the Risk Breakdown Structure (RBS) and SWOT analysis, were considered to be more appropriate to do at the higher, strategic risk analysis level. The approaches are still beneficial to determine general types of risks and testing long-term strategic objectives, but they are not as accurate and flexible as AI tools. One participant explained, "While traditional methods like RBS are excellent for identifying broad risks early on, they don't offer the real-time insights that AI provides, especially for complex, fast-moving projects."

Even with the better abilities of the AI, the conventional approach was still favored in some situations, especially when human knowledge and decision-making were essential. As an example, regulatory compliance risks, political changes and more general market trends were still better handled in the traditional qualitative assessments. As one respondent noted, "AI is great for operational and tactical risks, but when it comes to strategic decision-making, particularly in areas like compliance, the judgment of experienced project managers is still invaluable."



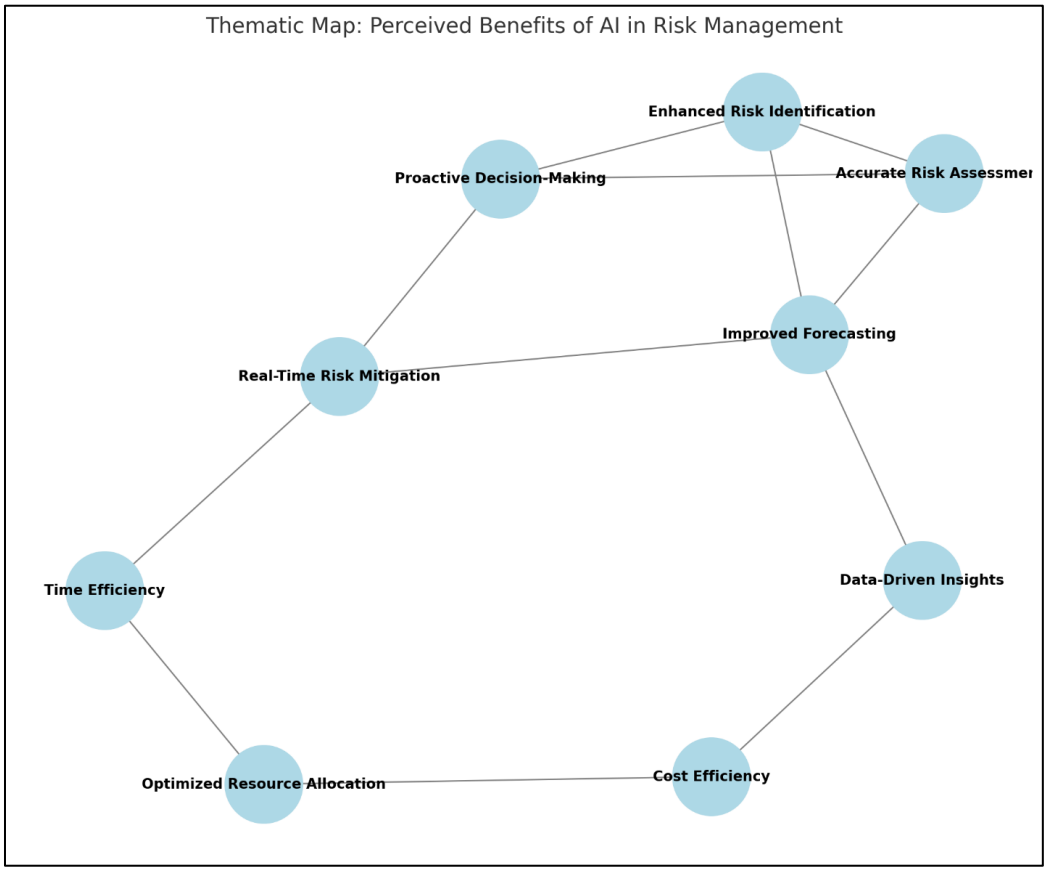
4.3.4 Perceived Benefits of AI in Risk Management

There are a number of perceived advantages of the adoption of AI in project risk management with many of them being mentioned in the interviews. Among the key advantages listed, there was the fact that AI could be used to make proactive decisions. The respondents stated that AI-based applications would identify risks earlier and this eventually enabled project managers to take the initiative to solve the situation, instead of reacting to the problem after it happened. According to one interviewee, AI tools have changed the way we used to be reactive to proactive. We are now able to predict risks, e.g. a delay or a disruption of the supply chain, and mitigate them before they escalate.

The other critical benefit that the respondents cited was a cost and time saving. The AI based predictive analytics provided an opportunity to allocate resources more efficiently, ensuring that labor, materials and equipment were used to their full extent. This has not only been able to save the expenses, but it has also led to the projects being carried out within reasonable time periods. One of the manufacturing industry respondents said, "Due to the application of AI to predict the required resources, we were able to minimize wastage and more efficiently distribute our budget, thus saving time and money.

Finally, the ability of AI to enhance the quality of risk estimation was raised on a regular basis, as well. These AI tools were capable of handling massive data, and they might contain sophisticated algorithms, which is why they are capable of delivering more trustful data about the potential risks and consequently led to the net quality of decision-making. One of the construction industry respondents added emphasis, saying that AI predictions have greatly decreased the margin

of error. It has been a big difference in our risk management process, being able to trust the information presented by data and not what we feel."



4.4 Discussion

This part will be a critical interpretation of the findings of the interviews and their comparison to the existing literature and the implications of the findings to the practice and further studies related to the field of AI-powered risk management of the projects.

4.4.1 AI Integration in Project Risk Management

The use of AI in the project risk management is highly correlated with the current literature findings. Some of the studies underline the potential of AI to increase risk prediction, resource management, and the overall outcomes of a project. Indeed, in one study, an article by Zhang and Tang (2024) asserts that AI-based applications, such as IBM Watson and Microsoft Azure, could potentially analyze large quantities of information, as well as arrive at more accurate risk forecasts, compared to their traditional equivalents. This is in line with the finding of the current paper where the respondents said they had witnessed improvement of predictive capabilities through the

integration of AI that allowed project managers to manage risks at an early age before they escalate beyond control. Furthermore, according to the literature, the study suggests that the introduction of AI occurs with test projects and the stage-by-stage implementation, which was deemed sufficient to mitigate the impact of interruptions to the existing projects by the respondents (Edunjobi and Odejide, 2024).

However, it does not pass without challenges as evidenced by the literature and the information provided in the interview. As an example, the data quality and the legacy integration are among the problems that have received significant attention in the academic literature (Isik, 2024). These technology barriers were embodied in the interviewees who have noted the complexity of the process of integrating the AI tools with the existing project management software. Nevertheless, despite such obstacles, the possibility of AI to improve risk management practices is still high. Practically, the project managers working in industries like construction or IT and manufacturing industry can improve the outcomes of their project by integrating the AI tools, yet they will have to make sure to have a robust data management system in place, and investing in the infrastructure that will enable such integrations.

4.4.2 Overcoming Challenges in AI Adoption

The interviewees presented the following challenges: technological challenges, resistance to change, and the absence of AI skills which align with those presented in the literature. Using a study by Brynjolfsson and McElheran (2016) as an example, the absence of knowledge and fear of losing a job shows that the unwillingness to use AI is grounded in the fear of potential job loss. This may be reflected in the interviews, with some of the respondents discussing how the initial employee cynicism regarding the use of AI in decision-making existed. In addition, a survey provided by Akanbi (2024) explains the issue of many organizations struggling with the integration of AI and legacy systems that is also reported by the respondents of this study.

Theoretical frameworks that may prove useful in contributing to the issues include the Technology Acceptance Model (TAM) and the Diffusion of Innovation Theory. According to TAM, usefulness and ease of use are also the key factors to the adoption of AI (Davis, 1989). The experience of the interviewees can be used to substantiate this idea since those ones who received appropriate training and were capable of observing the tangible advantages of AI tools were more eager to embrace the technology. Similarly, the Diffusion of Innovation Theory suggests that one

of the methods of overcoming resistance is to have early adopters and slow integration (Rogers, 2003). The latter can be traced to the gradual increase in AI tools in the projects that were described by the interviewees.

The obstacles may be overcome by investing in the training programs related to AI literacy, which will give the stakeholders the opportunity to feel the power of AI in their life, and obtain the support of leadership to undertake the cultural transformation. These are tactics that are required to decrease resistance and simplify the process of introducing AI in project management.

4.4.3 Effectiveness of AI-Driven Risk Management Tools

The usefulness of AI-based tools to the traditional tools like RBS and SWOT analysis is a matter of debate in the literature. Some of the studies indicate that AI applications have better results when it comes to real-time data processing and predictive analytics. As a case in point, in research by Edunjobi and Odejide (2024), it was observed that AI can be used to process complex real-time data across various sources to give timely and accurate risk predictions, which cannot be easily done using conventional techniques. In the present study, this was also reflected as the respondents indicated that AI could forecast risks, including delays and cost overruns, more accurately than conventional methods.

Nevertheless, the traditional approaches are still applicable, especially when it comes to strategic decision-making since in these cases, human expertise and judgment are indispensable (Zhang and Tang, 2024). The limitations of AI-driven tools, such as their dependency on high-quality data and the "black box" issue of model interpretability, were also identified in the study, aligning with concerns raised in the literature (Isik, 2024). The quality of data processed by AI tools only reflects the quality of these tools, and incomplete or low-quality data may result in wrong predictions. Also, although AI may offer data-based results, the inability to see how decisions are made may create obstacles to trust in the process by stakeholders (Edunjobi and Odejide, 2024).

To project managers, this implies that AI technology is not a substitute to the traditional risk management processes. The combination of the real-time predictive power of AI and the strategic expertise of the more traditional methods may provide the most extensive risk management solution.

4.4.4 Future Directions and Evolving AI in Risk Management

The future of project risk management and AI is promising as literature forecasts that AI tools will keep on advancing, becoming even more advanced and incorporated into the daily project management activities. Brynjolfsson and McElheran (2016) argue that AI will become a more and more central component of project management especially in construction and IT industries where complexity and uncertainty are most significant. The results of this research justify this opinion, and the respondents believe that AI will probably increase its presence in risk management, especially because machine learning algorithms are still rising and becoming more available.

Even though the future looks bright, issues like privacy of data and ethical concerns are still major setbacks to mass adoption of AI (Zhang and Tang, 2024). They have to be addressed through the establishment of proper governance models and non-opaque AI models. The integration of AI and other technologies (blockchain) to guarantee data security and trust should be explored in the future so as to offer data security and trust (Akanbi, 2024).

The types of industries that will gain much are construction and IT since the AI tools are still developing regarding its long-term strategic benefits. As the degree of AI increases, it is possible that the risk management process can be fully or partially automated and the project managers focus on high-level decisions, with reduced risks of human error. To do it, though, industries will have to overcome the current barriers to the use of AI, rendering the technology affordable, ethical, and capable of providing plausible insights into the different types of projects.

4.5 Conclusion of the Chapter

The chapter showed the key findings of the interview concerning the implementation of AI-based predictive analytics in project risk management. The findings demonstrate that AI-powered systems, such as IBM Watson, Microsoft Azure, and Google Cloud AI, are becoming evidence in project risk management systems, and do provide a significant advantage in terms of risk identification, forecast and resources allocation. However, the quality of data, the integration of the old systems, and the unwillingness of humans to change are significant barriers to mass adoption.

The implications of the results should be noted by the project managers and risk professionals. They state that AI can contribute to enhancing the existing risk management operations to the significant degree through providing the opportunity to make decisions proactively and predict more efficiently. Nevertheless, the process of integration must be carefully planned and must include pilot projects, large-scale training programs, and the implementation of AI tools gradually. Project managers ought to combine AI tools with the conventional risk management strategies to leverage the benefits of both. The following chapter will consider the conclusions of the study, including the proposals on how to eliminate the obstacles on the way to the use of AI and the possible methods of enhancing the AI use in the field of project risk management.

CHAPTER 05: CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The purpose of this research was to investigate how AI-based predictive analytics can be integrated in project risk management and whether it is more effective than other, more traditional approaches to risk management, such as SWOT analysis and Risk Breakdown Structure (RBS). The study has identified important insights of the process of adoption of AI tools, challenges, and benefits, and presented a strong awareness of the role of AI in contemporary project risk management based on the qualitative interview with project managers working in the construction, IT, and manufacturing industries.

The research found that AI applications such as IBM Watson, Microsoft Azure, and Google Cloud AI are finding more applications in industries to increase the risk identification, forecasting, and decision-making process. The ability of AI to analyse large datasets in real-time enables detecting any possible risks early, which was reported to be a major benefit in high-risk industries such as IT and construction. According to the project managers, AI-based predictive analytics offered some form of insight that mediums like traditional approaches did not offer especially the ability to identify complex patterns and avert risks before they occurred. These tools helped in making decisions based on data which enhanced efficiency and accuracy of the risk management practise.

Nevertheless, there are obstacles to the implementation of AI. Information quality problems were found to be a significant obstacle. The inability to achieve successful implementation of AI-driven tools was an issue of many organisations having dissimilar data sources, non-uniform formats, and data silos. In addition, change resistance was also raised as a major issue and this was caused by the fear of job loss, AI knowledge and poor knowledge on the application of AI in risk management. The unwillingness to accept AI was more acute with project managers who had long been accustomed to conventional practises. To get over this resistance, a cultural change and considerable investment in change management strategies and training was necessary.

The comparison of AI and conventional risk management procedures showed that traditional tools such as RBS and SWOT analysis are useful in strategic risk evaluation as AI can predict risks in real time and operational level. These methods offer a qualitative model that AI

tools tend to be insufficient in especially on bigger and intricate threats that demand human reasoning. It was discovered that the combination of AI tools and traditional methods is the most efficient option as it integrated the positive features of both techniques, which produces a more holistic risk management plan. The research provides useful data concerning the role of AI in managing risks within a project and the importance of organisations to deal with both technological and human obstacles to make sure the implementation of AI into their risk management practises is successful.

5.2 Recommendations

5.2.1 Recommendations for Practitioners

To organisations that consider employing AI-based predictive analytics in their project risk management processes, the initial suggestion is the adoption of a gradual implementation process. By launching pilot projects in the field of AI application, organisations will be able to determine the functionality of these tools in the limited setting first and then implement them in bigger, more complex projects. Pilot projects will allow determining which issues may arise, including difficulties with the integration with the legacy systems, data quality, and staff resistance. Through these challenges, organisations can make the transition to AI adoption in a smoother way by dealing with them initially.

Besides, organisations must invest in data quality management. The AI-oriented tools are highly sensitive to clean, accurate, and highly integrated information to be efficient. Firms should invest in good data governance systems, which would assist in the standardisation and sharing of data within various departments in a central repository. This will not only improve the performance of AI but also prevent inefficiencies which were caused by poor-quality of data that were encountered to discourage the success of AI adoption in this work. The use of automated data cleaning tools and the development of the best data management practices will lead to the more appropriate AI prediction and will provide more plausible information.

Lastly, it is important to train and develop AI literacy among the work force to ascertain that employees can use AI tools efficiently. The training of project managers and risk professionals should be done in a manner that not only teaches the technical skills of AI tools but also emphasises on the strategic use of the AI tools in project risk management. Providing extensive training sessions will make the employees more confident about the use of AI tools and reduce the

resistance to change. Moreover, the culture of constant learning and flexibility in the organisation will help to successfully implement AI technologies and make sure that the employees are ready to accept new technological solutions.

5.2.2 Recommendations for Researchers

In future research, it is important that the behavioural and cultural determinants of AI adoption should be studied. The present paper has shown that the opposition to AI is not purely based on the technological aspect but also on human factors including fear of losing their jobs, lack of knowledge, and trust to AI. The next step of the research should be the research investigation of the psychological and organisational issues that can influence the acceptance and application of the AI tools in the project risk management. The possibility to learn the impact of organisational culture, leadership styles, and attitudes of the employees on the adoption of AI will be an enormous source of information to overcome these barriers and make the introduction of AI products easier.

Also, longitudinal research is required to monitor the effectiveness of AI tools in project risk management in the long term. Although this research offered useful information on the early phases of AI implementation, it is critical to learn how these tools develop with time. The longitudinal research would be more insightful to how the AI systems could enhance, change and further influence decision-making and risk prediction as they are incorporated in the overall project management process. The performance of these tools in different stages of the project will be monitored; this will be used to establish their long-term value and contribution to project deliverables.

The next round of research should also be conducted on the synergy between AI and other new technologies such as blockchain and the Internet of Things (IoT). The combination of these technologies and the AI will contribute to the improvement of the project risk management as it will offer decentralised, real-time data streams and ensure the integrity of the data. Exploring these technological synergies would result in the creation of stronger and more stable AI-driven predictive analytics systems, which would eventually increase the project risk mitigation strategy and assist organisations to make more informed and data-driven decisions.

5.3 Limitations of the Study

Although this research offers important information on the use of AI in project risk management, it still has its flaws. The major constraint of the study is that the sample size is very limited (the 10-15 project managers). Although this is a reasonable sample size to demonstrate qualitative analysis, it might not be representative of the variety of experiences in different industries or geographical areas. The research included three industries, namely the construction industry, IT industry, and manufacturing, which is insufficient to make broad conclusions about the risk profile and organisation structure of other industries.

Also, the study was based on self-reported information via interviewing, thus can be biassed. The participants can have offered a potentially positive evaluation of AI tools or minimised the difficulties that they faced. Besides, the study utilised a cross-sectional research design as it only examined the situation of the AI adoption and not the impacts of AI in the long-term. To further develop the results in the future, they can positively influence the study of the future through increasing the sample size, more industries, and using longitudinal design to observe the long-term effects of AI tools on the project risk management.

5.4 Future Research Directions

The gaps that have been outlined during this research should be filled by future studies, especially regarding the realisation of the behavioural and organisational influences on AI adoption. In addition to technological challenges that were mentioned in this study, the organisational culture, employee attitudes, and leadership styles were also identified as a critical element in the effective adoption of AI. More research on these anthropocentric aspects will assist in finding ways to address change resistance and make the integration of AI compliant with the company culture and goals.

The investigation of the long-term effectiveness of AI tools in project risk management is the other important aspect of future research. Longitudinal studies would be able to trace the performance of AI systems over the time, and it would give details on how the AI systems change their influence on the decision-making process, risk reduction, and the success of the project in general. The opportunities of AI with other technologies, including blockchain and IoT, should also be considered by the researchers to create more sophisticated and secure risk management systems. Through the combination of such technologies, the organisation can enhance its data

integrity and advance its real-time decision-making and further streamline its risk management strategies, becoming able to unlock more value of AI in complex project settings.

References

Akanbi, C. (2024). *Overcoming Challenges in AI Adoption*. ResearchGate. Available at: https://www.researchgate.net/publication/382108051_Overcoming_Challenges_in_AI_Adoption

Allouzi, M. and Aljaafreh, M., 2024. Applied Ai In Neom construction projects: the potential impact Of Ai In enhancing projects success. *Acta Informatica Malaysia*, *8*(1), pp.32-44.

Arinze, C.A., Izionworu, V.O., Isong, D., Daudu, C.D. and Adefemi, A., 2024. Integrating artificial intelligence into engineering processes for improved efficiency and safety in oil and gas operations. *Open Access Research Journal of Engineering and Technology*, *6*(1), pp.39-51.

Atkinson, P., and Delamont, S. 2010. SAGE qualitative research methods, SAGE, ISBN: 1-4462-7570-1. (online resource).

Badmus, O., Rajput, S.A., Arogundade, J.B. and Williams, M., 2024. AI-driven business analytics and decision making. *World Journal of Advanced Research and Reviews*, *24*(1), pp.616-633.

Badmus, O.F., 2023. Application of AI technology in program management. *Journal of engineering research and reports*, *25*(8), pp.48-55.

Balnaves, M. and Caputi, P. 2001. Introduction to quantitative research methods an investigative approach, SAGE, ISBN: 0-7619-6804-0 (online resource).

Boinapalli, N.R., 2023. AI-Driven Predictive Analytics for Risk Management in Financial Markets. *Silicon Valley Tech Review*, *2*(1), pp.41-53.

Brynjolfsson, E., & McElheran, K. (2016). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W.W. Norton & Company.

Chhikara, H., Chhikara, S. and Gupta, L., 2025. Predictive Analytics in Finance: Leveraging AI and Machine Learning for Investment Strategies. In *Utilizing AI and Machine Learning in Financial Analysis* (pp. 325-336). IGI Global Scientific Publishing.

Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-340.

Diameh, J.T., Oluwatobi, B.T., Daniels, C., Ekaette, O., Sunday, N., Azumah, C. and Mariama, Q., 2025. Integrating AI-driven predictive analytics in project risk management to optimize decision-making and performance efficiency. *Int. J. Eng. Technol. Res. Manag*, *9*, pp.373-389.

Edunjobi, A., & Odejide, A. (2024). The Impact of Artificial Intelligence on Project Management: Enhancing Efficiency, Risk Mitigation, and Decision-Making in Complex Projects. *ResearchGate*. Available at: https://www.researchgate.net/publication/384266056_The_Impact_of_Artificial_Intelligence_on_Project_Management_Enhancing_Efficiency_Risk_Mitigation_and_Decision-Making_in_Complex_Projects

Enemosah, A., 2025. Enhancing DevOps efficiency through AI-driven predictive models for continuous integration and deployment pipelines. *International Journal of Research Publication and Reviews*, *6*(1), pp.871-887.

Foster, L., Sloan, L., Bryman, A. 2021 Bryman's social research methods, Oxford university press.

Goyal, A., 2023. Driving Continuous Improvement in Engineering Projects with AI-Enhanced Agile Testing and Machine Learning. *Int. J. Adv. Res. Sci. Commun. Technol*, *3*(3), pp.1320-1331.

Hannemann, I.H.S., 2024. *A comparative study of traditional and data-driven approaches in the project management performance* (Master's thesis, Universitat Politècnica de Catalunya).

Isik, E. (2024). *AI in Construction Risk Management*. Oxford Brookes University. Available at: https://radar.brookes.ac.uk/radar/file/17c901b1-609b-438e-bcc9-c4ad0b1f7989/1/ErhanISIK.pdf

Javaid, H.A., 2024. Ai-driven predictive analytics in finance: Transforming risk assessment and decision-making. *Advances in Computer Sciences*, *7*(1).

Kiani, A., 2024. Artificial intelligence in entrepreneurial project management: a review, framework and research agenda. *International Journal of Managing Projects in Business*.

Mahmud, F., Barikdar, C.R., Hassan, J., Goffer, M.A., Das, N., Orthi, S.M., Hasan, S.N. and Hasan, R., 2025. AI-Driven Cybersecurity in IT Project Management: Enhancing Threat Detection and Risk Mitigation. *Journal of Posthumanism*, *5*(4), pp.23-44.

Nenni, M.E., De Felice, F., De Luca, C. and Forcina, A., 2024. How artificial intelligence will transform project management in the age of digitization: a systematic literature review. *Management Review Quarterly*, pp.1-48.

Nguyen, T.V. and Vo, N. eds., 2024. *Using traditional design methods to enhance AI-driven decision making*. IGI Global.

Otoko, J., 2023. Optimizing cost, time, and contamination control in cleanroom construction using advanced BIM, digital twin, and AI-driven project management solutions. *World J Adv Res Rev*, *19*(2), pp.1623-1638.

Pope, D.C. 2017 Introduction to qualitative research methods, SAGE Publications Ltd.

Rogers, E.M. (2003). *Diffusion of Innovations*. 5th ed. Free Press.

Sundaramurthy, S.K., Ravichandran, N., Inaganti, A.C. and Muppalaneni, R., 2022. AI-Powered Operational Resilience: Building Secure, Scalable, and Intelligent Enterprises. *Artificial Intelligence and Machine Learning Review*, *3*(1), pp.1-10.

Taheri Khosroshahi, F., 2024. The Future of Project Management: Embracing artificial intelligence for enhanced efficiency, data-driven decision-making, and collaborative teamwork.

Thirumagal, P.G., Vaddepalli, S., Das, T., Das, S., Madem, S. and Immaculate, P.S., 2024, April. AI-Enhanced IoT Data Analytics for Risk Management in Banking Operations. In *2024 5th International Conference on Recent Trends in Computer Science and Technology (ICRTCST)* (pp. 177-181). IEEE.

Zhang, X., & Tang, L. (2024). Integration of AI in Project Risk Management in the Construction Industry: Challenges and Opportunities. *Journal of Construction Management*, 42(1), 55-72.