PERCEPTIONS AND ANTICIPATIONS TOWARDS AI-ENHANCED RISK MANAGEMENT
IN AGILE PROJECT MANAGEMENT: A COMPARATIVE SURVEY-BASED ANALYSIS OF
PMBOK AND PRINCE2 METHODOLOGIES

by

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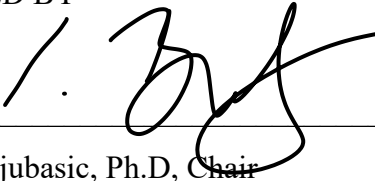

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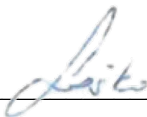PMBOK AND PRINCE2 METHODOLOGIES

by

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Dedication

Inscribed within these pages, resplendent with the fervour of relentless intellectual pursuit, I dedicate this thesis. A testament to the unwavering support of my parents, Smt. Sandhya Deb, and Shri. Swapan Kumar Deb, whose love and wisdom have been the foundation of my ambitions. To my cherished fiancée, Dr. Trinayana Brahma, an abiding source of strength and inspiration, your unwavering faith has been the beacon that guided me through the tempests of doubt. To my precious Athena, a mirthful melody amidst scholarly symphonies, your joy brings perspective. To my comrades of heart and mind, best friends who've weathered with me through the tempests of academia, your camaraderie has been invaluable. This work stands as an embodiment of your collective influence - an interweaving of your strengths, sacrifices, and unwavering belief in my pursuit of knowledge.

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First and foremost, I offer my deepest gratitude to Shiva and Shakti and Ganesha for their blessings throughout this endeavor.

My sincere gratitude is extended to my mentor, Dr. Hemant Palivela, whose profound expertise enhanced this dissertation significantly. Appreciation is due to the discerning evaluating committee, and to the subject matter experts whose invaluable insights molded my research.

Special acknowledgment to Shruti Sengupta, and Aishwarya Brahma, whose guidance and encouragement served as a steadfast beacon during my research journey.

ABSTRACT

PERCEPTIONS AND ANTICIPATIONS TOWARDS AI-ENHANCED RISK MANAGEMENT
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2023

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This research probes project management practitioners' perceptions and anticipations regarding integrating AI tools in risk management within Agile contexts, mainly focusing on PMBOK and PRINCE2 frameworks. The impetus for this inquiry emerges not only from the ongoing transformative shifts in the realm of project management due to AI advancements but also from notable literature gaps and corporate business requirements. Specifically, these gaps include a comprehensive comparative analysis of PMBOK and PRINCE2 in Agile risk management settings and a discernible need for in-depth studies exploring the tangible benefits and challenges of AI's role in fortifying risk management within these predominant frameworks. Additionally, there needs to be more empirical research combining PMBOK, PRINCE2, Agile strategies, risk

management paradigms, and the cutting-edge frontiers of AI. This investigation responds to these pressing demands, aiming to shed light on AI's real-world applicability and implications in contemporary project management practices.

A mixed-method approach was employed to understand these facets, encompassing qualitative and quantitative methods deeply—a structured survey furnished insights into broad trends surrounding AI's anticipated challenges and benefits. A qualitative probe, rooted in a comprehensive literature survey on PMBOK and PRINCE2, was realized through practitioner interviews. These engagements elucidated real-world experiences and challenges, showcasing determinants of successful AI integration in Agile using these frameworks.

Triangulated findings spotlight PMBOK and PRINCE2's allure for AI-augmented risk management in Agile scenarios. Practitioners expressed optimism about AI's capability to refine the risk management process. Nonetheless, specific barriers were underscored, which include the 'black box' issue, data privacy, integration challenges, and the need for AI-focused training, implying change management demands and cost considerations.

The study reveals an apparent enthusiasm among practitioners for AI's role in enhancing risk management, balanced by acknowledging the inherent challenges. While PMBOK and PRINCE2 are viewed as potent vehicles for AI integration, practitioners emphasize the importance of methodological agility, continuous upskilling, and fostering an innovative ethos. The preparedness and adaptability in addressing AI-specific challenges are paramount. This research adds to the current discussions on theory, provides a plan for further exploration, and gives practical advice for businesses and professionals on the verge of integrating Agile methodologies with AI.

1.1 Introduction

Project management has undergone substantial evolution, characterized by the integration of emerging methodologies and the advent of advanced technologies. Historically, frameworks have evolved from rigid, structured models to more flexible and adaptive strategies, notably Agile project management. The focus on responsiveness and adaptability within Agile project management distinguishes it from traditional approaches, making it particularly effective in industries like I.T. and software development characterized by rapid changes.

Within this landscape, the PMBOK (Project Management Body of Knowledge) and PRINCE2 (Projects in Controlled Environments) have emerged as predominant frameworks. Their structured guidelines offer controlled environments for project execution, ensuring that projects adhere to their scope, time, and budget. A crucial facet in these methodologies is risk management, an integral component in any project. This emphasizes the need for tools and strategies to address potential challenges proactively.

Simultaneously, the rise of Artificial Intelligence (A.I.) has opened new horizons. Initially perceived as a complex computation tool, its role expanded, encompassing diverse domains, including project management. A significant highlight is A.I.'s potential in risk management, especially within Agile settings, using methodologies like PMBOK and PRINCE2.

This research emerges at this intersection, exploring perceptions and anticipations around A.I.-enhanced risk management within Agile project environments, mainly through the lens of PMBOK and PRINCE2 methodologies. The motivation for this research is twofold: The aim is to provide valuable information for practitioners and address a significant gap in the current literature. This will help guide the future of project management amid swift technological advancements.

1.2 Statement of the problem

As project management techniques continue to develop, widely recognized methodologies such as PMBOK and PRINCE2 have become popular for managing projects on a global scale. Agile development practices, recognized for enabling rapid adaptation to changing requirements, are pivotal as organizations endeavour to meet the volatile demands of hyper-agile environments, especially in crucial scenarios such as COVID-19 vaccine distribution (Nazir et al., 2022). Over the years, the use of AI in the AEC industry has increased, offering the potential to optimize architectural processing, enhance design and engineering capabilities, and improve data-driven project management, among other benefits (Rafsanjani & Nabizadeh, 2023).

Nevertheless, the crux of the problem lies in the evident chasm between these methodologies and the integration of A.I., particularly in risk management. As Masso et al. (2020) pointed out, the software industry's rapid evolution implies new challenges in risk management due to the emergence of fresh approaches, yet the interaction of A.I. with established frameworks such as PMBOK and PRINCE2 remains under-investigated.

Research has illuminated AI's potential to dynamically adjust in fluctuating environments, particularly for SMEs' risk management within supply chains; yet, its integration with broader risk management paradigms, such as within Agile contexts, has been less explored (Wong et al., 2022). This becomes especially pertinent given that risk management is at the heart of project success, and A.I.'s capabilities can be game-changing.

The problem, thus, is twofold: Firstly, understanding the practitioners' perceptions and anticipations regarding the intersection of A.I., Agile, and established methodologies. Secondly, the industry needs guidelines on pragmatically deploying A.I. tools within these methodologies for enhanced risk management.

This research seeks to delve into this multi-faceted problem and shed light on the amalgamation of A.I., Agile principles, and methodologies like PMBOK and PRINCE2. The objective is to

bridge the gap in knowledge, synthesizing academic discourse and actionable insights for project management, risk management, and A.I. professionals.

1.3 Significance of the Study

Technological tools' evolution and integration into various sectors offer promising advancements, notably in project management. As project management techniques continue to develop, widely recognized methodologies such as PMBOK and PRINCE2 have become popular for managing projects on a global scale. Within this domain, the interface between AI and traditional project management methodologies, such as PMBOK and PRINCE2, still needs to be explored.

Purpose:

Driven by this knowledge gap, this research explores the perceptions and anticipations of project management practitioners towards AI-enhanced risk management in Agile project environments. The study places a significant emphasis on juxtaposing the PMBOK and PRINCE2 methodologies, aspiring to carve out insights that can be translatable into actionable strategies across diverse industrial landscapes.

Relevance and Benefits:

1. **For Project Management Practitioners:** This research sheds light on how incorporating AI within traditional methodologies can offer a transformative approach, potentially elevating risk management processes, refining prediction accuracy, and bolstering overall project outcomes.

2. **For Organizations:** By grasping the myriad possibilities of AI's role in project management, businesses are poised to capitalize on these technological strides. This could usher in heightened efficiency, cost-effectiveness, and project success, directly influencing profitability and bestowing a competitive edge.

3. **For the Scholarly Community:** Acting as a confluence of AI technology and established project management techniques, this investigation enriches the academic reservoir. It

opens avenues for subsequent inquiries, championing an integrative perspective to contemporary project management research.

4. **For AI Enthusiasts and Developers:** Grasping the nuances of project management professionals' expectations, AI pioneers can sculpt their innovations with heightened precision, addressing the industry's bespoke needs.

As the global landscape gravitates toward a more technologically augmented paradigm, understanding the symbiotic relationship between AI and project management becomes imperative. This study, by elucidating how AI can accentuate risk management, especially in Agile frameworks employing PMBOK and PRINCE2 methodologies, offers a compass for stakeholders ranging from on-ground project managers to the organizational echelons. With these insights, informed, avant-garde decisions can be made, propelling project innovation and efficacy.

1.4 Research Questions

The exploration into the crossroads of artificial intelligence and project management, specifically within PMBOK and PRINCE2 in Agile contexts, culminates into the following research questions:

1. How do project management practitioners perceive the effectiveness of risk management features of PMBOK and PRINCE2 methodologies when integrated into Agile environments?

2. What are project management practitioners' expectations and perceived challenges about incorporating Artificial Intelligence tools in risk management within Agile methodologies, particularly in the context of PMBOK and PRINCE2 frameworks?

3. How do project management practitioners compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk management within Agile project environments?

1.5 Hypotheses (Objectives)

Grounded within the research framework and oriented around PMBOK, PRINCE2, and AI in Agile settings, the study manifests the subsequent objectives:

1. **Objective 1:** To investigate project management practitioners' current understanding and perceptions regarding implementing risk management features of PMBOK and PRINCE2 methodologies within Agile environments.

2. **Objective 2:** To assess the current anticipation and perceived challenges within the project management community about integrating Artificial Intelligence tools in risk management within Agile methodologies, specifically in the context of PMBOK and PRINCE2 frameworks.

3. **Objective 3:** To analyze the comparative appeal of PMBOK and PRINCE2 methodologies for incorporating AI-enhanced risk management in Agile project environments, as the practitioners view.

1.6 Limitations, Delimitations, and Assumptions

1.6.1 Limitations

- **Data Availability:** The need for comprehensive case studies showcasing the implementation of AI in risk management within the frameworks of PMBOK and PRINCE2 presents a significant limitation. The scarcity of publicly available, detailed data could benefit from a deeper investigation.

- **Diversity in Implementation:** Both PMBOK and PRINCE2 methodologies and AI integration in risk management vary in their application across diverse organizations and projects. Therefore, while the findings will provide valuable insights, they may only be universally applicable across some contexts.

- **Subjective Perceptions:** Relying heavily on project management practitioners' subjective perceptions and anticipations introduces an element of variability. Individual experiences, biases, or potential misinformation can impact research outcomes.

- **AI's Complexity:** The intricate nature of AI tools and their dynamic role in risk management makes it challenging to stay abreast of technological advancements. This complexity might need to be revised in precise understanding and gauging the efficacy of these tools within PMBOK and PRINCE2 frameworks.
- **Time Constraints:** The fixed timeframe for this research might limit the scope of exploration and the number of practitioners involved. Rapid technological shifts in AI and changes in project management practices might necessitate swiftly updating certain research facets.

1.6.2 Delimitations
- The study delves into PMBOK and PRINCE2 methodologies within Agile environments, thus not covering other project management methodologies in detail.
- The focus remains primarily on integrating AI-enhanced risk management tools, potentially overlooking other AI implementations in project management.

1.6.3 Assumptions
- The selected project management practitioners are assumed to provide honest and unbiased inputs, reflecting their understanding and anticipations regarding AI-enhanced risk management in Agile environments.
- Despite their inherent differences, the methodologies of PMBOK and PRINCE2 can be analyzed within the same research framework for their potential in integrating AI tools, particularly in Agile settings.
- Using AI tools in project management can have a significant impact, particularly in risk management. Integrating these tools into established methodologies is not only possible but also advantageous.

1.7 Definition of Terms

Agile Project Management (Agile): An iterative approach to planning and guiding project processes. Agile methodologies involve breaking down tasks into manageable increments known

as 'sprints' or 'iterations' with minimal planning. In contrast to traditional project management, the focus of Agile approaches is on fostering flexibility and collaboration.

Artificial Intelligence (AI): Artificial intelligence (AI) is the field of computer application and science that deals with developing computer systems capable of performing tasks that typically require human intelligence. In the context of this research, AI refers to the tools and techniques that can enhance risk management in project management.

Likert Scale: A psychometric scale used in questionnaires to gauge respondents' attitudes or feelings toward a particular topic. Respondents are asked to indicate their agreement or disagreement on a symmetric agree-disagree scale.

Mixed-Methods Approach: A research design that combines both qualitative and quantitative methods. This study integrates surveys with Likert scale questions (quantitative) and open-ended questions (qualitative).

PMBOK (Project Management Body of Knowledge): A standardized set of practices and knowledge areas widely recognized as best practices for project management. Published by the Project Management Institute, PMBOK outlines a framework of processes and terminologies in project management.

PRINCE2 (Projects IN Controlled Environments): A process-driven project management methodology emphasizing dividing projects into manageable and controllable stages. It is characterized by its detailed processes, themes, and principles.

Risk Management: The process of identifying, analyzing, and mitigating uncertainties in decision-making. Project management encompasses practices and strategies to minimize the potential adverse effects of uncertainties on project objectives.

Purposive Sampling: A non-random sampling method where participants are chosen based on specific characteristics or qualities relevant to the research, relying on the judgment of the researcher.

Snowball Sampling: A sampling technique where existing participants help the researcher identify and recruit additional participants. It is beneficial when researching specific subgroups where members need help to locate.

Stratified Sampling: This is a way of sampling that involves dividing the population into smaller groups or strata based on shared characteristics. Statistics. It ensures that members from each subgroup are randomly and proportionally represented in the sample.

Thematic Analysis: A qualitative method used for identification, analysis, and reporting patterns or themes within data. This study utilizes thematic analysis to dissect open-ended survey responses.

1.8 Background

The project management domain has constantly evolved, reflecting industries' shifting demands and challenges. Central to this evolution has been the Agile Project Management approach. This iterative method prioritizes flexibility, adaptability, and responsiveness, allowing project teams to address emerging challenges promptly. It underscores the shift from conventional project management techniques that followed a linear path.

During Agile's rise, the project management community has also given importance to standardized methodologies. PMBOK and PRINCE2 stand out in this regard. Each with its unique emphasis, PMBOK focuses on knowledge areas and best practices, while PRINCE2 structures its approach around controlled stages of project delivery.

Artificial Intelligence's integration in this context is not just an advancement but transformative. Especially in Risk Management, A.I.'s capabilities – from predictive analytics to machine

learning algorithms – promise a paradigm shift. By providing tools for efficient risk identification, analysis, and mitigation, A.I. can significantly enhance decision-making processes in project management.

However, the integration of A.I. within Agile project management, especially concerning methodologies like PMBOK and PRINCE2, has uncertainties and challenges. This research seeks to explore these very areas – the perceptions, anticipations, and challenges practitioners face.

Employing a Mixed-Methods Approach, the research aims to delve into the nuances of these integrations, offering a comprehensive understanding that might shape the future direction of project management in an A.I.-driven world.

CHAPTER II:

REVIEW OF THE LITERATURE

2.1 Introduction

In the dynamic field of project management, PMBOK and PRINCE2 remain pivotal frameworks guiding project execution and management. In parallel, Agile methodologies have seen an upward trend, with their flexible and adaptive nature being highly favoured in tech-oriented industries. Artificial Intelligence (A.I.) has also made its way into project management, marking a significant impact, particularly on risk management processes. Despite these advancements, literature regarding the perceptions and anticipations of project practitioners towards AI-enhanced risk management and a comparative survey-based analysis between PMBOK and PRINCE2 methodologies within Agile environments remains to be sparse.

This study employs the PRISMA guidelines to present a systematic and rigorous literature review, ensuring the review's transparency, consistency, and quality. The literature review aims to delve into the intricacies of PMBOK, PRINCE2, Agile methodologies, risk management, and the role of A.I. in enhancing these practices. The study will facilitate a more nuanced understanding of these areas, informing the research objectives. These objectives include investigating practitioners' perceptions of integrating risk management features of PMBOK and PRINCE2 methodologies in Agile environments, their anticipations, and perceived challenges of integrating A.I. tools, and how they compare the appeal of both methodologies in terms of AI-enhanced risk management within Agile project management.

The chapter will be structured as follows: Section 2.1 will introduce the literature review. Section 2.2 will cover project management methodologies, specifically PMBOK and PRINCE2, including comparative studies. Section 2.3 will delve into Agile methodology, focusing on its principles, evolution, and relationship with risk management. Section 2.4 will explore Agile's approach to risk management and how it integrates with PMBOK and PRINCE2. Section 2.5 will investigate A.I.'s role in project management and its applications. Section 2.6 will look at

A.I.'s function in risk management. Section 2.7 will examine the intersection of PMBOK, PRINCE2, Agile, and A.I. Section 2.8 will analyse perceptions and anticipations towards AI-enhanced risk management in Agile project management. Section 2.9 will identify gaps in the literature, and finally, Section 2.10 will conclude and summarize the critical insights from the literature review, outlining the proposed research's focus areas.

Through an exploration of these topics, this chapter sets the theoretical groundwork for assessing the perceptions and anticipations of project management practitioners, providing a foundational understanding that underpins the subsequent research questions and objectives. It aims to situate the study within the broader academic dialogue and supply a robust justification for the chosen research direction.

2.2 Inclusion Criteria

We adhered to the process of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow method to guarantee a meticulous and systematic approach to the literature review.

- **Identification**: Our initial phase began with a comprehensive search of databases such as Google Scholar, IEEE Xplore, PubMed, Scopus, Web of Science, ProQuest, and JSTOR. Utilizing a combination of crucial search terms, including but not limited to "PMBOK and Risk Management," "Strengths and Weaknesses of PRINCE2", "Enhancing Risk Management in Agile Project Management," "Framework for Risk Management in Agile Methodologies," "Comparison of Risk Management Techniques in Agile, PMBOK, and PRINCE2", "Machine Learning Tools for Project Management," and "Comparison of PMBOK and PRINCE2". This broad search yielded over 550 articles, journals, books, and other relevant literature.

- **Screening**: The next step involved filtering out publications that were not directly relevant. These identified resources' titles, abstracts, and keywords were meticulously

reviewed. We primarily excluded literature that did not explicitly address the convergence of the various domains or was published over a decade ago to ensure contemporariness. This screening narrowed our pool down to 291 resources.

- **Eligibility**: A deeper dive was undertaken during this phase. We rigorously assessed the full text of the screened articles, ensuring they aligned closely with our research objectives and offered substantial insights. Critical criteria for exclusion at this stage were:
  - Lack of significant data or a clear focus on integrating AI into Agile risk management.
  - Non-concentration on traditional methodologies, especially PMBOK, and PRINCE2, in tandem with Agile.
  - Not addressing AI's role specifically in risk management.
  - Purely theoretical works that lacked applicable frameworks or case studies. After this thorough examination, 232 articles were excluded, further refining our selection.

- **Inclusion**: The culmination of our meticulous process resulted in selecting publications of the highest relevance and value to our research. Emphasis was placed on literature that provided profound insights on the comparative analysis of PMBOK and PRINCE2, especially within AI-enhanced Agile environments. After this thorough process, 59 references were cited as the core for our literature review.

This rigorous adherence to the PRISMA Flow method has facilitated an organized, unbiased, and comprehensive literature review, laying a robust foundation for our research.

2.3 Clear Organizing Themes

Given the various topics covered, the Literature Review Chapter further categorizes the sections under various themes:

2.3.1 Project Management Methodologies: An Overview

Project management methodologies provide guiding principles and processes to manage, control, and deliver projects effectively and efficiently (Papke-Shields et al., 2010). These methodologies are strategic frameworks designed to structure, plan, and control the information system development process.

Traditional project management methodologies, like Waterfall, see Figure 1, canter around a linear, sequential approach where progress flows steadily downwards through conception, initiation, analysis, design, construction, testing, implementation, and maintenance stages (Conforto et al., 2014). While Waterfall is excellent for projects requiring high control levels and clear objectives, its lack of flexibility makes it unsuitable for projects with uncertain or fast-changing requirements.
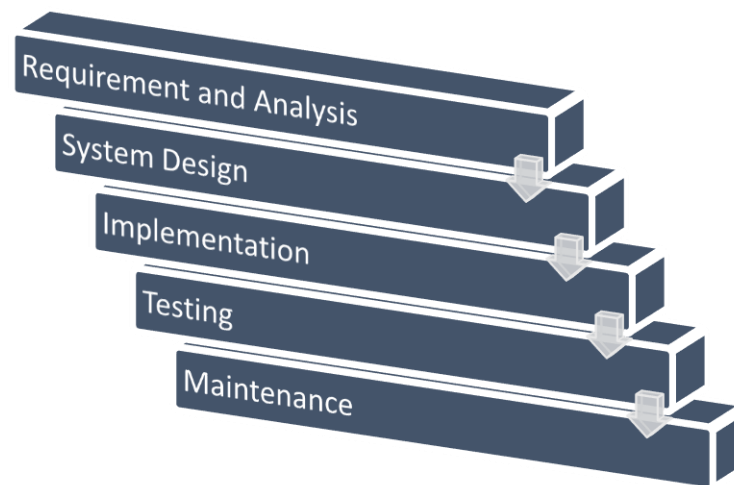
Figure 2-1 Waterfall Model (Author's own illustration)

On the other hand, flexible methodologies, like Agile (see Figure 2), focus on incremental and iterative development, promoting adaptability and achieving customer satisfaction by rapidly delivering small, usable portions of the system (Conforto et al., 2014). Agile methodologies champion collaboration, self-organization, and cross-functionality of teams.
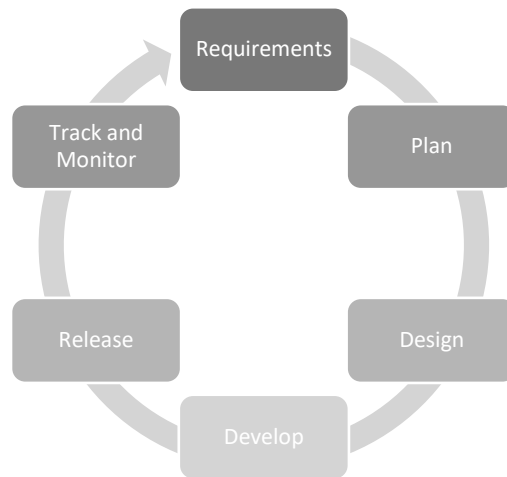
Figure 2-2 Agile Process Flow (Author's own illustration)

In the middle of the spectrum are methodologies like PRINCE2 (Projects in Controlled Environments) and PMBOK (Project Management Book of Knowledge), which can be adapted to suit various project requirements and contexts. These methodologies incorporate traditional and flexible methods, providing a comprehensive framework for project management that considers project complexity and uncertainty levels.

The following sections will be delving into the specifics of the PRINCE2 and PMBOK methodologies.

2.3.1.1 Project Management Body of Knowledge (PMBOK) Methodology

The Project Management Body of Knowledge is highly recognized in project management methodologies for its structured approach that offers comprehensive coverage of all facets of project management, including risk management (Fitsilis, 2008). The recent inclusion of agile practices and an agile guideline appendix in the PMBOK Sixth Edition by the PMI acknowledges the rise of Agile methodologies. However, when assessing the compatibility of Scrum-developed IT projects with PMBOK processes, certain conflicts arise, especially in areas

such as executing integration, long-term scope management, project scheduling, cost estimations, and team management (Rosenberger & Tick, 2018).

To address the dynamic nature of modern project environments, the Project Management Institute (PMI) introduced significant changes in the seventh edition of PMBOK, see Figure 3 (Project Management Institute, 2021). This edition emphasizes principles, value delivery, and project tailoring to accommodate emerging trends, suggesting an evolutionary and disruptive shift from earlier versions (Amaro & Domingues, 2023). This newer approach aims to facilitate project tailoring and value creation, thus empowering project teams to achieve better results.

Figure 2-3 Changes from PMBOK Guide; (Source: PMI, n.d.)

Despite these positive steps, disparities exist between PMBOK's theoretical framework and its practical implementation. A survey involving 117 project managers revealed significant variations in implementing PMBOK knowledge areas, with integration, cost, and procurement being more frequently implemented. In contrast, quality, scope, and stakeholder areas were less often applied (Davidov et al., 2023). This finding underlines the need for improved alignment

between textbooks and actual project management practices, suggesting a need to reassess and refine educational resources.

Risk management has been consistently emphasized as a critical aspect of project management. Studies highlight the significant influence of risk management planning and risk identification on project performance. For instance, in the renewable energy sector, effective risk management was found to account for about 79.6% of project performance variance (Kunya & Yusuf, 2023). Hence, the research proposes enhancing risk management practices to improve project performance further.

Rehacek (2017) provides an in-depth examination of primary project risk management standards, emphasizing the crucial role of risk management in project management. He highlights the paradox of project risk exposure being highest during the early stages when the information regarding the risk is minimal. The study advocates for a balanced approach towards opportunities and threats when managing risks, stressing the need for project-specific tailoring of risk management standards.

In the era of increasing uncertainties, such as the Covid-19 pandemic, there has been a push towards more flexible and dynamic project management methodologies like Agile. Nevertheless, Agile, while recognized for its flexibility and willingness to adapt, often grapples with uncontrolled changes which can inadvertently lead to project delays and budget overshoots (Marnada et al., 2022). Potential solutions include leveraging user story maturity or minimum viable products to bridge the existing gaps.

Despite these challenges, several studies, such as those by Fitsilis (2008) and Rebaiaia and Vieira (2014), support integrating Agile methodologies with PMBOK. They argue that such integration could offer a more holistic and flexible framework for project management, optimizing project execution and risk minimization.

In conclusion, the literature indicates a clear consensus on the prospective benefits of a combined approach incorporating Agile methodologies with PMBOK for effective project management. However, a significant gap exists in this area, particularly concerning risk management.

Addressing this gap, with a focus on enhancing PMBOK's integration with Agile methodologies and the application of A.I. and machine learning tools in risk management, aligns with the research objectives. The research is poised to contribute significantly to the understanding and application of PMBOK in today's Agile-dominated project environment.

2.3.1.2 PRINCE2 Methodology

The Prince2 Methodology is globally recognized for its significance in risk management within Agile project management methodologies. Developed by the U.K. government's Central Computer and Telecommunications Agency (CCTA), PRINCE2, an acronym for Projects IN Controlled Environments, employs a structured yet adaptable, process-oriented approach for efficient project management. Central to its design are four components: 7 Principles, 7 Themes, 7 Processes, and a capability for customization to match the demands of the project. To ensure control in PRINCE2, the methodology prescribes three key strategies: partitioning the project into manageable, controllable stages; supervising milestones; and delineating the organizational structure for the project team. A distinctive feature of PRINCE2 is its product-cantered planning which centres on the project's output, with a strong emphasis on both change and quality control mechanisms (Ghosh et al., 2012)., see Figure 4 The Prince2 Processes (Thomson, n.d.). The methodology uses seven principles, themes, and processes; one is risk management, a systematic approach to identifying, assessing, and controlling project risks.
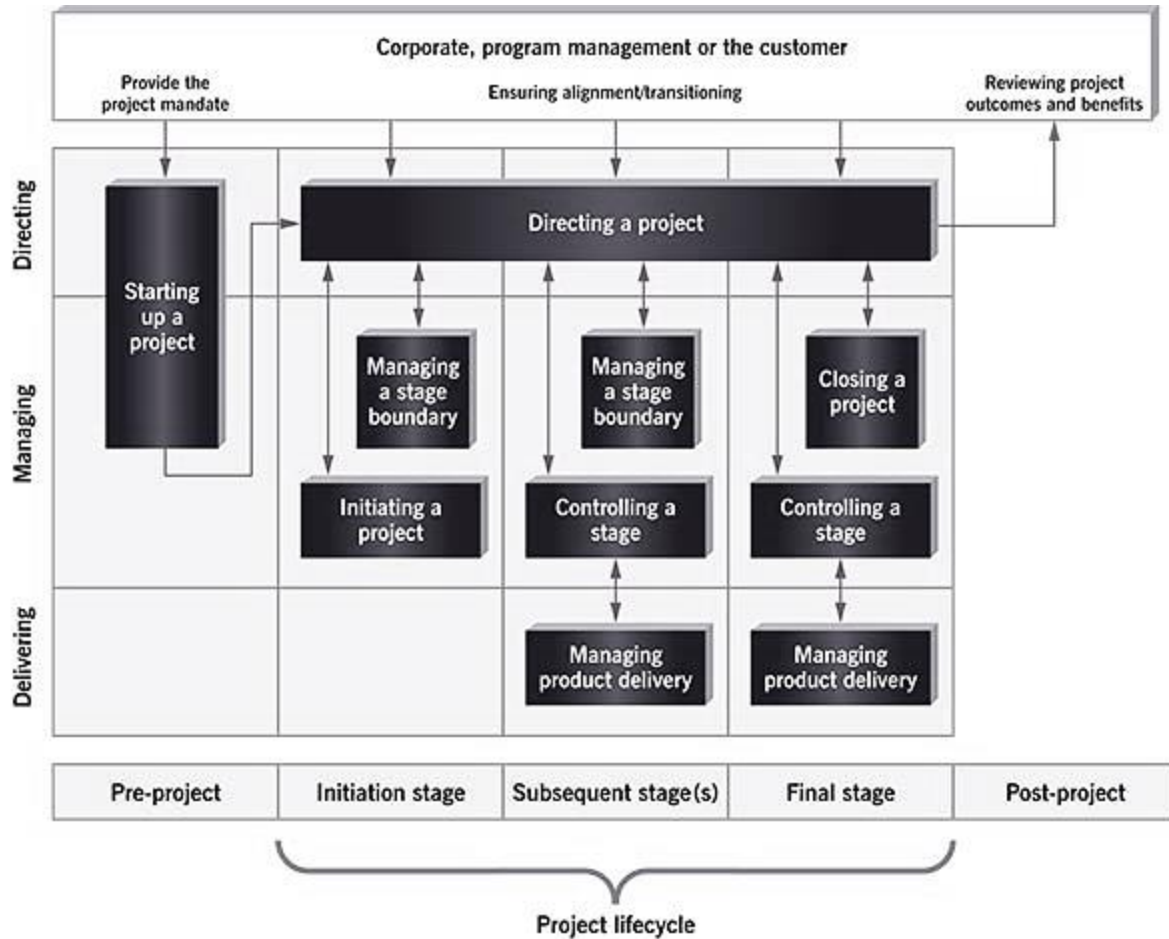
Figure 2-4 The Prince2 Processes from Prince2 6th Edition; (Source: Axelos, n.d.)

Even though PRINCE2 provides a structured yet flexible, process-based approach to enhance project management, its inherent structure requires tailoring to meet the specific needs of a project, particularly in dynamic environments such as Agile methodologies or when integrating with newer technologies like Artificial Intelligence (Ghosh et al., 2012). In this context, the research by Dodd and Wang (2012) into risk management practices of small businesses according to PRINCE2 methodologies provides valuable insights. They found that proactive risk management was crucial for business survival, especially in unstable economic climates. However, the methods like PRINCE2, while able to reduce risk, cannot ensure total risk avoidance, particularly in environments characterized by constant change and economic uncertainty.

Karaman and Kurt (2015) proposed that PRINCE2 might be more suitable for small I.T. projects, focusing on project board activities and management by exception. Conversely, PMBOK may be more applicable to larger, more complex I.T. projects with high stakeholder engagement. However, the effectiveness of PMBOK and PRINCE2 largely depends on a project's specific needs and context (Jamali & Oveisi, 2016).

Several standards, notably the Project Management Body of Knowledge (PMBoK), have been developed, offering a structured guide on essential tools, techniques, and knowledge needed for efficient project management (Akhmetshin et al., 2018). On the other hand, PRINCE2 manages the project with a clearly defined framework, including roles, responsibilities, principles, and processes. Both methodologies offer a comprehensive project management approach that meets ISO 21500 standards when used in tandem.

Mousaei and Gandomani (2018) explored the combination of Scrum, a popular Agile development methodology, and Prince2 to address the absence of risk management mechanisms in the software development process. The proposed model was reported to mitigate project risks successfully, increase the project success rate, enhance product quality, and offer reliable risk identification, analysis, and control mechanisms. They recommended further exploration of hybrid models that fuse project management standards like PMBOK, P2M, OPM3, PRINCE2, and Agile methods like Scrum, DSDM, XP, and ASD to improve project management and quality assurance in Agile software development.

In conclusion, this updated literature review emphasizes the need for further exploration of how to blend the strengths of these methodologies, particularly in risk management, within Agile project management methodologies and how A.I. can enhance these processes. This aligns with the research objectives and questions, especially about the strengths and weaknesses of PMBOK and PRINCE2 methodologies and how A.I. and machine learning tools can enhance risk management processes within Agile methodologies. The review also underscores the importance of developing a framework that incorporates the strengths of PMBOK and PRINCE2 and evaluating the effectiveness of the developed framework and the integration of A.I. tools in enhancing risk management in Agile project management.

2.3.1.3 Comparative Studies

Integrating Artificial Intelligence (A.I.) into risk management strategies in Agile methodologies is an area of growing interest. Recent literature reveals a burgeoning interest in utilizing Artificial Intelligence (AI) and Machine Learning (ML) techniques for achieving a proactive and predictive approach in Supply Chain Risk Management (SCRM), especially considering the increasing need to predict uncertainties with greater precision using varied data sources (Deiva Ganesh & Kalpana, 2022). Similarly, this applies for the field of Project risk management and other areas. A pivotal aspect of this exploration is comparing the PMBOK and PRINCE2 methodologies, especially their differing approaches to risk management within Agile environments.

In today's fast-paced business and technological environment, organizations are recognizing the importance of innovative project management methodologies, like PMBOK and PRINCE2, to meet commercial objectives and the emerging demand for Agile methodologies in the labour market (Akhmetshin et al., 2018). This adaptation signifies the shifting landscape of project management from rigid, structured planning towards a more iterative and flexible approach (Morjane et al., 2022). However, a precise translation of terminology, processes, and structures between traditional and Agile paradigms is essential to ensure seamless transitions (Ghosh et al., 2015).

Existing comparative studies (Ghosh et al., 2015; Raharjo & Purwandari, 2020) provide insightful reflections on these methodologies' unique strengths, weaknesses, and differences, especially in the context of A.I. integration. However, they also reveal a knowledge gap about integrating A.I. tools into risk management strategies within Agile project management. This research aims to bridge that gap by examining the current state of risk management within Agile methodologies in PMBOK and PRINCE2, identifying their strengths and weaknesses, and investigating the potential of A.I. for enhancing risk management in Agile.

Agile Project Management (APM), characterized by its iterative process and flexibility, promises superior productivity, quality, and customer satisfaction, especially in high-risk and time-sensitive projects (Salameh, 2014). However, Agile methodologies may need more explicit

strategies for risk management (Fitsilis, 2008). Tomanek and Juricek (2015) propose filling this gap by integrating PRINCE2's systematic risk management approach into the Scrum framework.

The sustainability of traditional project management strategies is questioned in the rapidly evolving digital landscape. Hybrid project management, incorporating elements from Agile methodologies and classic project management, offers a promising solution for future sustainability (Leong et al., 2023). By leveraging best practices from different methods, these hybrid methodologies optimize the likelihood of project success, reduce costs, improve outcomes, minimize waste, and enhance stakeholder satisfaction. However, these innovative approaches need further exploration to understand why hybrid initiatives are more effective.

In summary, the literature highlights the ongoing evolution in project management methodologies, the growing interest in A.I. integration, the unique implications of various methods, and the potential of hybrid methodologies. While Agile methodologies have shown great promise, especially in managing high-risk projects, their incorporation into traditional project management methodologies is still an open area of research. This study targets to fill this knowledge gap by exploring how best to combine the strengths of traditional and Agile processes and use A.I. to enhance risk management within Agile project management.

2.3.2 Agile Methodology and Its Evolution

The Agile methodology was first formalized in 2001 with the Agile Manifesto, a response to traditional project management approaches viewed as overly rigid and bureaucratic (Beck et al., 2001). The Agile methodology prioritizes people and communication above tools and procedures, functional software over extensive documentation, partnering with customers over negotiating contracts, and adapting to change rather than sticking to a rigid plan.

Agile methodologies have been adopted across various industries due to their focus on customer satisfaction through the continuous delivery of valuable software, welcoming changing requirements, and promoting sustainable development (Serrador & Pinto, 2015).

2.3.2.1 Principles and Practices of Agile

The Agile methodology is guided by twelve fundamental principles (Beck et al., 2001). These include customer satisfaction through early and continuous delivery of valuable software, welcoming changing requirements, frequent delivery of working software, close collaboration between business and developers, projects built around motivated individuals, face-to-face communication, primary measurement of progress through working software, sustainable development, technical excellence, simplicity, self-organizing teams, and regular reflection for effectiveness enhancement.

Several Agile practices have emerged from these principles. Techniques such as Scrum, Extreme Programming (XP), and Kanban are based on small, self-organizing teams that work in iterations to deliver increments of value to customers (Hoda et al., 2012).

2.3.2.2 Evolution and Adoption of Agile in Project Management

The need for increased adaptability and responsiveness in project management drove the evolution of Agile methodologies. These methodologies were adopted due to their ability to handle the increasing complexity and volatility of the modern business environment (Dingsøyr et al., 2012).

Agile has transformed from a novel approach to a mainstream methodology within project management. In a report by VersionOne (2018), 97% of organizations reported using Agile development methods. Factors contributing to Agile adoption include increased productivity, improved team morale, better product quality, and faster time to market (VersionOne, 2018).

The adoption of Agile has been challenging, however. Resistance to change, lack of skilled personnel, and difficulties aligning corporate culture with Agile principles are common obstacles to Agile implementation (Serrador & Pinto, 2015).

2.3.3 Agile Methodology and Risk Management

Agile methodologies frequently emphasize addressing risks in IT projects, particularly those related to software development, by integrating iterative and feedback-focused processes. However, often the perception in agile projects is that risks are mostly threats (negative risks),

with limited attention given to opportunities (positive risks) that can arise, especially in the IT domain. There is an irony in the agile mantra of "embrace change," given the potential value-creation through positive risks in IT projects, yet this positive risk evaluation isn't prominently featured. This perspective on risk management in agile projects can sometimes appear narrower than the broader understanding by the risk management community (Moran, 2014).

Recent research emphasizes the importance of incorporating systematic risk management strategies throughout every stage of project execution, particularly within the I.T. sector (Tucnik et al., 2023). This emerging trend further points towards a need for an integrated approach to risk management within Agile methodologies, suggesting the utility of combining Agile with techniques from other methodologies such as PRINCE2. Such a merger could enhance risk communication and better equip teams to handle project uncertainties (Tomanek & Juricek, 2015). This point aligns with the first research objective of this thesis.

The application of Agile methodologies has been found to transcend the boundaries of the software and I.T. industries, making its way into various other sectors such as IoT system development and biotechnology (Guerrero-Ulloa et al., 2023; Martin, 2023). Despite this widespread adoption, specific gaps exist in Agile methodology, especially in eliciting and analysing requirements, the maintenance phase, and non-functional requirements in IoT system development (Guerrero-Ulloa et al., 2023).

With the COVID-19 pandemic necessitating a shift towards remote work, new challenges have emerged for Agile methodologies. The inherent nature of Agile, which promotes reactiveness, collaboration, and decentralized decision-making, can be impeded in a remote setting due to fewer opportunities for organic interaction (Reunamaki & Fey, 2023).

Another notable challenge is balancing agility and security in software development, particularly within Small and Medium-sized Enterprises (SMEs). It has been observed that Agile methods often compromise security, a critical aspect of software development, for the sake of increased speed and flexibility. Mihelič et al., 2023) recommend a lightweight approach to evaluate Agile methods from a security perspective, which could be particularly beneficial for SMEs.

On the positive side, there is growing interest in leveraging design flexibility, a salient feature of Agile methodologies, as a strategy for risk mitigation (Tucnik et al., 2023). Likewise, PMBOK and PRINCE2, known for their more explicit risk management strategies, could complement Agile methodologies and improve project outcomes. This could be especially beneficial for larger or more complex projects requiring a more formal approach to risk management (Schwalbe, 2015).

Artificial intelligence (AI) and machine learning (ML) increasingly influence banking risk management, offering potential solutions to address contemporary global economic and financial challenges. Their measured and well-prepared application can provide substantial positive effects on several risk management areas, including credit, market, liquidity, and operational risks, amongst others (Milojević & Redzepagic, 2021). Integrating such technologies into risk maturity models, along with other innovative methods like the LEGO approach and sensitivity analysis, is also being considered (Kusrini et al., 2023).

Despite these advancements, the literature reveals noticeable gaps in our understanding of risk management within Agile methodologies. These gaps pertain to the integration of A.I. into these methodologies and the comparison of PMBOK and PRINCE2 methodologies in terms of their approach to risk management (Raharjo and Purwandari, 2020). Addressing these gaps could significantly improve risk management within Agile project management methodologies, contributing to this study's aim and research questions.

In conclusion, the existing literature underscores the idea that while Agile methodologies naturally manage risks due to their inherent flexibility, there is considerable scope for integrating more formal and explicit risk management strategies, including A.I. tools and procedures from the PMBOK and PRINCE2 methodologies. Understanding risk management in Agile methodologies and effectively integrating these additional elements can significantly enhance project outcomes. This aligns with this thesis's research objectives and questions, underscoring the need for this study.

2.3.3.1 Risk Management in Agile: Challenges and Solutions

Managing risks is a crucial component of project management, encompassing risk identification, assessment, and prioritization (Project Management Institute, 2017). Within Agile, however, risk management can present unique challenges due to the methodology's inherent flexibility and iterative nature.

Firstly, the speed and flexibility of Agile projects can lead to overlooked or hastily assessed risks (Williams, 2012). Additionally, due to the iterative nature of Agile, risks can emerge rapidly and unexpectedly within an Agile project, demanding quick and effective responses.

Despite these challenges, Agile methodology inherently addresses risk management through its principles and practices. Frequent iterations allow risks to be identified and addressed early, and the emphasis on communication promotes an open dialogue about potential issues (Williams, 2012).

Risk management in Agile is further enhanced through daily stand-ups, retrospectives, and iteration planning, all providing platforms for discussing and addressing risks (Williams, 2012).

2.3.3.2 Implementation of Risk Management in PMBOK and PRINCE2 within Agile Context

The PMBOK and PRINCE2 methodologies have risk management principles, which Agile can implement.

PMBOK proposes a structured risk management approach, which includes 1.) risk identification, 2.) qualitative risk analysis, 3.) quantitative risk analysis, 4.) risk response planning, and 5.) risk monitoring and control (Project Management Institute, 2017). These principles can be incorporated within Agile to fit Agile's iterative structure. For example, risk identification and analysis can be done during iteration planning, while risk response planning and monitoring can be done throughout the iteration.

Similarly, PRINCE2 also proposes a structured approach to risk management, albeit with a greater focus on pre-emptive planning (Office of Government Commerce, 2009). PRINCE2's emphasis on preparing risk responses can complement Agile's reactive nature, providing a more

balanced risk management approach. As with PMBOK, PRINCE2's principles can be implemented within Agile by adapting them to Agile's iterative structure.

In conclusion, while risk management in Agile presents unique challenges, these can be addressed through Agile's inherent principles and practices and the incorporation of risk management principles from PMBOK and PRINCE2.

2.3.4 AI in Project Management: An Emerging Field

Artificial Intelligence (A.I.) has brought about a vital transformation in numerous industries. Project management is no exception. The potential of A.I. in project management is vast, offering a means to automate processes, increase productivity, and enhance decision-making (Schoemaker et al., 2018).

Incorporating AI into management offers unparalleled potential for value creation by automating standard work, letting managers emphasize more on roles that require human judgment and strategic decision-making (Kolbjørnsrud et al., 2016). Furthermore, AI techniques are being leveraged to model, predict, and optimize complex project issues in a data-driven approach, facilitating enhanced decision-making processes and risk mitigation (Pan and Zhang, 2021).

2.3.4.1 Applications of AI in Project Management

Leading artificial intelligence technologies, particularly machine learning (ML), are paving the way for future predictions in supply chain risk management. These ML algorithms excel at pinpointing anomalous risk factors and deriving forward-looking insights from historical datasets (Guo et al., 2021; Mohanty et al., 2021; Uthayakumar et al., 2020; Yang et al., 2023). Stakeholder communication and various modes of communication analysis is very important in Project management, for which various technologies like Natural Language Processing (NLP) can be used. For example, Natural Language Processing (NLP) combined with human analysis can effectively distil meaningful consumer insights from vast amounts of community feedback, such as tweets about health topics (Wang et al., 2023).

Artificial intelligence (AI) will take over administrative coordination and control tasks, automating functions like scheduling, resource allocation, and reporting, thereby alleviating managers from such time-consuming duties (Kolbjørnsrud et al., 2016). Furthermore, AI-powered project management tools can assist in maintaining and tracking project progress, ensuring that projects stay within scope and budget.

2.3.4.2 Current Studies and Developments of AI in Project Management

Research in A.I. and project management is ongoing, with numerous studies investigating A.I.'s potential applications and impacts. Also, Machine learning (ML) has demonstrated its capability in various areas like predicting supply chain risk (SCR) by reducing human labour, enhancing response times, and providing predictive insights, particularly during the COVID-19 pandemic (Guo et al., 2021, Mohanty et al., 2021, Uthayakumar et al., 2020).

Similarly, in a parallel field in the realm of construction engineering and management (CEM), the integration of artificial intelligence (AI) has led to a significant digital shift, providing opportunities for automation, risk mitigation, and increased efficiency. Pan and Zhang (2021) discuss how AI has the potential to remodel and optimize various stages of complex projects in a data-driven manner.

Despite these promising developments, the integration of A.I. into project management is still in its early stages, and further research is required to understand its potential and address any emerging challenges fully.

2.3.5 The Role of AI in Risk Management

Artificial Intelligence (A.I.) is increasingly recognized for its potential to augment risk management in project management contexts. It is capacity to process vast amounts of data and mitigate human bias significantly improves project management efficiency (Soravito, 2023). As complexity increases in projects and many organizations undervalue the importance of data, the role of A.I. becomes pivotal.

A.I. tools such as fuzzy systems, CBR, ANNs, SVM, and transformed regression models play a significant role in risk management (Soravito, 2023). These tools can lead to more accurate and impartial decision-making, supplementing traditional statistical models that need to catch up in meeting the dynamic needs of project management. However, these powerful tools are designed to complement, rather than replace, traditional risk management methods, highlighting the continued importance of expert judgment in the risk management process.

Fotso et al. (2022) assert the potential of A.I. to mitigate project failures in the I.T. sector. They suggest a holistic approach involving a mix of qualified project management professionals, relevant skills, processes, milestones, and budgeting, with AI being a significant contributor. A.I. can efficiently manage project scope, time, cost, and resources while enhancing quality control, risk awareness, and project productivity. The beginning of the Fourth Industrial Revolution, with A.I. at the forefront, has profoundly transformed project management. The synergistic application of A.I. and the Internet of Things (IoT) can lead to improved data analysis, streamlined workflows, accurate data predictions, process automation, and timesaving, contributing to better project outcomes with PMBOK, Prince2, and Agile methodologies.

Aziz and Dowling (2019, pp. 33-50) discuss and informs about the transformative potential of AI and machine learning in reshaping the methods of risk management, emphasizing the advancements in managing and understanding financial risks with the integration of AI-driven solutions. However, despite the evident potential of A.I., challenges such as lack of investment, resistance to change, and difficulty understanding A.I. tools persist (Soravito, 2023).

Mishra et al. (2023) demonstrate how AI/ML can enhance decision-making within Agile methodologies by automating routine tasks, enabling project managers to focus more on complex problem-solving and innovative lessons. This reflects the principles of Agile project management and aligns with the first research question.

Fotso et al. (2022) emphasize that successful implementation of technology project management (TPM) involves requirements like highly qualified professionals, critical thinking, communication skills, and conflict and change management abilities. Aligning these skills with the unique, fluctuating characteristics of I.T. project management, such as resource planning,

agile methodologies, and hybrid project management, can tackle challenges arising from project implementation, thereby reducing discrepancies and delays.

Concurrent research underscores the importance of A.I. and OR methods in the banking sector, opening new avenues for their application in risk management (Doumpos et al., 2022). This underlines the scope of incorporating A.I. in risk management in PMBOK and PRINCE2 methodologies, reflecting your second research objective.

Dwivedi et al. (2023) highlight the transformative role of A.I. tools like ChatGPT in sectors including risk management. They emphasize the need to overcome organizational resistance to change and develop criteria to evaluate generative A.I. outputs. They also raise concerns about the potential misuse of A.I. tools, necessitating proactive cybersecurity measures. This reinforces the need to consider all possible risks associated with A.I. integration in Agile project management methodologies.

Schuett et al. (2023) scrutinize the role of an A.I. ethics board in companies developing and deploying artificial intelligence systems and their potential to mitigate associated risks. This underlines the need to integrate A.I. tools into Agile methodologies while ensuring necessary ethical considerations are met, reinforcing the third research objective.

Hacker et al. (2023) emphasizes the necessity of regulatory measures that keep pace with rapid A.I. development for effective risk management. Papagiannidis et al. (2022) also highlight the need for robust A.I. governance practices when integrating A.I. into organizational operations. These perspectives echo the importance of evaluating the effectiveness of the developed framework and the integration of A.I. tools in enhancing risk management in Agile project management, resonating with the final research question.

In conclusion, the literature provides substantial evidence of the potential of A.I. to enhance risk management within Agile methodologies and the challenges associated with integrating these A.I. tools. Further research is needed to develop a comprehensive framework to incorporate A.I. into Agile methodologies, particularly those outlined in PMBOK and PRINCE2. The literature also suggests the need for collaboration between academia, regulators, and technology experts to create comprehensive risk management models that harness the potential of AI.

2.3.6 Intersection of PMBOK, PRINCE2, Agile, and Machine Learning/AI

The confluence of PMBOK, PRINCE2, Agile methodologies, and machine learning/A.I. paints a progressive picture for the future of project management. This innovative approach uniquely combines the robustness of traditional project management frameworks with the agility of modern methodologies while harnessing the power of A.I. and machine learning to push the edges of project management, particularly in risk management.

Traditional project management methodologies, such as PMBOK and PRINCE2, offer well-structured processes and guiding principles that aid project managers in proficiently managing various project aspects, including risk management. Their comprehensive frameworks ensure that project risks are meticulously identified, analysed, responded to, and continuously monitored throughout the project lifecycle, emphasizing the need for iterative risk assessment and vigilance.

Conversely, Agile methodologies introduce a more flexible and adaptive stance to project management, making them ideal for projects with high uncertainty or changeability, a characteristic often found in tech and software development ventures. Agile methodologies encourage continuous feedback, iterative progression, and a swift response to change, all integral to successful risk management.

Incorporating A.I. and machine learning tools into project management is a relatively nascent development that promises substantial enhancements. A.I. technologies have the potential to automate various project management tasks, refine decision-making through data-driven insights, and elevate risk identification, analysis, and response strategies. Machine learning, a subset of A.I., can analyse historical project data to anticipate potential risks, enabling more proactive risk management.

Although PMBOK, PRINCE2, and Agile methodologies have proven effective in managing project risk, their amalgamation with A.I. technologies open up the possibility of crafting an even more potent, efficient approach to risk management. However, this integration is largely

uncharted territory, with limited studies investigating how these methodologies can be combined and enhanced through A.I. for improved risk management.

This research aims to traverse this intersection of PMBOK, PRINCE2, Agile methodologies, and A.I., focusing on risk management. By comparing the risk management strategies of PMBOK and PRINCE2 in Agile environments and exploring how they can be augmented with A.I., this study aspires to provide fresh insights into this topic and make significant contributions to this emerging field of research.

2.3.7 Perceptions and Anticipations towards AI-Enhanced Risk Management in Agile Project Management

Integrating Artificial Intelligence (A.I.) into risk management is a novel and rapidly evolving area in Agile project management. The perceptions and anticipations of project management practitioners towards AI-enhanced risk management can provide critical insights into its potential benefits, challenges, and future directions.

There is a growing interest in the potential of A.I. to augment or even transform traditional risk management practices in Agile. This is primarily due to the ability of A.I. to handle large volumes of data and make predictions based on complex patterns that may be difficult for humans to perceive (Kerzner & Kerzner, 2017). Such capabilities enable more proactive and accurate risk identification, assessment, and response.

A survey conducted by KPMG International (2019) found that many project management professionals anticipate that A.I. will significantly enhance risk management capabilities, providing more predictive insights and allowing for more informed decision-making.

However, alongside the optimism, there are also concerns and challenges. These include issues related to data privacy, the need for new skills, the potential for job displacement, and the fear of reliance on 'black box' algorithms that make decisions that humans do not fully understand (Brynjolfsson & McAfee, 2014).

Furthermore, there is a recognition that while A.I. can enhance risk management, it is not a panacea. The human element remains critical, mainly when dealing with ethical, political, or socially sensitive risks that require nuanced judgment (Kerzner & Kerzner, 2017).

Overall, the perception towards AI-enhanced risk management in Agile is cautiously optimistic, recognizing both the vast potential and the significant challenges ahead. More empirical research is needed to understand better how A.I. can be effectively integrated into Agile risk management practices and address the concerns and challenges practitioners identify.

2.4 Gaps in Literature

Several gaps emerge after a comprehensive examination of the literature about PMBOK, PRINCE2, Agile methodologies, risk management, and the application of A.I. within these contexts. These gaps indicate areas requiring further exploration and represent key points this research seeks to address.

Primarily, a need for more studies offering a detailed comparative analysis of PMBOK and PRINCE2 methodologies within Agile environments, with a particular focus on risk management, is evident. While both PMBOK and PRINCE2 methodologies and their interplay with Agile methodologies have been extensively examined, a comprehensive comparative analysis specifically focused on risk management is still wanting. This gap hinders understanding how these methodologies can be harnessed to optimize risk management in Agile environments.

Secondarily, utilizing A.I. to elevate risk management within these methodologies is significantly under-researched. Considering A.I. technologies' rapid progression and potential applicability in project management, this represents an essential domain requiring further exploration. While a few studies broach the potential of A.I. in project management, a thorough investigation into A.I.'s specific role in bolstering risk management within PMBOK, PRINCE2, and Agile methodologies remains a discernible gap in the existing literature.

Tertiary, there needs to be more empirical research that integrates these domains - PMBOK, PRINCE2, Agile methodologies, risk management, and A.I. While these areas have been studied in isolation, minimal research attempts to amalgamate them; this presents a substantial opportunity for this study to contribute novel insights by examining these areas combined.

Lastly, although some existing frameworks aim to merge different project management methodologies, only some propose frameworks for assimilating the strengths of PMBOK and PRINCE2 in Agile contexts, specifically for risk management. There have been minimal efforts to present a framework incorporating A.I. tools to enhance risk management. This represents a significant lacuna in the literature this research aims to fill.

In conclusion, while existing literature does offer some insights into the individual domains this research explores, an exhaustive analysis that seamlessly blends these domains is yet to be completed. This research contributes to the existing body of literature by addressing these gaps, offering fresh insights into the comparative analysis of PMBOK and PRINCE2, the potential role of A.I. in risk management, and developing an integrated framework to enhance risk management in Agile project management.

2.5 Conclusion and Summary

The literature review has traversed a range of topics and theories integral to the primary focus of this research, namely, the comparative study of PMBOK and PRINCE2 methodologies to enhance risk management within Agile environments utilizing A.I.

The review embarked on an extensive journey through multiple intertwined domains:

PMBOK, PRINCE2, Agile methodology, A.I., and risk management. It commenced by delving into the project management methodologies of PMBOK and PRINCE2, emphasizing their strategies for risk management. These methodologies each present comprehensive frameworks

for managing project risks, though they distinguish themselves in several key aspects due to their fundamental philosophies and approaches.

Subsequently, our focus shifted to Agile methodology and its approach towards risk management. With its inherent adaptability and responsiveness to change, Agile offers effective risk management in uncertain or dynamic project environments.

Integrating traditional project management methodologies like PMBOK and PRINCE2 can fortify Agile's risk management capabilities.

We assessed the possible contribution of A.I. and machine learning to risk management.AI shows immense promise in refining risk management processes by facilitating automation, advancing decision-making through data-driven insights, and promoting proactive risk management.

We scrutinized several research pieces in the comparative studies segment that compared PMBOK, PRINCE2, and Agile methodologies. Although these studies yield valuable insights, there must be more research gaps in comparing these methodologies' effectiveness in risk management within Agile environments, accentuated by A.I.

The final segments spotlighted the gaps in the existing literature and deliberated on the intersection of PMBOK, PRINCE2, Agile methodologies, and AI. The fusion of these diverse areas is a largely unexplored research avenue that harbours significant potential for enhancing risk management in Agile project management.

To conclude, while current literature provides substantial exploration into PMBOK, PRINCE2, Agile methodologies, A.I., and risk management, a more lucid comprehension is required of the symbiosis of these areas to augment risk management within Agile environments. This literature review has laid a solid groundwork for the subsequent research, delineating the current state of knowledge, identifying opportunities for further investigation, and pinpointing the gaps that this research intends to bridge.

This research aims to bridge these gaps, thereby contributing to a more profound understanding of this subject and establishing a groundwork for further research in this compelling and evolving field. It aspires to furnish the field of project management with invaluable insights into the efficient amalgamation of PMBOK, PRINCE2, Agile methodology, and A.I. for an enhanced risk management approach.

CHAPTER III:

METHODOLOGY

3.1 Introduction

This chapter outlines the methodology used in the research to address the central question: "How can a comparative analysis of PMBOK and PRINCE2 augment risk management in Agile methodology using Artificial Intelligence, and what are the key characteristics of an AI-enhanced framework?" The research design, inspired by the systematic PRISMA approach for literature review, aims to facilitate a thorough analysis, robust data collection, and credible interpretations and conclusions.

The research design is organized around three main objectives: 1) investigating the perceptions of project management practitioners about risk management features of PMBOK and PRINCE2 methodologies in Agile environments, 2) assessing the anticipation and challenges of using Artificial Intelligence tools for risk management within Agile methodologies, specifically with PMBOK and PRINCE2, and 3) analyzing the comparative appeal of PMBOK and PRINCE2 methodologies when considering AI-enhanced risk management in Agile projects.

A mixed-method approach, combining qualitative and quantitative techniques, forms the foundation of the research. By taking this approach, we can thoroughly comprehend the characteristics, advantages, and drawbacks of utilizing PMBOK and PRINCE2 methodologies for Agile risk management. Additionally, we can explore how AI can potentially enhance these processes. Using qualitative and quantitative methods in research allows for a more complete understanding of the studied topic. It helps overcome any limitations arising from relying solely on one form. The following sections of this chapter elaborate on the research design, data collection techniques and instruments, sampling approach, and data analysis methodologies. Ethical considerations related to the study are also discussed, along with the inherent limitations of the method.

The chosen research methodology aims to contribute valuable insights to the existing knowledge on PMBOK, PRINCE2, Agile methodology, AI, and risk management. The findings are expected to have practical implications for organizations implementing Agile methodologies and those considering the integration of AI in project risk management.

3.2 Operationalization of Theoretical Constructs

3.2.1 Research Philosophy

The research philosophy underpinning this investigation is interpretivism. This philosophical paradigm is suitable for the research due to the complex and context-specific nature of risk management within project management methodologies, particularly PMBOK and PRINCE2, within Agile environments using AI tools.

Interpretivism enabled a deep and nuanced understanding of the phenomena under study, allowing us to explore how PMBOK and PRINCE2 address risk in Agile projects and the potential of AI to enhance these processes. This philosophy acknowledges multiple realities and interpretations, recognizing that truths are constructed through individual experiences and understandings.

Incorporating the PRISMA approach within this interpretive framework ensured systematic and transparent methods for the literature review. PRISMA's structured methodology complemented interpretivism by providing a roadmap for sourcing and synthesizing diverse perspectives central to this philosophical stance.

Given the variability of risk management practices across projects and organizations and the evolving nature of AI integration, interpretivism aligns well with the research objectives. It encouraged exploring diverse perspectives on risk management, including those of project managers, risk managers, and AI specialists with practical experience in these methodologies.

Within this research philosophy, the study seeks to understand the reasons and mechanisms behind risk management practices in PMBOK and PRINCE2 within Agile environments and the

role of AI tools in advancing these practices. It values subjective experiences and interpretations and aims to extract insights rooted in specific contexts and experiences.

In conclusion, the interpretivism research philosophy provided a suitable foundation for this investigation, facilitating a detailed, nuanced, and context-specific understanding of the research problem. It emphasized the importance of comprehensive and meaningful responses to research questions, which are integral to the research design.

3.2.2 Research Approach

The research approach adopted for this study is primarily a mixed method, combining both qualitative and quantitative analyses. This approach is aligned with the interpretive philosophy of the research, allowing for a nuanced understanding and interpretation of the phenomena under investigation.

Quantitative Approach: While the study is primarily quantitative, it incorporates significant qualitative analysis elements. The comparative evaluation of PMBOK and PRINCE2 methodologies will involve quantification, especially regarding their appeal and applicability in integrating AI-enhanced risk management within Agile environments. This included comparing preferences or anticipation levels of project management practitioners derived from survey responses. Similarly, evaluating perceived challenges in incorporating AI tools in risk management involved the analysis of quantitative data, such as frequency and impact ratings. IBM SPSS software is also used for detailed analysis in evaluating and understanding the gathered data.

Qualitative Approach: A qualitative approach was pertinent given the study's exploratory nature, particularly concerning implementing, and integrating AI tools for risk management in Agile environments following PMBOK and PRINCE2 methodologies. In line with this, the PRISMA guidelines were employed to systematically review and select literature, ensuring a comprehensive capture of relevant studies and a clear understanding of the current landscape. This approach allowed for a detailed examination and interpretation of relevant practices, experiences, and perceptions from the viewpoint of project management professionals. The qualitative method included an in-depth review and synthesis from primary data collection of interviews. The existing literature, sourced and analyzed using the PRISMA guidelines, was

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revisited during the triangulation phase. Additionally, the qualitative process was carried out with the help of industry-standard software NVivo. This approach suited the intricacy and novelty of the research topic, allowing for flexibility and depth in data collection and analysis. In conclusion, the mixed-methods approach, enhanced by the systematic approach of PRISMA in reviewing the literature, enabled a comprehensive exploration and understanding of the research problem. The qualitative aspect fosters a deep, nuanced understanding of the topic, while the quantitative facet introduces objectivity and precision. This balanced approach enhances the robustness, credibility, and generalizability of the research findings, making it highly suitable for this study. The combination of qualitative and quantitative analyses ensures that the research design addresses the research objectives effectively, enabling a thorough investigation of the integration of AI in risk management within Agile environments using PMBOK and PRINCE2 methodologies.

3.3 Research Design

The research design for this study aligns with a pragmatic and mixed-methods approach, integrating elements of both qualitative and quantitative research. This strategy enables an in-depth exploration of the research topic, comprehensively understanding various facets of PMBOK, PRINCE2, and AI-enhanced risk management in Agile project environments.

This study design involves three primary phases running parallel corresponding to the research objectives:

1. **Understanding Perceptions**: The first phase involves assessing project management practitioners' understanding and perceptions of the risk management features of PMBOK and PRINCE2 when implemented within Agile environments. This phase primarily employed quantitative methods supported by qualitative elements running parallel. The pre-phase included a comprehensive literature review to understand the theoretical underpinnings of PMBOK and PRINCE2 risk management. Post that, practitioner surveys were conducted to gather quantitative data on their experiences and perceptions of risk management practices within Agile projects

following these methodologies. Expert interviews complement the survey data, providing valuable insights into real-world applications and challenges.

2. **Assessing Anticipation and Challenges**: The second parallel phase focused on the anticipation and perceived challenges in the project management community regarding integrating AI tools in risk management within Agile methodologies, particularly in the context of PMBOK and PRINCE2 frameworks. This phase employed a mixed-method approach, combining surveys and expert interviews. Surveys gathered quantitative data on practitioners' expectations, reservations, and perceived roadblocks in harnessing AI for risk management. Focused interviews allowed for a more in-depth exploration of their responses and provided nuanced insights into the practical considerations and implications of AI integration.

3. **Comparative Analysis**: The third parallel phase analyzed the appeal of PMBOK and PRINCE2 methodologies for integrating AI-enhanced risk management in Agile environments, as perceived by project management practitioners. This phase also used a mixed-method approach, employing quantitative analysis of survey responses to understand the preferences and inclinations of practitioners towards each methodology. Qualitative interpretation of interview data offered more profound insights into the reasons behind their choices, allowing for a richer understanding of the comparative appeal of PMBOK and PRINCE2.

Each research design phase directly addresses distinct research questions, thereby collectively contributing to answering the central research query. This design ensures a systematic and comprehensive exploration of the research topic, striking a balance between theoretical investigation and practical interpretation. All the phases were strongly supported by parallel analysis using industry-standard software for quantitative and qualitative analysis. By concluding this process, we achieved invaluable insights into the perceived efficacy, anticipation, challenges, and comparative appeal of PMBOK and PRINCE2 methodologies for AI-enhanced risk management in Agile project management. The pragmatic and mixed-methods approach contributed to the credibility and validity of the research findings, making it highly relevant and applicable to project management and AI integration.

3.3.1 Research Survey Questions

Section 1: Perception of Risk Management Features in PMBOK and PRINCE2

Table 3-1 Perception of Risk Management Features in PMBOK and PRINCE2

SLN	Question	Options
1	How familiar are you with PMBOK and PRINCE2 methodologies?	Choose in a Scale of 0 to 10.0 is not familiar,5 is somewhat familiar,10 is very familiar
2	In your opinion, how effective are the risk identification processes in PMBOK when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PMBOK)
3	In your opinion, how effective are the risk assessment and analysis processes in PMBOK when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PMBOK)

4	In your opinion, how effective are the risk management planning processes in PMBOK when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PMBOK)
5	In your opinion, how effective are the risk monitoring and control processes in PMBOK when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PMBOK)
6	In your opinion, how effective are the risk communication processes in PMBOK when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PMBOK)

7	In your opinion, how effective are the risk identification processes in PRINCE2 when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PRINCE2)
8	In your opinion, how effective are the risk assessment and analysis processes in PRINCE2 when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PRINCE2)
9	In your opinion, how effective are the risk management planning processes in PRINCE2 when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PRINCE2)

10	In your opinion, how effective are the risk monitoring and control processes in PRINCE2 when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PRINCE2)
11	In your opinion, how effective are the risk communication processes in PRINCE2 when integrated into Agile environments?	- Highly effective - Moderately effective - Slightly effective - Not effective - Not applicable (if not familiar with PRINCE2)

Section 2: Anticipation of Artificial Intelligence in Agile Risk Management

Table 3-2 Anticipation of Artificial Intelligence in Agile Risk Management

SLN	Question	Options
12	How familiar are you with Artificial Intelligence tools in the context of risk management?	- Choose in a Scale of 0 to 100. 0 is not familiar,50 is somewhat familiar,100 is very familiar
13	What are your expectations regarding the integration of Artificial Intelligence tools in risk identification within Agile methodologies, specifically in the context of PMBOK and PRINCE2 frameworks?	- Enhanced identification of risks and opportunities - Improved risk analysis and prioritization - Automated risk prediction and trend analysis - Streamlined risk documentation and reporting - All of the above (please specify) - Others
14	What challenges do you anticipate in incorporating Artificial Intelligence tools in risk management within Agile methodologies,	- Lack of Awareness and Understanding

	particularly in the context of PMBOK and PRINCE2 frameworks?	- Data Privacy and Security Concerns
		- Resistance to Change
		- Integration Complexity
		- Skill Gap and Training Needs
		- Cost and Resouce Constraints
		- Performance Reliability and Accuracy
		- Limited Customization and Adaptability
		- All of the above
		- None of the above
		- Other
15	How important do you think it is for Agile project management practitioners to have knowledge and skills in utilizing Artificial Intelligence tools for risk management?	- Very important
		- Moderately important
		- Slightly important
		- Not important
		- Not sure

Section 3: Comparative Evaluation of PMBOK and PRINCE2 in AI-Enhanced Risk Management

Table 3-3 Comparative Evaluation of PMBOK and PRINCE2 in AI-Enhanced Risk Management

SLN	Question	Options
16	How would you compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk identification within Agile project environments?	- PMBOK is more appealing and applicable - PRINCE2 is more appealing and applicable - Both are equally appealing and applicable - Neither is appealing or applicable - Not applicable (if not familiar with PMBOK or PRINCE2)
17	How would you compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk analysis within Agile project environments?	- PMBOK is more appealing and applicable - PRINCE2 is more appealing and applicable - Both are equally appealing and applicable - Neither is appealing or applicable

		- Not applicable (if not familiar with PMBOK or PRINCE2)
18	How would you compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk response planning within Agile project environments?	- PMBOK is more appealing and applicable - PRINCE2 is more appealing and applicable - Both are equally appealing and applicable - Neither is appealing or applicable - Not applicable (if not familiar with PMBOK or PRINCE2)
19	How would you compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk monitoring and control within Agile project environments?	- PMBOK is more appealing and applicable - PRINCE2 is more appealing and applicable - Both are equally appealing and applicable - Neither is appealing or applicable - Not applicable (if not familiar with PMBOK or PRINCE2)

20	How would you compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk communication within Agile project environments?	- PMBOK is more appealing and applicable - PRINCE2 is more appealing and applicable - Both are equally appealing and applicable - Neither is appealing or applicable - Not applicable (if not familiar with PMBOK or PRINCE2)
21	Based on your understanding and experience, How do you rate the scope of Artificial Intelligence (AI) in the coming years for risk management in Agile projects following PMBOK and PRINCE2 frameworks?	- Choose in a Scale of 1 to 5.1 being the lowest,5 being the highest.
22	In your opinion, in the coming decade what timeframe do you anticipate the maturity of Artificial Intelligence (AI) in risk management for Agile projects following PMBOK and PRINCE2 methodologies?	- Choose in a Scale of 0 to 10. 0 means now,5 means 5 years,10 means 10 years or more.

Section 4: Demographic Information:

Table 3-4 Demographic Information

SLN	Question	Options
23	What is your role in project management?	- Project manager/Director/C-Level Executives - Team member/Consultant/Developer/Tester - Agile coach - Risk management specialist - Other
24	How many years of experience do you have in project management?	- Choose in a Scale of 0 to 30. 0 meaning 0 years, 30 meaning 30 years.
25	Which industry do you primarily work in?	- IT/Technology - Construction/Engineering - Healthcare - Financial Services - Manufacturing - Other (please specify)

3.3.2 Research Survey Questions Design Explanation

Table 3-5 Research Survey Questions Design Explanation

Question Number	Question Group (Section 3.3.1)	Explanation for Design
1	1	"How familiar are you with PMBOK and PRINCE2 methodologies?" - This question is intended to establish the respondents' baseline understanding of PMBOK and PRINCE2 methodologies. The scale from 0 to 10 allows quantification of this knowledge, thus permitting correlations with other responses, and aiding segmentation of responses.
2	2-6	"In your opinion, how effective are the risk... processes in PMBOK when integrated into Agile environments?" - These questions pertain to the first research objective and question. They help in understanding how the respondents perceive the integration of different risk management features of PMBOK in Agile environments. Each question targets a specific aspect of risk management, allowing for more nuanced analysis. (These questions are clubbed together in a matrix for the user to choose).
3	7-11	Similar to the previous questions, these ones target PRINCE2 methodologies and help in assessing the perceived effectiveness of the integration of its risk management features into Agile environments.

		(These questions are clubbed together in a matrix for the user to choose).
4	12	"How familiar are you with Artificial Intelligence tools in the context of risk management?" - This question establishes respondents' baseline understanding of AI tools used in risk management. Similar to question 1, the answers can help in correlating familiarity with anticipations, perceived challenges, and the perceived appeal of using AI in risk management.
5	13	"What are your expectations regarding the integration of Artificial Intelligence tools in risk identification within Agile methodologies...?" - This question directly ties to the second research objective and question. It explores the expectations of the project management practitioners concerning the integration of AI tools for risk identification.
6	14	"What challenges do you anticipate in incorporating Artificial Intelligence tools in risk management within Agile methodologies...?" - Similar to question 13, this question pertains to the second research objective and question. It explores the perceived challenges in the integration of AI tools for risk management.
7	15	"How important do you think it is for Agile project management practitioners to have knowledge and skills in utilizing Artificial Intelligence tools for risk management?" - This question measures the perceived importance of AI skills in the context of Agile project management, giving insights about its future role in the field.

8	16-20	"How would you compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk... within Agile project environments?" - These questions are aligned with the third research objective and question. They measure the perceived comparative appeal of PMBOK and PRINCE2 methodologies for incorporating AI-enhanced risk management in Agile project environments. (These questions are clubbed together in a matrix for the user to choose).
9	21	"How do you rate the scope of Artificial Intelligence (AI) in the coming years for risk management in Agile projects following PMBOK and PRINCE2 frameworks?" - This question gauges the perceived future scope of AI in risk management, offering an understanding of its potential trajectory and the urgency with which it might need to be adopted or adapted for.
10	22	"In your opinion, in the coming decade what timeframe do you anticipate the maturity of Artificial Intelligence (AI) in risk management for Agile projects following PMBOK and PRINCE2 methodologies?" - This question tries to understand the perceived timeline for the maturity of AI in risk management. This can guide projections for development, adoption, and adaptation strategies.
11	23-25	The demographic questions (role in project management, years of experience, and industry) - These are standard demographic questions meant to provide context to the responses, allowing for comparisons across roles, experience levels, and industries. For example, someone in a managerial role might have different views from those of a team

SLN	Question	Explanation for Design
	member, or someone with extensive experience might perceive things differently from someone new in the field.	

3.3.3 Research Interview Questions and Design Explanation

Table 3-6 Research Interview Questions and Design Explanation

SLN	Question	Explanation for Design
Q1	Can you describe your experience with the implementation of risk management features of PMBOK and PRINCE2 methodologies within Agile environments?	This question is meant to gather first-hand accounts about the practical implementation of PMBOK and PRINCE2 methodologies in Agile environments. By asking about their experiences, you are aiming to understand the effectiveness and applicability of these methodologies in real-life scenarios, hence fulfilling the first research objective and answering the first research question.
Q2	What do you consider the key strengths and weaknesses of PMBOK and PRINCE2 methodologies in terms of risk management within Agile environments?	This question is designed to understand the pros and cons of PMBOK and PRINCE2 methodologies in Agile environments. Participants' responses would reveal their perception of the methodologies' strengths and weaknesses, thus providing insights into the methodologies' effectiveness in Agile environments, which pertains to your first research question.
Q3	Can you describe any challenges or obstacles you faced while integrating these methodologies with Agile practices?	By asking about challenges faced while integrating these methodologies with Agile, this question helps to understand potential roadblocks to successful implementation. It gives insight into the practical issues experienced by practitioners, which feeds into both the first and second research objectives and

		questions.
Q4	Have you had any experience or considered the use of AI tools within risk management? Can you share your thoughts or perceptions of this?	This question is directly tied to your second research objective. It helps understand prior exposure to, and opinions about, the use of AI in risk management. This will set the stage for gauging participants' anticipation towards AI-enhanced risk management in Agile environments.
Q5	What are your expectations towards the integration of AI tools within the risk management practices of Agile methodologies?	This question aligns with your second research objective and question by asking about expectations towards AI integration in risk management. Responses will reveal the practitioners' anticipation, hopes, and potential concerns about the use of AI tools in Agile project management.
Q6	In your opinion, what potential challenges could be faced when integrating AI tools into the risk management practices of PMBOK and PRINCE2 in Agile environments?	The question is geared to capture anticipated challenges in integrating AI tools in PMBOK and PRINCE2 methodologies, directly fulfilling the second research objective. Understanding these potential issues can be instrumental in developing strategies to facilitate effective AI integration.
Q7	How do you anticipate the role of AI in transforming the risk management aspects of Agile practices?	This question allows practitioners to express their views on how AI could transform Agile practices, particularly risk management. It will help to understand the potential impact and benefits of AI, tying into the second research objective.
Q8	How do you perceive the comparative appeal of PMBOK and PRINCE2 for incorporating AI-	This question connects directly to your third research objective and question. By asking practitioners about the comparative appeal of PMBOK and PRINCE2 for AI-enhanced risk management, you can assess their

	enhanced risk management within Agile project environments? Can you explain why?	preference and reasoning behind their choice.
Q9	In your opinion, what skills or knowledge do Agile project management practitioners need to effectively utilize AI tools for risk management?	The focus of this question is on the skills and knowledge necessary for integrating AI into Agile risk management. The responses will help to identify potential gaps in skills and training requirements to effectively use AI tools for risk management, serving the second and third research objectives.
Q10	Can you describe your experience with the effectiveness of PMBOK and PRINCE2 methodologies in Agile environments, particularly in their risk identification, assessment, planning, monitoring, and control processes?	This question goes deeper into understanding the effectiveness of PMBOK and PRINCE2 methodologies in Agile environments, concentrating on the risk management processes. The answers will give insights into the application and perceived effectiveness of these methodologies in practice, contributing to the first research question.
Q11	Based on your familiarity with PMBOK and PRINCE2 methodologies, how do you foresee the impact of AI-enhanced risk communication within Agile project environments?	This question considers the potential implications of AI-enhanced risk communication in Agile environments. Participants' predictions can reveal potential benefits, challenges, and changes needed in communication processes, which aligns with the second research objective.
Q12	Could you elaborate on	This question asks participants to reflect on the

	the importance of Agile project management practitioners having knowledge and skills in utilizing Artificial Intelligence tools for risk management?	importance of having AI skills and knowledge for effective risk management. It provides insights into the perceived importance of training in AI for practitioners and how this might impact the integration and effectiveness of AI in risk management, feeding into your second and third research objectives.

3.3.4 Methodological Approach

The study employs a robust mixed-method approach that puts together the benefits of both qualitative and quantitative methods of research. Using these methods, the study intends to comprehensively understand project management practitioners' perceptions, anticipations, and the comparative appeal of PMBOK and PRINCE2 methodologies for AI-enhanced risk management in Agile environments. The methodological approach for this research is stated below in the Figure.
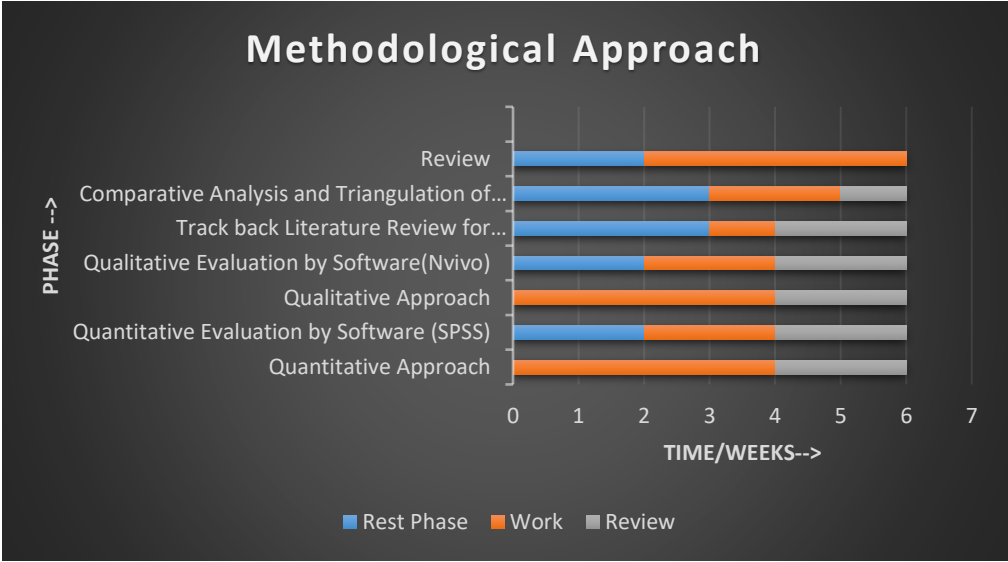
Figure 3-1 Research Design - Methodological Approach (Author's own illustration)

3.3.5 Quantitative Approach

The quantitative approach is employed primarily to assess the current anticipation and perceived challenges regarding integrating AI tools in risk management within Agile methodologies, particularly in the context of PMBOK and PRINCE2 frameworks. This approach involved developing and implementing a structured survey to gather quantitative data from various project management practitioners. The survey included closed-ended questions, allowing statistical analysis to draw objective and generalizable conclusions about practitioners' anticipations and perceived challenges. This quantitative data gathered offered insights into the prevalence and distribution of views among practitioners, aiding in formulating broader trends and patterns.

3.3.6 Qualitative Approach

The qualitative approach was employed to explore project management practitioners' current understanding and perceptions concerning the risk management features of PMBOK and PRINCE2 methodologies within Agile environments. This was pivotal in enhancing our quantitative data analysis. Before delving into the qualitative assessment and shaping our interview questions, we undertook a comprehensive literature review to grasp both the theoretical underpinnings and the practical applications of PMBOK and PRINCE2. Moreover, our qualitative method encompassed the design and execution of a practitioner survey with open-ended questions, enabling participants to share in-depth insights, experiences, and feedback about these methodologies' efficacy in Agile contexts. Through this, we gained a deeper understanding of practitioners' real-world experiences, application challenges, and the determinants of their success.

3.3.7 Comparative Analysis

The final phase of the research involved a comparative analysis of the appeal of PMBOK and PRINCE2 methodologies for incorporating AI-enhanced risk management in Agile project environments. This phase employed qualitative and quantitative approaches, using the data collected from surveys and interviews. The qualitative data is subjected to interpretative analysis, allowing for a nuanced understanding of the reasons behind practitioners' preferences and

inclinations toward each methodology. Concurrently, the quantitative data underwent statistical analysis to identify significant differences in the perceived appeal of PMBOK and PRINCE2. Combining these analyses, the research comprehensively assessed each methodology's suitability and practical implications for AI-enhanced risk management within Agile environments.

3.3.8 Literature Review Methodology

We employed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Flow method to ensure a rigorous and systematic approach to the literature review. The same is depicted in Figure 1 below, along with the process:

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only.
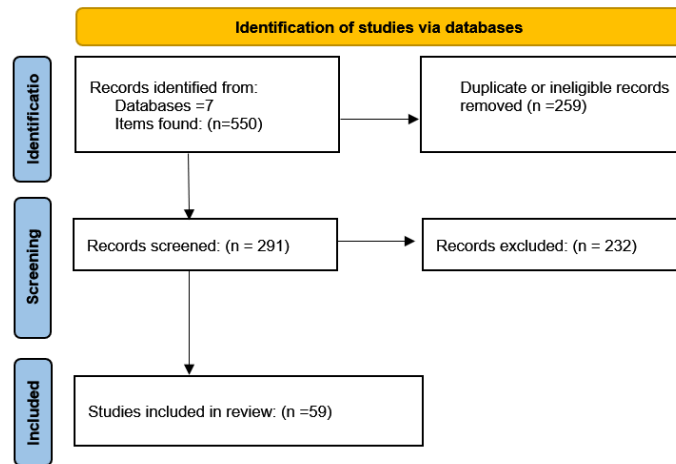
Figure 3-2 Identification of studies; Source:(Page et al., 2021)

1. **Identification**:

Starting with a broad search on electronic databases like Google Scholar, IEEE Xplore, PubMed, Scopus, Web of Science, ProQuest, and JSTOR, we used key search terms including: "PMBOK and Risk Management," "Strengths and Weaknesses of PRINCE2", "Integration of PMBOK and PRINCE2 into Agile", "Enhancing Risk Management in Agile Project Management," "Agile Methodologies and Risk Management," "Framework for Risk Management in Agile Methodologies," "Effectiveness of AI tools in Agile Project Management," "Use of AI and Machine Learning in PMBOK," "Use of AI and Machine Learning in

PRINCE2", "Comparison of Risk Management Techniques in Agile, PMBOK, and PRINCE2", "Case Studies of Risk Management in Agile Methodologies," "PRINCE2 and Risk Management", "Role of AI in Agile Risk Management," "Risk Management in Agile Methodologies," "AI in Risk Management," "Machine Learning in Risk Management," "AI Tools for Project Management," "Machine Learning Tools for Project Management," "Comparison of PMBOK and PRINCE2", "Strengths and Weaknesses of PMBOK," "PMBOK," "PRINCE2," "Agile methodology," "AI," and "risk management."

This initial search yielded many publications comprising over 550 articles, journals, books, and other information.

2. **Screening**:

We filtered out the irrelevant resources by reviewing titles, abstracts, and keywords from these identified resources. Publications not explicitly addressing the intersection of the domains or older than ten years were mainly excluded to maintain relevancy. Two hundred ninety-one were left from this phase.

3. **Eligibility**:

The next phase involved a more in-depth analysis of the screened literature. Full-text articles related to the research topic were studied, ensuring they contributed substantial insights to our research objectives. Two hundred and ten were excluded from the remaining list left for scanning. Any studies with insufficient data or need a clear focus on integrating AI into Agile risk management methodologies were excluded. Any papers not focusing on the traditional methodologies (PMBOK, PRINCE2) with Agile were excluded. Also, any papers addressing AI's role not pertaining to risk management were excluded. Purely theoretical without applicable frameworks or case studies were excluded too.

4. **Inclusion**:

The final selection consisted of those publications that offered the most valuable information, particularly on the comparative analysis of PMBOK and PRINCE2 within Agile environments, accentuated by AI. Alternatively, any relevant information the research could use to review the literature was included. Here we cited 59 references for the review. These formed the core references for our literature review.

In conclusion, the PRISMA Flow method ensured an organized, systematic, and unbiased literature review, setting a solid foundation for our research.

3.4 Population and Sample

3.4.1 Research Population and Sampling Methods

The research aims to investigate project management practitioners' perspectives and experiences related to integrating PMBOK and PRINCE2 methodologies in Agile environments and their familiarity with AI-enhanced risk management. The research population comprises professionals with practical knowledge and exposure to PMBOK and PRINCE2 methodologies within Agile project management and those involved in AI-enhanced risk management.

1. **Research Population**: The research population comprises project management practitioners from various roles, including project managers, risk managers, and professionals actively engaged in project management and risk management activities within the IT/Technology industry. These professionals possess a working knowledge of PMBOK and PRINCE2 methodologies, which enables them to offer valuable insights into the effectiveness of these methodologies within Agile environments. Additionally, individuals involved in developing, implementing, or applying AI tools in project risk management processes also form part of the research population. This diverse group of professionals from different geographical locations will provide a range of perspectives, enriching the research findings.

2. **Sampling Methods**: The research, in its backdrop, used purposive, stratified, and potential snowball sampling to select participants.

   - **Purposive Sampling** (40%): With purposive Sampling, we deliberately selected individuals with substantial experience and expertise in implementing PMBOK and PRINCE2 methodologies in Agile environments. These participants were expected to possess valuable insights into the strengths and limitations of these methodologies within the context of Agile project management.

   - **Stratified Sampling** (40%): Stratified Sampling will ensure a balanced representation of project management practitioners familiar with either PMBOK or PRINCE2 methodologies. This

stratification allowed for a robust comparative analysis, enabling the research to identify potential differences and commonalities in practitioners' perceptions of the two processes.

  - **Snowball Sampling** (20%): To ensure a broader representation and reach of professionals involved in the intersection of AI and project risk management, snowball sampling was employed. This sampling method relied on referrals from initial participants to identify additional relevant participants. This approach was particularly suitable for capturing insights from experts in the evolving field of AI-enhanced risk management.

3. **Sample Size**: The sample size for quantitative analysis was reached using the sample size calculator tool, and for qualitative analysis, it was determined based on data saturation, which means data collection continued until no new insights or themes emerged from the data. As qualitative research often focuses on in-depth exploration rather than statistical representation, the aim is to ensure a diverse and comprehensive set of participants who can provide rich and nuanced data for analysis.

In conclusion, the research population and Sampling methods are thoughtfully designed to ensure that the study captures meaningful insights from project management practitioners and AI specialists. The combination of purposive, stratified, and potentially snowball sampling helped generate rigorous and practical findings that contribute to understanding PMBOK and PRINCE2 methodologies' effectiveness in Agile environments and the potential for AI-enhanced risk management. The comprehensive approach to participant selection aimed to ensure a broad representation of perspectives and experiences, enhancing the research's credibility and relevance to project management and AI-enhanced risk management.

3.4.2 Defining the Target Population and Sample Frame

The target population for this research includes project management practitioners with practical knowledge and experience in utilizing PMBOK and PRINCE2 methodologies within Agile environments. These professionals possess hands-on experience with the challenges and complexities of risk management in Agile environments. They offer a unique perspective on how AI-enhanced risk management could be integrated into these environments.

As gleaned from the provided data, the sample frame was defined based on specific criteria. To be eligible for participation, project management practitioners should have substantial years of experience in project management and have worked with either the PMBOK or PRINCE2 methodologies in Agile environments. Additionally, they were required to have a basic understanding of AI tools. The sample frame was refined to include English-speaking countries due to language and resource constraints.

3.5 Data Collection and Instrumentation

3.5.1 Participant Selection

3.5.1.1 Selection and Recruitment of Project Management Practitioners

As detailed in the provided data, several strategies were employed to recruit project management practitioners for this study. These strategies included professional networks, project management forums, social media platforms like LinkedIn, and project management organizations like the Project Management Institute (PMI). The local chapters were approached to get inputs from experienced professionals in PMBOK and PRINCE2.

Recruitment materials, such as emails and online advertisements on our website, clearly outlined the purpose of the study, the selection criteria, the kind of involvement required (i.e., completing an online survey and possibly participating in an interview), and the measures taken to ensure confidentiality and privacy.

Recruiting project management practitioners involved in carefully screening potential participants based on the selection criteria. Those meeting the criteria were asked to participate in the study.

3.5.1.2 Sampling Techniques and Sample Size Determination

As evident from the provided data, a purposive, stratified, and snowball sampling technique was used in this study. This non-probability sampling method was particularly suited to the research

objectives, as it allowed for selecting participants with specific expertise and experience. Within the purposive Sampling (40%) approach, typical case, and expert Sampling were used to ensure a comprehensive and diverse range of insights. Stratified Sampling (40%) ensured a balanced representation of project management practitioners familiar with either PMBOK or PRINCE2 methodologies. Snowball Sampling (20%) was used to ensure a broader representation and reach of professionals involved in the intersection of AI and project risk management.

The sample size for quantitative analysis was calculated using the sample size calculator tool. Qualitative analysis was determined based on data saturation, which means data collection continued until no new insights or themes emerged from the data. The primary goal was sufficient responses to conduct qualitative and quantitative analyses effectively. An initial target sample size of 385 respondents for the survey was set (see Figure 7 below), with the understanding that adjustments might be made based on the progress of data collection.

As qualitative data collection progressed, no initial sample size was strictly defined, and the actual sample size was continually assessed. If data saturation had been reached with fewer respondents, data collection would have been stopped earlier. Conversely, if new and relevant information continued to emerge, efforts would be made to recruit more respondents until saturation was achieved. Monitoring the response rate and employing strategies to increase participation were also part of the data collection process.

Figure 3-3 Sample Size Calculator - Quantitative Analysis; Source: (Calculator.net (n.d.)).

For the qualitative component of this study, interviews were conducted with 12 distinguished participants occupying senior roles and possessing extensive expertise in technology, AI, and project management. This number was determined as we progressed through the interviews, recognizing a point of saturation where no novel insights were forthcoming (Figure 8 below). Consistently, these participants reiterated similar viewpoints and themes, affirming the adequacy of the sample size.
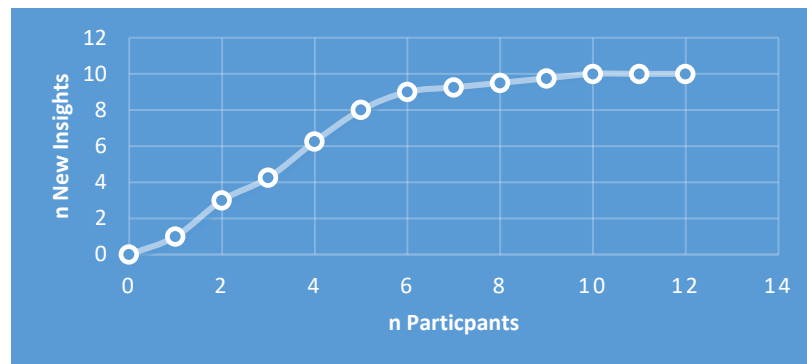
Figure 3-4 Qualitative Analysis Data Saturation (Author's own illustration)

Several factors influenced the decision to restrict the interviews to 12 participants:

1. **Depth and Richness of Data**: The interviews yielded comprehensive and in-depth data, indicating the richness of insights from each session.
2. **Time and Resource Constraints**: Practical considerations, such as resource availability and feasibility, suggested that 12 in-depth interviews struck an optimal balance between acquiring exhaustive data and manageable research demands.
3. **Specificity of the Research Topic**: Given the niche nature of the topic, only a select pool of experts or practitioners possess the depth of knowledge requisite for valuable insights.
4. **Diverse Representation**: The chosen participants represented a diverse spectrum of roles, experiences, and perspectives, ensuring that even with a limited sample, the insights provided a holistic overview of the research topic.
5. **Quality Over Quantity**: The emphasis was placed on the profundity of discernment rather than mere numerical strength.

This approach and rationale ensure the rigor and credibility of the qualitative findings in the study.

3.5.2 Instrumentation

3.5.2.1 Time Horizon

Given the focus of this research project on understanding the perceptions and anticipations towards AI-enhanced risk management in Agile project management using PMBOK and PRINCE2 methodologies, a mixed method survey-based approach was chosen. This method is particularly pertinent in this research due to the constant evolution and integration of AI technologies, allowing for a comprehensive exploration of the phenomena through diverse data sources. The research spanned over fourteen months (see Figure 9 below for a timeline), excluding the time dedicated to theoretical knowledge. This duration provided ample time for conceptualization and collecting detailed and relevant data from project management practitioners. Through this survey-based study, the researcher aims to capture the intricate perceptions and anticipation towards AI in risk management within Agile environments using PMBOK and PRINCE2 methodologies. The timeline for various stages of the research is as follows:

1. **Literature Review** (2 months): Conduct a comprehensive review of existing literature on AI in risk management, Agile methodologies, and using PMBOK and PRINCE2 methodologies. Five hundred fifty plus papers, journals, and articles were downloaded and studied during the Literature Review phase. Only the significant ones were referred to in the Literature Review chapter to shape the research. Additionally, a detailed research plan was developed during this stage. The literature review was a critical step in establishing the research's theoretical framework and identifying gaps in current knowledge.

2. **Data Collection** (1-2 months): Engaging with project management practitioners with experience in PMBOK and PRINCE2 methodologies within Agile environments and familiarity with AI-enhanced risk management. Data will be gathered through surveys, offering comparative insights into the appeal of PMBOK and PRINCE2 for incorporating AI-enhanced risk management in Agile project environments. This phase was conducted over one month. The

survey was distributed in our organization with 500,000 employees and marketed through LinkedIn and Google. Parallelly interviews we conducted during this period with industry experts and higher management. This phase required careful planning and coordination to ensure an adequate number of participants and the successful administration of surveys and interviews.

3. **Data Analysis and Interpretation** (1-2 months): Analysis and interpretation of survey responses concerning the research objectives and questions. This stage was crucial in understanding how project management practitioners perceive and anticipate AI-enhanced risk management in Agile project management using PMBOK and PRINCE2 methodologies. The data analysis process will involve quantitative techniques, such as statistical analysis, and qualitative methods, including thematic analysis, to derive meaningful insights from the data. Processing software was used for both quantitative and qualitative analysis.

4. **Writing and Review** (1-2 months): Writing up the research findings, drawing conclusions, and making revisions based on feedback from supervisors and peers. This stage involved synthesizing the research results into a cohesive and coherent narrative that addressed the research questions and contributed to the existing knowledge on AI-enhanced risk management in Agile environments.

It is important to note that these stages are not strictly linear and have many overlaps in parallel timelines. For example, preliminary data analysis began during the data collection to identify potential trends or emerging themes. Much time was spent conceptualizing and finalizing the research idea before we began the remaining process. Also, the estimated timeframe was based on progress per day than the number of months. On average, it was tracked as more than 12 hours of work in the later phases to complete the research paper and review it at the earliest. This study's nature enabled us to capture the evolving and nuanced anticipations and perceptions towards AI-enhanced risk management in Agile project environments using PMBOK and PRINCE2 methodologies. The research is designed to provide valuable, in-depth insights that can contribute significantly to project and AI-enhanced risk management.
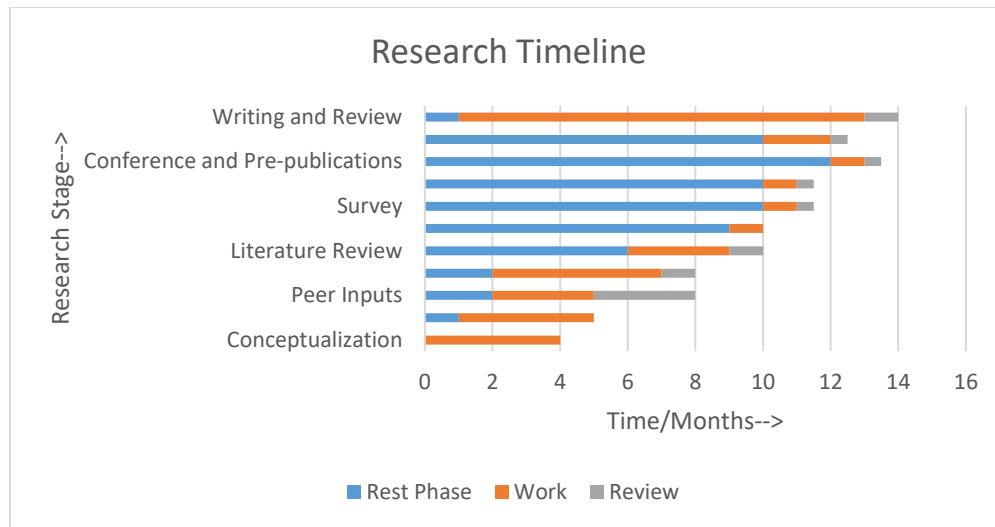
Figure 3-5 Research Timeline (Author's own illustration)

3.5.2.2 Data Collection and Sampling

Data collection and Sampling are a significant part of this mixed-methods study that combines quantitative and qualitative research approaches. This chapter outlines how the target population and sample frame were defined, how project management practitioners were selected and recruited, and the techniques used for Sampling and determining the sample size.

3.5.2.2.1 Primary Data Collection

This section details the various methods and techniques utilized to gather the primary data for this research project, as outlined in the provided data. The primary data collection process is essential for acquiring first-hand, original information directly from the target population. The methodologies selected for this research are Surveys and Interviews.

3.5.2.2.1.1 Surveys

Surveys were chosen as a principal data collection method for this study due to their ability to reach a wide array of participants, generate large quantities of quality data, and provide deep and broad insights. The surveys were designed to address the research objectives and questions, focusing on understanding perceptions, anticipations, and comparative preferences regarding

using AI-enhanced risk management in PMBOK and PRINCE2 methodologies within Agile environments.

A pilot test was conducted before administering the survey to the entire sample group, as described in the provided data. The pilot testing phase was essential to detect potential issues in the survey design and validate the instrument's reliability. Pre-testing with a sample group and assessing the reliability and validity of the survey instrument ensured the effectiveness and appropriateness of the survey for the main study.

Practitioners expressing interest in participating in the survey were carefully approached and provided with informed consent. Efforts were made to maintain a high response rate for the survey, including reminders and explaining the benefits to the academic and corporate world.

3.5.2.2.1.2 Interviews

In addition to surveys, interviews were conducted to gather in-depth qualitative data. These interviews allowed for a richer, more nuanced understanding of the perceptions and anticipations towards AI-enhanced risk management in Agile project management, specifically in the context of PMBOK and PRINCE2 methodologies. The structured interviews provided a balance between consistency across participants and flexibility to explore exciting or unexpected topics that arose during the conversation.

Just like the surveys, informed consent was crucial before conducting any interviews. The interviewees were briefed on the purpose and scope of the interview, the estimated duration, the recording process, and the confidentiality of their responses. As per UAE law, recording is restricted, so the interviews were transcribed directly in the old-fashioned way of pen and paper. Ensuring participation and collecting data via interviews required strategies to monitor and improve response rates similar to those employed during the survey collection.

Through these data collection methods, the research aimed to secure a high response rate for surveys and interviews, ensuring that the findings were robust, diverse, and representative of the target population.

3.5.2.2.2 Secondary Data Collection

Secondary data collection involved thoroughly examining existing literature, including academic articles, industry reports, case studies, and white papers. The secondary data provided context and background knowledge on the themes of the study. The data collected from various sources, coupled with the mixed-methods approach, contributed to the robustness and reliability of the research findings.

In conclusion, this study's data collection and sampling methods were carefully designed to comprehensively explore the perceptions and anticipations towards AI-enhanced risk management in Agile project management using PMBOK and PRINCE2 methodologies. The combination of surveys, interviews, and PRISMA-informed secondary data analysis provided a well-rounded understanding of the research problem. It allowed meaningful insights to contribute to the project and AI-enhanced risk management. The research rigor and ethical considerations further enhanced the quality and credibility of the study's outcomes.

3.6 Data Collection Procedures

3.6.1 Quantitative Survey Data Collection and presentation of results

In the following sections, we shall delve into the specifics of the findings from the survey. The survey data has been organized and illustrated through numerous figures, charts, and tables, summarizing the results and highlighting significant patterns and trends. Each of the ensuing sections is dedicated to a different aspect of our research objectives and questions. Each objective is addressed through pertinent questions from the survey, with the results presented sequentially.

3.6.1.2 Presentation of detailed survey results

3.6.1.2.1 Survey Demographics and Technical Specifications

Survey on Comparative Analysis of PMBOK vs PRINCE2 in Enhancing
Risk Management in Agile Methodology using Artificial Intelligence
and Tools for Projects

Data from All Time ⌄
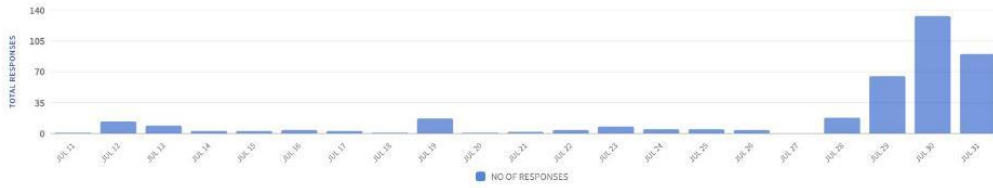
Figure 3-6 Survey Response Period; Source: (SurveySparrow (n.d.))
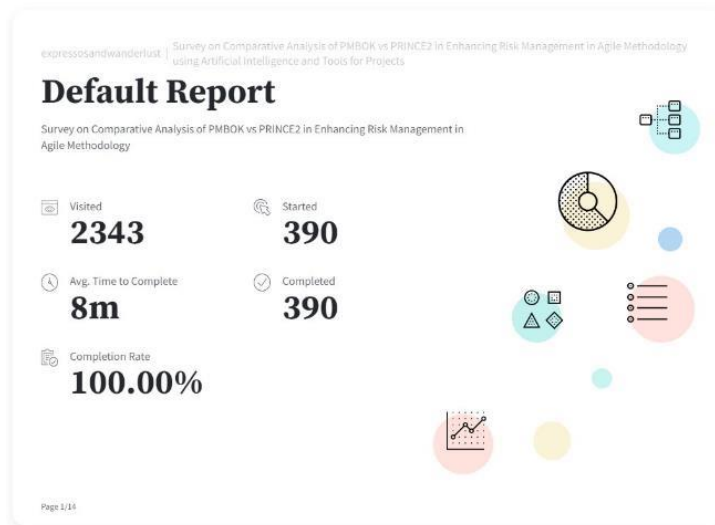
Figure 3-7 Survey Response Report; Source: (SurveySparrow (n.d.))

3.6.1.2.2 Survey Reports

How familiar are you with PMBOK and PRINCE2 methodologies?

Section 1/4: Perception of Risk Management Features in PMBOK and PRINCE2 *PMBOK is the Project Management Body of Knowledge *PRINCE2 is Projects IN Controlled Environments 2

Answered: **390**   Skipped: **0**
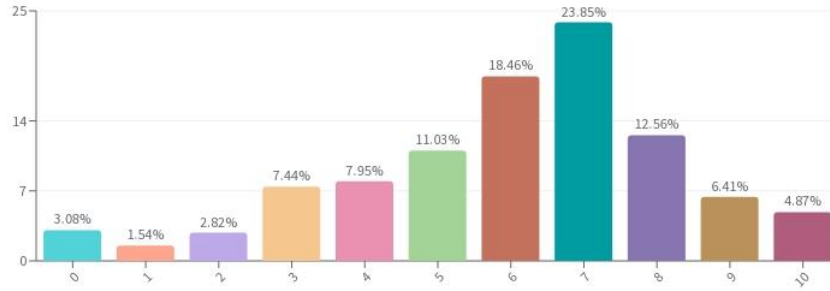
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
0	12	3.08 %
1	6	1.54 %
2	11	2.82 %
3	29	7.44 %
4	31	7.95 %
5	43	11.03 %
6	72	18.46 %
7	93	23.85 %
8	49	12.56 %
9	25	6.41 %
10	19	4.87 %

Figure 3-8 Q01 Familiarity with PMBOK and PRINCE2; Source: (SurveySparrow (n.d.))

QUESTION 02 | MATRIX

In your opinion, how effective are the risk processes in PMBOK when integrated into Agile environments?

Section 1/4: Perception of Risk Management Features in PMBOK and PRINCE2   For your information : -Risk Identification: systematically identifying and documenting potential risks to anticipate and mitigate threats, ensuring project success. -Risk Assessment: evaluating identified risks by analyzing their likelihood, impact, and prioritizing them for effective risk management decisions. -Risk Management Planning: developing strategies, processes, and actions to proactively address identified risks, mitigate their impact, and ensure effective risk response throughout the project lifecycle. -Risk Monitoring and Control: continuously tracking and evaluating identified risks, implementing appropriate measures to control and mitigate risks, and ensuring that risk management activities remain effective and aligned with project objectives. -Risk Communication: effectively conveying information about identified risks, their potential impact, and mitigation strategies to stakeholders, promoting transparency, understanding, and informed decision-making.

Answered: 390   Skipped: 0
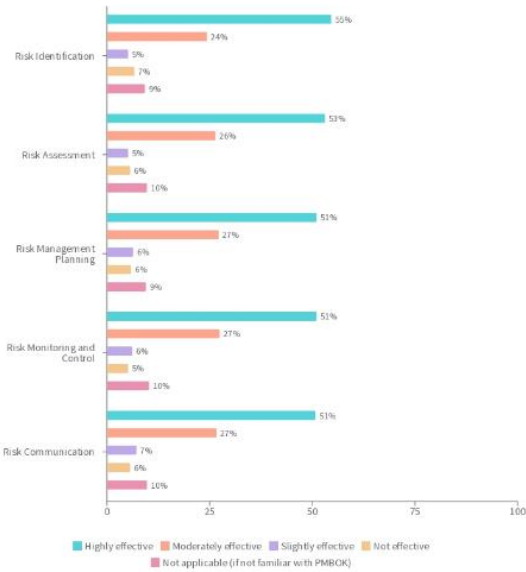
	HIGHLY EFFECTIVE	MODERATELY EFFECTIVE	SLIGHTLY EFFECTIVE
Risk Identification	213 (54.62%)	95 (24.36%)	20 (5.13%)
Risk Assessment	207 (53.08%)	103 (26.41%)	20 (5.13%)
Risk Management Planning	199 (51.03%)	106 (27.18%)	25 (6.41%)
Risk Monitoring and Control	199 (51.03%)	107 (27.44%)	24 (6.15%)
Risk Communication	198 (50.77%)	104 (26.67%)	28 (7.18%)
Total	1016 (52.10%)	515 (26.41%)	117 (6.00%)

	NOT EFFECTIVE	NOT APPLICABLE (IF NOT FAMILIAR WITH PMBOK)
Risk Identification	26 (6.67%)	36 (9.23%)
Risk Assessment	22 (5.64%)	38 (9.74%)
Risk Management Planning	23 (5.90%)	37 (9.49%)
Risk Monitoring and Control	20 (5.13%)	40 (10.26%)
Risk Communication	22 (5.64%)	38 (9.74%)
Total	113 (5.79%)	189 (9.69%)

Figure 3-9 Q02 Effectiveness of Risk Processes in PMBOK; Source: (SurveySparrow (n.d.))

QUESTION 03 | MATRIX

In your opinion, how effective are the risk processes in PRINCE2 when integrated into Agile environments?

Section 1/4: Perception of Risk Management Features in PMBOK and PRINCE2

Answered: **390**   Skipped: **0**
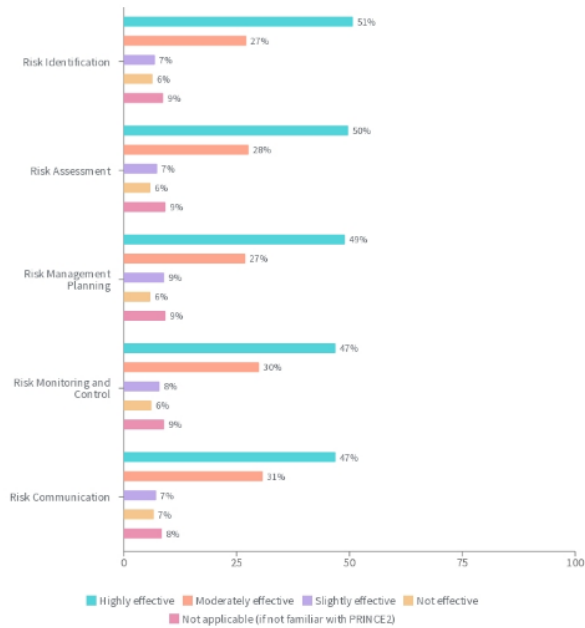
	HIGHLY EFFECTIVE	MODERATELY EFFECTIVE	SLIGHTLY EFFECTIVE
Risk Identification	198 (50.77%)	106 (27.18%)	27 (6.92%)
Risk Assessment	194 (49.74%)	108 (27.69%)	29 (7.44%)
Risk Management Planning	191 (48.97%)	105 (26.92%)	35 (8.97%)
Risk Monitoring and Control	183 (46.92%)	117 (30.00%)	31 (7.95%)
Risk Communication	183 (46.92%)	120 (30.77%)	28 (7.18%)
Total	**949 (48.67%)**	**556 (28.51%)**	**150 (7.69%)**

	NOT EFFECTIVE	NOT APPLICABLE (IF NOT FAMILIAR WITH PRINCE2)
Risk Identification	25 (6.41%)	34 (8.72%)
Risk Assessment	23 (5.90%)	36 (9.23%)
Risk Management Planning	23 (5.90%)	36 (9.23%)
Risk Monitoring and Control	24 (6.15%)	35 (8.97%)
Risk Communication	26 (6.67%)	33 (8.46%)
Total	**121 (6.21%)**	**174 (8.92%)**

Figure 3-10 Q03 Effectiveness of Risk Process in PRINCE2; Source: (SurveySparrow (n.d.))

74

Figure 3-11 Q04 Familiarity with AI tools; Source: (SurveySparrow (n.d.))

QUESTION 05 | MULTIPLE CHOICE

What are your expectations regarding the integration of Artificial Intelligence tools in risk identification within Agile methodologies, specifically in the context of PMBOK and PRINCE2 frameworks?

Section 2/4: Anticipation of Artificial Intelligence in Agile Risk Management

Answered: **390**   Skipped: **0**
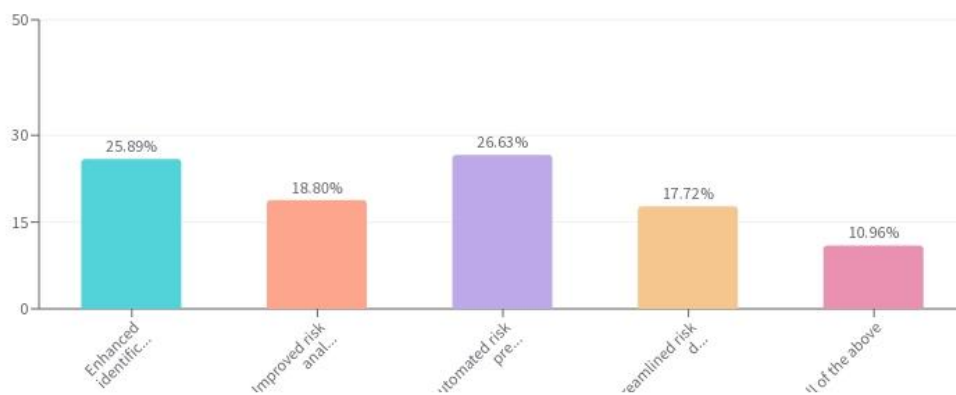
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
Enhanced identification of risks and opportunities	314	25.89 %
Improved risk analysis and prioritization	228	18.80 %
Automated risk prediction and trend analysis	323	26.63 %
Streamlined risk documentation and reporting	215	17.72 %
All of the above	133	10.96 %

Figure 3-12 Q05 Expectations from AI tools integration; Source: (SurveySparrow (n.d.))

QUESTION 06 | MULTIPLE CHOICE

What challenges do you anticipate in incorporating Artificial Intelligence tools in risk management within Agile methodologies, particularly in the context of PMBOK and PRINCE2 frameworks?

Section 2/4: Anticipation of Artificial Intelligence in Agile Risk Management

Answered: **390**   Skipped: **0**
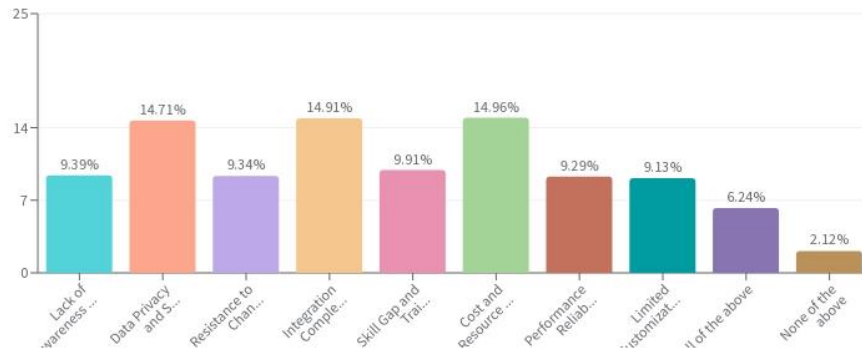
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
Lack of Awareness and Understanding	182	9.39 %
Data Privacy and Security Concerns	285	14.71 %
Resistance to Change	181	9.34 %
Integration Complexity	289	14.91 %
Skill Gap and Training Needs	192	9.91 %
Cost and Resource Constraints	290	14.96 %
Performance Reliability and Accuracy	180	9.29 %
Limited Customization and Adaptability	177	9.13 %
All of the above	121	6.24 %
None of the above	41	2.12 %

Figure 3-13 Q06 Challenges in Incorporating AI tools; Source: (SurveySparrow (n.d.))

77

How important do you think it is for Agile project management practitioners to have knowledge and skills in utilizing Artificial Intelligence tools for risk management?

Section 2/4: Anticipation of Artificial Intelligence in Agile Risk Management

Answered: **390**   Skipped: **0**
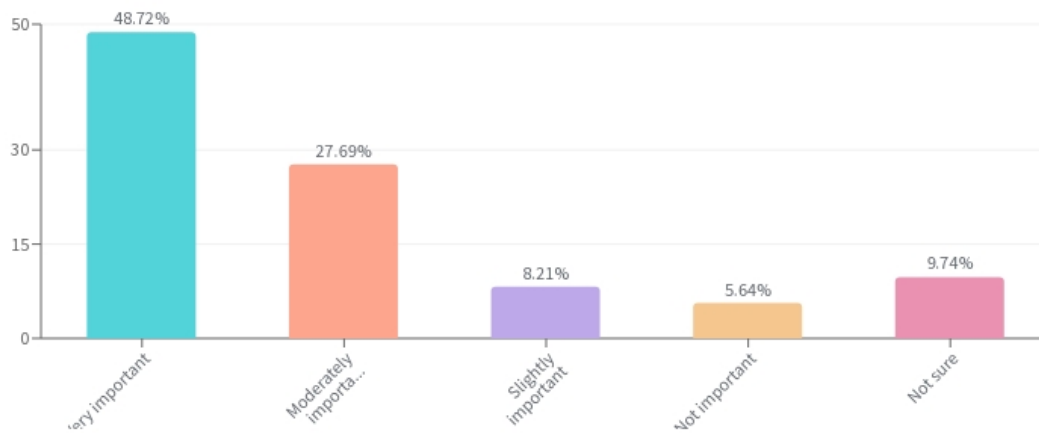
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
Very important	190	48.72 %
Moderately important	108	27.69 %
Slightly important	32	8.21 %
Not important	22	5.64 %
Not sure	38	9.74 %

Figure 3-14 Q07 Skillset requirement of AI; Source: (SurveySparrow (n.d.))

Figure 3-15 Q08 Appeal of PMBOK and PRINCE2; Source: (SurveySparrow (n.d.))
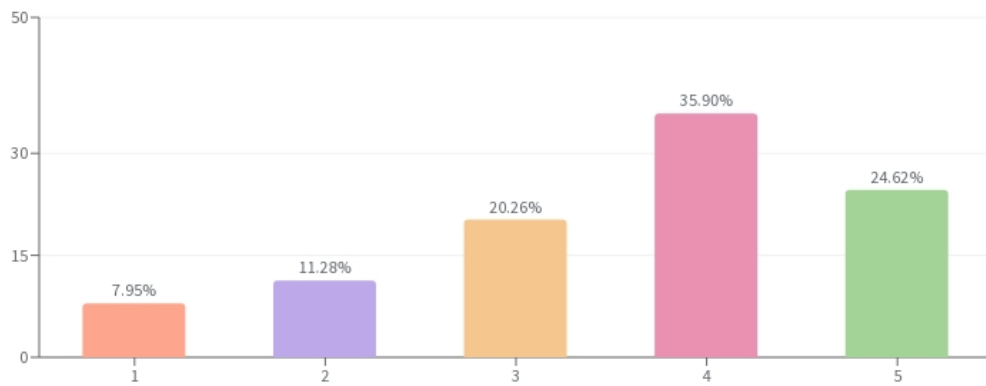
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
1	31	7.95 %
2	44	11.28 %
3	79	20.26 %
4	140	35.90 %
5	96	24.62 %

Figure 3-16 Q09 Scope of Artificial Intelligence; Source: (SurveySparrow (n.d.))
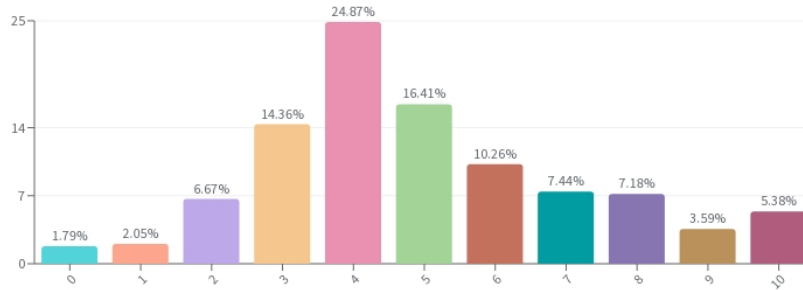
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
0	7	1.79 %
1	8	2.05 %
2	26	6.67 %
3	56	14.36 %
4	97	24.87 %
5	64	16.41 %
6	40	10.26 %
7	29	7.44 %
8	28	7.18 %
9	14	3.59 %
10	21	5.38 %

Figure 3-17 Q10 Anticipated Timeframe for maturity; Source: (SurveySparrow (n.d.))

QUESTION 11 | MULTIPLE CHOICE

What is your role in project management?

Section 4/4: Personal and Demographic Information.

Answered: **390**   Skipped: **0**
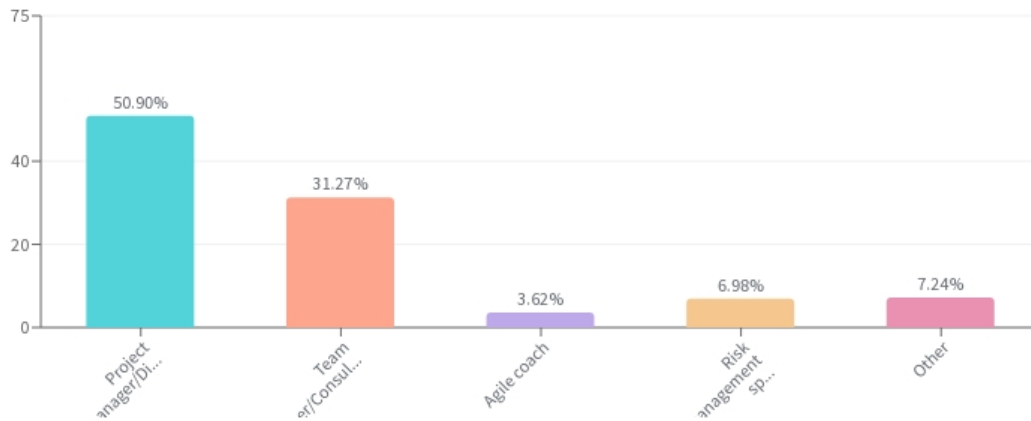
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
Project manager/Directors/C-Level Executives	197	50.90 %
Team member/Consultant/Developer/Tester	121	31.27 %
Agile coach	14	3.62 %
Risk management specialist	27	6.98 %
Other	28	7.24 %

Figure 3-18 Q11 PM role demographics; Source: (SurveySparrow (n.d.))
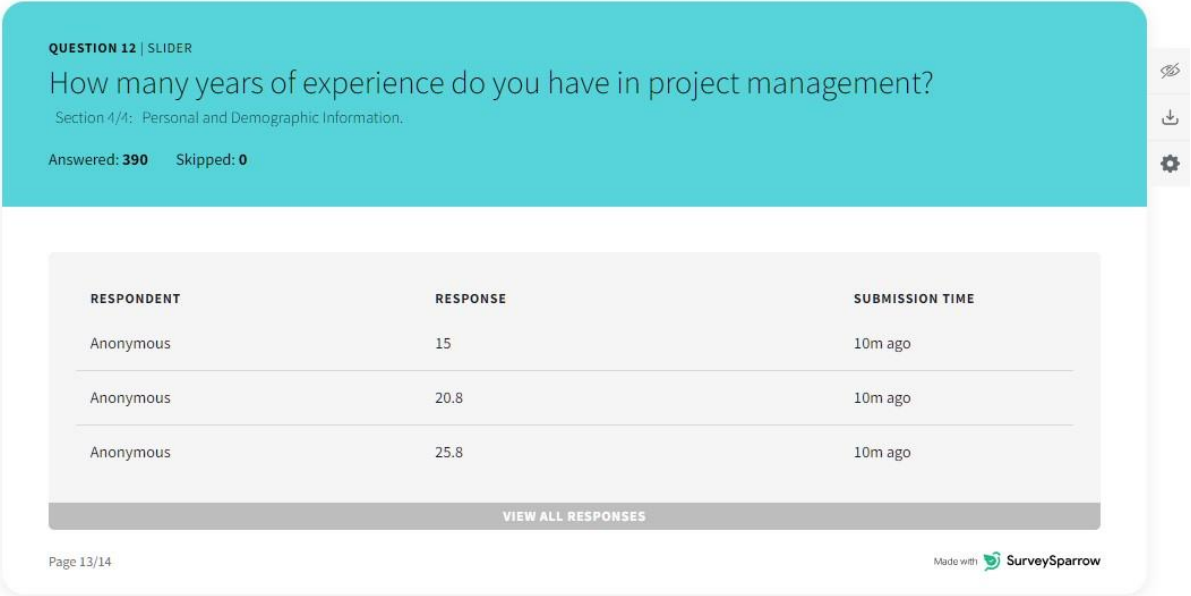
Figure 3-19 Q12 Project management experience data; Source: (SurveySparrow (n.d.))
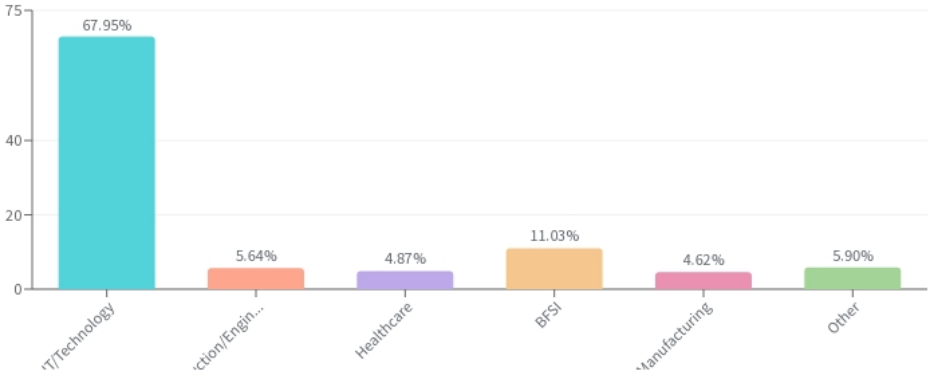
ANSWER CHOICES	RESPONSES	RESPONSE PERCENTAGE
IT/Technology	265	67.95 %
Construction/Engineering	22	5.64 %
Healthcare	19	4.87 %
BFSI	43	11.03 %
Manufacturing	18	4.62 %
Other	23	5.90 %

Figure 3-20 Q13 Industry demographics data; Source: (SurveySparrow (n.d.))

3.6.2 Qualitative Research Interview Data Collection

The qualitative research interviews played a pivotal role in unravelling the perceptions, expectations, and challenges project management practitioners face in integrating AI-enhanced

risk management within Agile methodologies. A purposeful sampling technique was utilized to select 12 senior-level executives, heads of departments, and C-Level executives as participants who brought diverse experiences and perspectives to the study.

Structured interviews were conducted with each participant, facilitated by a pre-defined interview guide. These interviews were designed to explore participants' familiarity with Agile methodologies, views on risk management practices, expectations about AI integration, perceived challenges, and potential implementation strategies. The interviews, ranging from 9-15 minutes, were recorded to ensure an accurate representation of participants' insights.

To enhance the credibility of the collected data, several measures were implemented. Sending the interview questions in advance and re-iterating the questions to make sure participants understand the context clearly. Member checking allowed participants to verify the accuracy of their transcribed responses, contributing to the validity of the interpretations. A reflexive journal was also maintained for the research records, documenting personal biases and reflections throughout the data collection process.

The transcripts of the qualitative research interviews are in the Appendix section, providing readers with an unfiltered view of participants' viewpoints and enriching the study's overall findings.

3.7 Data Analysis and Limitations

The data analysis is a crucial step following data collection and will be tailored to suit the type of data gathered and the research questions and objectives. The study involves both quantitative and qualitative processes to ensure a comprehensive understanding of the research problem.

Quantitative Data Analysis:
The data was collected through surveys, as stated in the provided data. The survey responses will include Likert scale questions and other numerical information. The quantitative data is analyzed using statistical software such as SPSS, Excel, and Power BI. Descriptive statistics summarized

the data, providing an overview of project management practitioners' perceptions of the effectiveness of PMBOK and PRINCE2 methodologies when integrated into Agile environments. Inferential statistics, such as t-tests, chi-square tests, or correlation analyses, were used to explore potential relationships between variables. The research also offered insights into the expectations and perceived challenges regarding incorporating AI tools in risk management within these methodologies.

Qualitative Data Analysis:

As mentioned in the provided data, qualitative data were primarily gathered through open-ended interview questions. The data underwent a thematic analysis, following the six-phase process outlined by Braun and Clarke (2006). This process involves familiarizing yourself with the gathered data, generating initial codes from them, searching for themes, reviewing the themes found, defining and naming themes, and producing the report. However, most of the process was applied using the industry top-grade qualitative analysis tool NVivo. The thematic analysis provided more profound insights into project management practitioners' comparative perceptions of PMBOK and PRINCE2 methodologies for incorporating AI-enhanced risk management in Agile project environments.

Data Triangulation:

Data triangulation was carried out to enhance the validity and reliability of the research findings. This process involves cross-checking and confirming the results obtained from both our quantitative and qualitative analyses. The research aimed to ensure the conclusions are well-founded and robust by triangulating the data.

The results chapter will apply these data analysis techniques to the collected data, providing valuable insights into the perceptions, anticipations, and comparisons of PMBOK, PRINCE2, Agile methodologies, and AI-enhanced risk management.

3.7.1 Quantitative Analysis on Survey Data Using IBM SPSS

3.7.1.1 Introduction

In this chapter, we present the results of the quantitative analysis conducted using the IBM SPSS (Statistical Package for the Social Sciences) software, version 29.0.1.0. SPSS is a powerful tool used for complex data manipulation and analysis. It has enabled us to manage our data effectively and perform various statistical tests that have helped uncover trends and insights from our survey responses.

In this chapter, we present the results of the quantitative analysis conducted using the IBM SPSS (Statistical Package for the Social Sciences) software. SPSS is a powerful tool used for complex data manipulation and analysis. It has enabled us to manage our data effectively and perform various statistical tests that have helped uncover trends and insights from our survey responses.

Initial Data Overview:
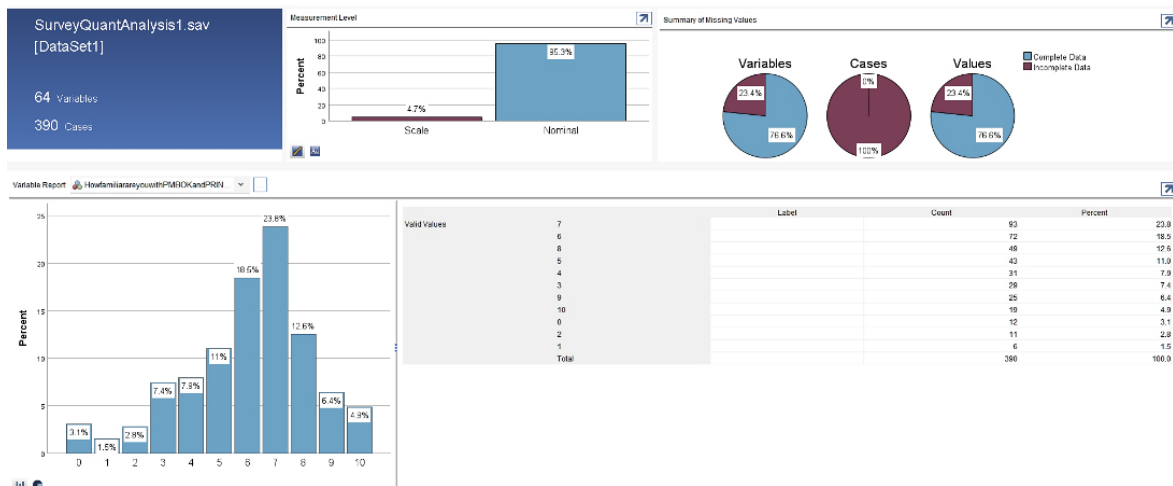
Figure 3-21 Initial Data Overview; Source: (Generated using IBM SPSS Statistics)

After Transformation:
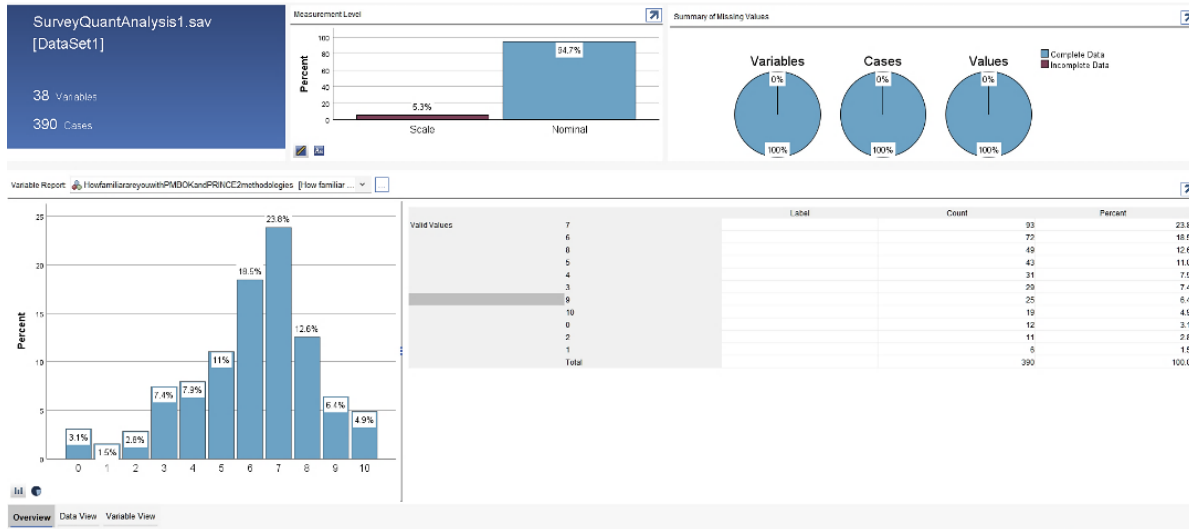
Figure 3-22 Data post transformation; Source: (Generated using IBM SPSS Statistics)

3.7.1.2 Data Preparation and Cleaning in SPSS

The data preparation and cleaning process in SPSS (Statistical Package for the Social Sciences) involves several steps. The following steps were followed during the Data Preparation and Cleaning process in SPSS:

1. Data Import: The first step was completed successfully after exporting it from the survey portal.

2. Identify Missing Data: On careful check, no missing data was found that could impact the analysis. The variables which had no impact were removed.

3. Handling Missing Data: NA

4. Check for Outliers: No Outliers were present as these were closed-ended questions.

5. Deal with Outliers: NA.

6. Data Transformation: Data transformation was carefully done. Variables were removed that had no impact. Blank fields will be considered null for any calculations below.

3.7.1.3 Descriptive Analysis in SPSS

This section will explore the descriptive statistics computed from our data set. This includes measures of central tendency like mean, median, and mode, and measures of dispersion such as

range, interquartile range, variance, and standard deviation. The descriptive statistics performed gave the following results:

(note - This analysis provides essential summaries about the sample and the measures. This included calculating measures of central tendency (mean, median, mode), measures of dispersion (range, standard deviation, variance), and frequency distributions.)

Table 3-7 Descriptive Analysis in SPSS; Source: (Generated using IBM SPSS Statistics)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
How familiar are you with PMBOK and PRINCE2 methodologies?	390	0	10	6.01	2.270
Based on your understanding and experience, How do you rate the scope of Artificial Intelligence (AI) in the coming years for risk management in Agile projects following PMBOK and PRINCE2 frameworks?	390	1	5	3.58	1.201

	N	Minimum	Maximum	Mean	Std. Deviation
In your opinion, in the coming decade what timeframe do you anticipate the maturity of Artificial Intelligence (AI) in risk management for Agile projects following PMBOK and PRINCE2 methodologies?	390	0	10	4.97	2.276
How many years of experience do you have in project management?	390	.0	30.0	11.065	6.6680
How familiar are you with Artificial Intelligence / AI tools in the context of risk management?	390	0	100	47.52	21.581
Valid N (listwise)	390				

3.7.1.4 Reliability Analysis in SPSS

"Beyond the descriptive statistics, this section will delve into the reliability statistical analysis. This involves testing hypotheses, examining relationships between variables, and then drawing our conclusions about the population based on our sample data."

Scale: ALL VARIABLES

Table 3-8 Reliability Analysis in SPSS- Case Processing Summary; Source: (Generated using IBM SPSS Statistics)

Case Processing Summary

		N	%
Cases	Valid	390	100.0

Excluded[a]	0	.0
Total	390	100.0

a. Listwise deletion based on all variables in
the procedure.

Table 3-9 Reliability Analysis in SPSS- Reliability Statistics; Source: (Generated using IBM SPSS Statistics)

Reliability Statistics

Cronbach's Alpha	N of Items
.370	3

Fleiss Multirater Kappa

Table 3-10 Reliability Analysis in SPSS- Fleiss Multirater Kappa; Source: (Generated using IBM SPSS Statistics)

Overall Agreement[a]

	Kappa	Asymptotic Standard Error	z	Sig.	Asymptotic 95% Confidence Interval Lower Bound	Upper Bound
Overall Agreement	.002	.005	.405	.685	-.007	.011

a. Sample data contains 390 effective subjects and 2 raters.

3.7.1.5 Cross-tabulation

Cross Tabulations were performed among variables to check the relationships and the total percentage. All of them came as 100 percent. Sample case processing is provided below.

Table 3-11 Cross Tabulation- Case Processing Summary; Source: (Generated using IBM SPSS Statistics)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
How familiar are you with PMBOK and PRINCE2 methodologies? * How familiar are you with Artificial Intelligence / AI tools in the context of risk management?	390	100.0%	0	0.0%	390	100.0%

3.7.1.6 Correlation Analysis

Table 3-12 Correlation Analysis; Source: (Generated using IBM SPSS Statistics)

Correlations

	How familiar are you with PMBOK and PRINCE2 methodologies?	How familiar are you with Artificial Intelligence / AI tools in the context of risk management?	Based on your understanding and experience, How do you rate the scope of Artificial Intelligence (AI) in the coming years for risk management in Agile projects following	In your opinion, in the coming decade what timeframe do you anticipate the maturity of Artificial Intelligence (AI) in risk management for Agile projects following PMBOK and	How many years of experience do you have in project management?

				PMBOK and PRINCE2 frameworks?	PRINCE2 methodologies?	
How familiar are you with PMBOK and PRINCE2 methodologies?	Pearson Correlation	1	.409**	.447**	-.304**	.468**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000
	N	390	390	390	390	390
How familiar are you with Artificial Intelligence / AI tools in the context of risk management?	Pearson Correlation	.409**	1	.394**	-.283**	.398**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
	N	390	390	390	390	390
Based on your understanding and experience, How do you rate the scope of Artificial Intelligence (AI) in the coming years for risk management in Agile projects following PMBOK and	Pearson Correlation	.447**	.394**	1	-.445**	.346**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000
	N	390	390	390	390	390

PRINCE2 frameworks?						
In your opinion, in the coming decade what timeframe do you anticipate the maturity of Artificial Intelligence (AI) in risk management for Agile projects following PMBOK and PRINCE2 methodologies ?	Pearson Correlatio n	-.304**	-.283**	-.445**	1	-.244**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
	N	390	390	390	390	390
How many years of experience do you have in project management?	Pearson Correlatio n	.468**	.398**	.346**	-.244**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	390	390	390	390	390

**. Correlation is significant at the 0.01 level (2-tailed).

3.7.1.7 Regression Analysis

In this context, regression analysis examines and comprehends the correlation between the independent and ithe dependent variables. If the dependent variable is dichotomous, we use logistic regression. If it is continuous, linear regression is more appropriate.

Table 3-13 Regression Analysis; Source: (Generated using IBM SPSS Statistics)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	How many years of experience do you have in project management?, How familiar are you with Artificial Intelligence / AI tools in the context of risk management?[b]	.	Enter

a. Dependent Variable: How familiar are you with PMBOK and PRINCE2 methodologies?

b. All requested variables entered.

Table 3-14 Regression Model Summary; Source: (Generated using IBM SPSS Statistics)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.527ª	.278	.274	1.934

a. Predictors: (Constant), How many years of experience do you have in project management?, How familiar are you with Artificial Intelligence / AI tools in the context of risk management?

Table 3-15 Regression Analysis- ANOVA; Source: (Generated using IBM SPSS Statistics)

ANOVAª

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	556.869	2	278.435	74.463	<.001ᵇ
	Residual	1447.089	387	3.739		
	Total	2003.959	389			

a. Dependent Variable: How familiar are you with PMBOK and PRINCE2 methodologies?

b. Predictors: (Constant), How many years of experience do you have in project management?, How familiar are you with Artificial Intelligence / AI tools in the context of risk management?

Table 3-16 Regression Analysis- Coefficients; Source: (Generated using IBM SPSS Statistics)

Coefficientsª

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.323	.251		13.220	<.001
	How familiar are you with Artificial Intelligence / AI tools in the context of risk management?	.028	.005	.264	5.611	<.001

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	How many years of experience do you have in project management?	.124	.016	.363	7.704	<.001

a. Dependent Variable: How familiar are you with PMBOK and PRINCE2 methodologies?

3.7.1.8 Interpretation of SPSS Analysis Results

Descriptive Analysis:

The Descriptive Statistics table gives an overview of the basic features of the data collected from the survey for each of the five questions listed. The table describes the size of the sample (N), minimum and maximum values, mean (average), and standard deviation (Std. Deviation) for each question.

Question 1: "How familiar are you with PMBOK and PRINCE2 methodologies?": The average response to this question was 6.01 out of 10, suggesting that most respondents have a somewhat above-average familiarity with PMBOK and PRINCE2 methodologies. The standard deviation of 2.270 indicates that responses varied somewhat around this average.

Question 2: "Based on your understanding and experience, How do you rate the scope of Artificial Intelligence (AI) in the coming years for risk management in Agile projects following PMBOK and PRINCE2 frameworks?": On a scale of 1 to 5, the mean response was 3.58. This indicates that, on average, respondents perceive the scope of AI in risk management in Agile projects as slightly above moderately effective. The standard deviation of 1.201 shows that the responses were dispersed around this average.

Question 3: "In your opinion, in the coming decade, what timeframe do you anticipate the maturity of Artificial Intelligence (AI) in risk management for Agile projects following PMBOK and PRINCE2 methodologies?": The mean response to this question was 4.97 out of 10, indicating somewhat middling anticipation for the maturity of AI in risk management in the next decade. The standard deviation 2.276 suggests a fair amount of variation in these responses.

Question 4: "How many years of experience do you have in project management?": The average number of years of experience in project management among the respondents was approximately 11 years, with a reasonably high standard deviation of 6.668 years. This suggests a wide range of experience levels among the respondents.

Question 5: "How familiar are you with Artificial Intelligence / AI tools in the context of risk management?": The average familiarity was 47.52 out of 100, suggesting that the respondents, on average, have a moderately low level of familiarity with AI tools in the context of risk management. The standard deviation of 21.581 indicates quite a wide dispersion in responses, suggesting a broad range of familiarity levels with AI tools in this context.

Descriptive analysis summarizes the data and offers insights into the data's central tendency, dispersion, and distribution. It gives a clear and concise snapshot of the data, which is helpful in further understanding the dataset's characteristics before conducting more complex analyses. Descriptive statistics also provide:

- An excellent initial measure to understand response trends.
- Respondents' demographics.
- General behaviors or attitudes toward the research's subjects.

It sets the stage for further, mor complex analyses and hypothesis testing.

Reliability Analysis

In alignment with the research objectives and questions, the conducted analysis provides an insightful understanding of the survey results, albeit with certain limitations common in empirical research. The reliability analysis and Fleiss Multirater Kappa may indicate a less-than-ideal internal consistency and agreement among raters, but this can also be interpreted as a reflection of the diverse viewpoints and understandings within the community of project management practitioners regarding AI-enhanced risk management in Agile project management, particularly in the context of PMBOK and PRINCE2 methodologies.

The Cronbach's Alpha score of 0.370, while somewhat lower than the traditionally acceptable level, could suggest that our respondents do not hold uniform opinions and that there is significant diversity in their perceptions. This diversity might be beneficial, as it indicates the presence of an expansive range of perspectives on the topic under investigation. This diversity could result in more affluent, more nuanced findings, allowing us to understand better the complexity and depth of practitioners' perceptions and anticipations toward AI-enhanced risk management.

The Fleiss Multirater Kappa of 0.002 highlights the disparity among the raters, potentially revealing a broad spectrum of understandings and experiences within the domain of project management, particularly regarding the integration of AI in risk management within Agile methodologies and the adoption of PMBOK and PRINCE2 frameworks. This, too, underlines the complexity of the subject matter, making it a worthwhile area of research.

The Cross-tabulations showed no missing cases, meaning all 390 survey respondents responded to both the questions about their familiarity with PMBOK and PRINCE2 methodologies and their familiarity with Artificial Intelligence/AI tools in the context of risk management. This 100% response rate bolsters the comprehensiveness of the dataset and contributes to the robustness of the analyses and findings.

Despite certain limitations, this research significantly contributes to the current knowledge on the perceptions and anticipations towards AI-enhanced risk management in Agile project management. It invites future research to delve further into this multifaceted area and continue this critical dialogue in project management research.

Correlational Analysis

The correlation analysis offered valuable insights directly relevant to the research objectives and questions. The investigation revealed several significant correlations among the key variables under study.

Firstly, there is a considerably significant positive correlation between the familiarity of project management practitioners with PMBOK and PRINCE2 methodologies and their familiarity with Artificial Intelligence or AI tools in the context of risk management (r = .409, p < .01). This suggests that those who are more familiar with these project management methodologies also tend to be more familiar with AI tools. This finding speaks to the first research objective, illustrating the close association between practitioners' understanding of these methodologies and their knowledge of AI tools.

Secondly, the analysis reveals a substantial positive correlation between the familiarity of project management practitioners with PMBOK and PRINCE2 methodologies and their anticipation of the scope of AI in the coming years for risk management in Agile projects following these frameworks (r = .447, p < .01). This relationship indicates that those who are more conversant with these methodologies also foresee a more substantial role for AI in risk management within Agile methodologies. This result aligns with the second research objective, revealing the anticipation within the project management community regarding the potential of AI integration in risk management within Agile methodologies.

However, the analysis also reveals a significant negative correlation between the anticipated timeframe for the maturity of AI in risk management for Agile projects following PMBOK and PRINCE2 methodologies and both the familiarity with these methodologies (r = -.304, p < .01) and the familiarity with AI tools (r = -.283, p < .01). This suggests that the more familiar the respondents are with these methodologies and AI tools, the sooner they anticipate the maturity of AI in risk management. This finding is interesting, highlighting the perceived challenges and timescales for integrating AI tools in risk management within Agile methodologies, fulfilling the second research objective.

Finally, a strong positive correlation was found between the number of years of experience in project management and the familiarity with both PMBOK and PRINCE2 methodologies (r = .468, p < .01) and AI tools (r = .398, p < .01). This suggests that more experienced practitioners are more likely to be familiar with both these methodologies and AI tools. This relationship underscores the importance of practical experience in building knowledge and understanding in this field, potentially informing training and development strategies in the industry.

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In conclusion, the correlation analysis provides valuable insights. It supports the research aims and questions, contributing significantly to our understanding of the current perceptions, anticipations, and understanding regarding AI-enhanced risk management in Agile project management within the context of PMBOK and PRINCE2 methodologies.

Regression Analysis

The regression analysis provides clear insights that support the research objectives and questions. It reveals significant relationships between the familiarity of project management practitioners with PMBOK and PRINCE2 methodologies and their experience in project management and familiarity with Artificial Intelligence/AI tools in the context of risk management.

The model summary indicates an R square value of .278, suggesting that the model explains approximately 27.8% of the variance in the familiarity of project management practitioners with PMBOK and PRINCE2 methodologies. This indicates a moderate effect size and is a clear pointer to the relevance of the predictor variables in understanding and predicting practitioners' familiarity with these project management methodologies.

The ANOVA table confirms the statistical significance of the model (F = 74.463, p < .001), indicating that the predictors used (i.e., years of experience in project management and familiarity with AI tools in risk management) do have a significant effect on the dependent variable (familiarity with PMBOK and PRINCE2 methodologies).

The coefficients table provides further insights. The significant positive beta coefficients for both familiarity with AI tools in risk management (.264, p < .001) and years of experience in project management (.363, p < .001) indicate that as familiarity with AI tools and years of experience in project management increase, so does familiarity with PMBOK and PRINCE2 methodologies.

These findings strongly support the first research objective, providing concrete evidence that the understanding and perceptions of project management practitioners regarding implementing risk management features of PMBOK and PRINCE2 methodologies within Agile environments are

positively associated with their familiarity with AI tools and years of experience in project management. The findings also back up the second research objective, showing that those familiar with AI tools in risk management are likely to be more conversant with PMBOK and PRINCE2 methodologies.

Overall, the regression analysis offers clear evidence that the integration of Artificial Intelligence tools in risk management within Agile methodologies, specifically in the context of PMBOK and PRINCE2 frameworks, is connected to the familiarity of practitioners with these methodologies and the number of years they have spent in project management. This highlights the importance of AI familiarity and experience for the current and future implementation of AI-enhanced risk management in Agile project management.

3.7.2 Qualitative Analysis on Research Interviews using NVivo

3.7.2.1 Data Collection Recap

As previously outlined in the Methodology chapter, the primary means of data collection for this research was through open-ended survey questions directed at experienced project management practitioners. The participants represented an extensive range of roles within the field of project management, with each one providing unique and invaluable insights pertinent to the research objectives and questions. The responses to these questions gave in-depth qualitative data about the perceptions, anticipations, and challenges experienced by practitioners concerning the integration of AI-enhanced risk management within Agile environments, specifically concerning the PMBOK and PRINCE2 methodologies.

The recruitment of the 12 participants was strategically done to ensure a diverse representation of the project management field. The participants, drawn from sectors such as IT and BFSI, held roles ranging from service delivery managers, directors, risk experts, and risk analysts to architects, cloud specialists, and managers. All participants had over a decade of experience in their respective domains, ensuring a mature understanding and outlook on the research topics.

The open-ended survey questions were framed to capture the participants' nuanced perceptions and anticipations about the study's research questions. This included their views on the effectiveness of risk management features of PMBOK and PRINCE2 methodologies when integrated into Agile environments. It also encapsulated their expectations and perceived challenges about incorporating AI tools into risk management within these methodologies.

The collected data was then prepared for a detailed thematic analysis as proposed by Braun and Clarke (2006). This rigorous approach of analysis is critical in firstly identifying, then analyzing, and finally reporting patterns within the data, thus allowing a comprehensive understanding of the perceptions and anticipations towards AI-enhanced risk management in Agile project management, as well as the comparative appeal of PMBOK and PRINCE2 methodologies in this context. The following sections of this chapter will delve into the findings derived from this analysis and discuss them concerning the study's research objectives and questions.

3.7.2.2 Explanation of Analytical Tool (NVivo)

NVivo, version 14, is a powerful computer-assisted qualitative data analysis software (CAQDAS), was employed to analyze qualitative data. The choice of NVivo as the primary tool for data analysis in this research was motivated by several factors.

First, NVivo is widely acknowledged for its ability to manage, organize, and analyze large volumes of diverse data sources. In qualitative research, data often originate from unstructured formats such as interview transcripts, field notes, or social media content; NVivo's features enable effective data handling.

Second, NVivo supports researchers in facilitating the iterative nature of qualitative analysis. The software allows for easy data retrieval, re-categorization, and re-analysis as understanding deepens and interpretations evolve during the research process.

Third, NVivo offers a robust platform for coding qualitative data, a crucial step in qualitative analysis. *Coding* is the process of categorizing and tagging data and is made more efficient and

manageable with NVivo. The software allows for deductive and inductive coding strategies, enabling the development of themes and sub-themes.

Moreover, NVivo offers a visualization feature that assists in identifying the patterns, relationships, and trends in the data. Graphs, charts, and diagrams can be created to facilitate a deeper understanding of the
data, adding layers to the analysis.

Finally, NVivo promotes transparency and replicability in qualitative research. It does this by recording all analytical decisions made during the research process, leaving an 'audit trail' that others can examine. This enhances the reliability and validity of the research findings.

While NVivo cannot replace the researcher's role in interpreting and making sense of the data, it significantly aids in qualitative data's systematic and rigorous analysis. It should be noted, however, that the
software does not analyze the data autonomously. The insights drawn wholly depend on the researcher's interpretive lens and understanding of the context.

3.7.2.3 Thematic Analysis

The thematic analysis, conducted utilizing NVivo software, followed the process outlined by Braun and Clarke (2006) to identify patterns within the qualitative data collected from the open-ended survey questions. This section presents the methodology and findings of the thematic analysis, which helped distill key themes and understand the perceptions and anticipations of project management practitioners concerning AI-enhanced risk management within Agile project management, particularly in the context of PMBOK and PRINCE2 methodologies.

3.7.2.3.1 Familiarization with Data

The first step in the thematic analysis was to familiarize ourselves with the data. All survey responses were meticulously read and re-read within the NVivo environment to understand the participants' views, experiences, and expectations regarding incorporating AI in risk management within Agile methodologies. This step provided a comprehensive dataset overview and set the

foundation for generating initial codes. The data was fed into the tool, as shown in the Figure below:
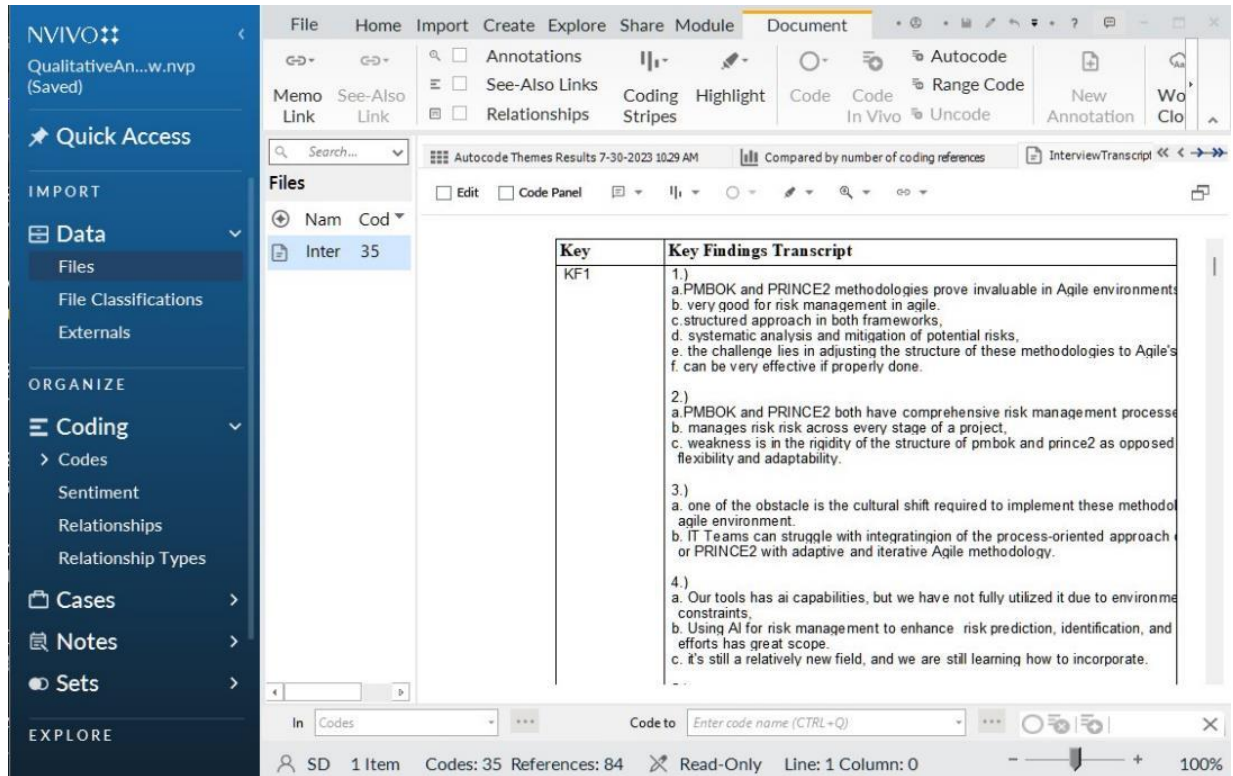
Figure 3-23 Data Import; Source: (Generated using NVivo)

3.7.2.3.2 Generation of Initial Codes

Using the coding features of NVivo, initial codes were generated. Coding is organizing the data into meaningful groups that share some common aspects. Each participant's responses were dissected into manageable segments (refer to Word Frequency Query in APPENDIX F), and initial codes were assigned to these segments within NVivo based on their relevance to the research objectives and questions. The following coding structure formatted report and the Comparison of the Number of Coding References were generated.

Table 3-17 Generated Coding Structure; Source: (Generated using NVivo)

Code Structure			
Qualitative Analysis Research Interview			
Hierarchical Name	**Nick nam**	**Aggregat e**	**User Assigne**
Code			
Codes\\Autocoded Themes			
Codes\\Autocoded Themes\\ai-enhanced risk		Yes	None
Codes\\Autocoded Themes\\ai-enhanced risk		No	None
Codes\\Autocoded Themes\\approach		Yes	None
Codes\\Autocoded Themes\\approach\process-oriented		No	None
Codes\\Autocoded Themes\\approach\structured approach		No	None
Codes\\Autocoded Themes\\environment		Yes	None
Codes\\Autocoded Themes\\environment\agile environment		No	None
Codes\\Autocoded Themes\\environment\environment		No	None
Codes\\Autocoded Themes\\fast pace		Yes	None
Codes\\Autocoded Themes\\fast pace\fast pace		No	None
Codes\\Autocoded Themes\\issues		Yes	None
Codes\\Autocoded Themes\\issues\black box issue		No	None
Codes\\Autocoded Themes\\issues\potential issues		No	None
Codes\\Autocoded Themes\\management		Yes	None
Codes\\Autocoded Themes\\management\good change		No	None
Codes\\Autocoded Themes\\management\project managers		No	None
Codes\\Autocoded Themes\\methodologies		Yes	None
Codes\\Autocoded Themes\\methodologies\agile		No	None
Codes\\Autocoded Themes\\methodologies\prince2		No	None
Codes\\Autocoded Themes\\methodologies\procedural		No	None
Codes\\Autocoded Themes\\methodologies\thorough		No	None
Codes\\Autocoded Themes\\risk		Yes	None
Codes\\Autocoded Themes\\risk\ai-enhanced risk		No	None
Codes\\Autocoded Themes\\risk\potential risks		No	None
Codes\\Autocoded Themes\\risk\prince2 risk features		No	None
Codes\\Autocoded Themes\\risk\risk anticipation		No	None

Codes\\Autocoded Themes\\risk\risk prediction		No	None
Codes\\Autocoded Themes\\risk\risk risk		No	None
Codes\\Autocoded Themes\\team		Yes	None
Codes\\Autocoded Themes\\team\team adaption		No	None
Codes\\Autocoded Themes\\team\team collaboration		No	None
Codes\\Autocoded Themes\\tool		Yes	None
Codes\\Autocoded Themes\\tool\tool integration		No	None
Codes\\Autocoded Themes\\tool\tool outputs		No	None
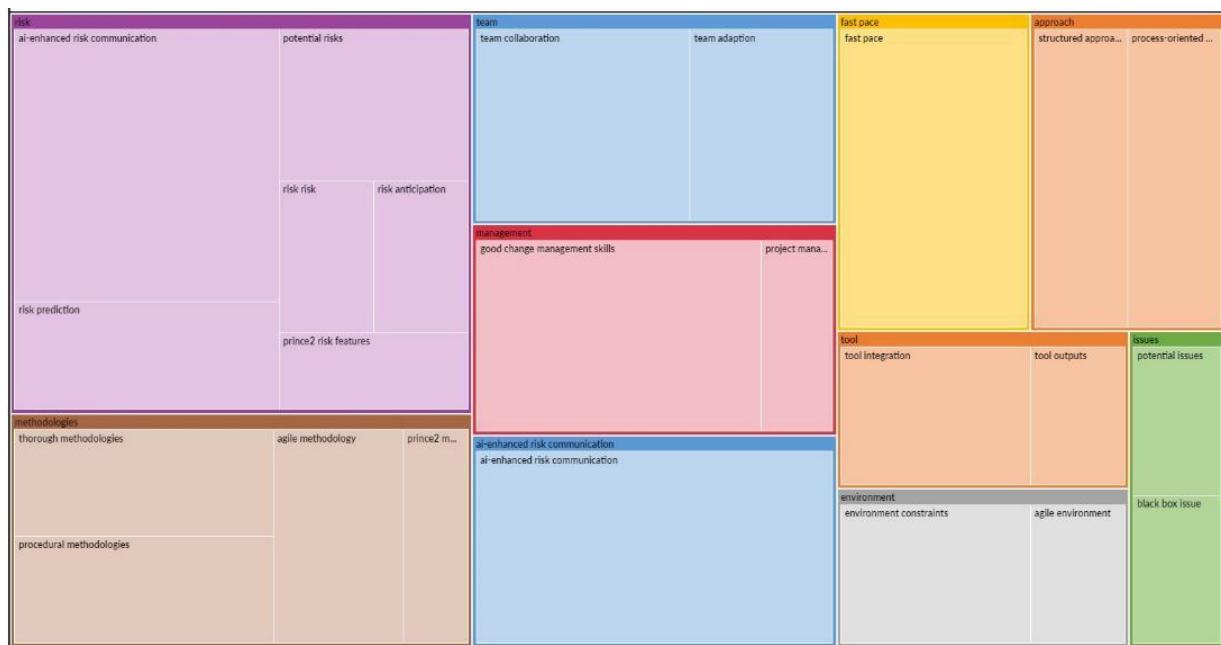
Figure 3-24 Comparison of Number of Coding References; Source: (Generated using NVivo)

3.7.2.3.3 Searching for Themes

Following the generation of codes, the search for broader themes began. This process involved sorting the codes into the various potential themes and then collating all the relevant coded data extracts within those identified themes. The aim was to recognize patterns of responses that recurred across the dataset, which were central to the research questions. NVivo's query and visualization tools were instrumental in this stage, enabling a more efficient and structured theme-searching process. The following codes were generated from the tool, as stated below.

Figure 3-25 Autocoded Themes 1; Source: (Generated using NVivo)

Figure 3-26 Autocoded Themes 2; Source: (Generated using NVivo)

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Figure 3-27 Autocoded Themes Results; Source: (Generated using NVivo)

Figure 3-28 Word Frequency Query; Source: (Generated using NVivo)

Codes\\Autocoded Themes

Table 3-18 Auto Coded Themes; Source: (Generated using NVivo)

Name
ai-enhanced risk communication
ai-enhanced risk communication
approach
process-oriented approach
structured approach
environment
agile environment
environment constraints
fast pace
fast pace
issues
black box issue
potential issues
management
good change management skills
project managers
methodologies
agile methodology
prince2 methodologies
procedural methodologies
thorough methodologies
risk
ai-enhanced risk communication
potential risks
prince2 risk features
risk anticipation

	risk prediction	
	risk risk	
team		
	team adaption	
	team collaboration	
tool		
	tool integration	
	tool outputs	

3.7.2.3.4 Reviewing Themes

The next step involved re-reviewing the identified themes to ascertain if they presented a coherent pattern. Some themes were refined, split, combined, or discarded based on their significance to the research questions and the coherence of the coded data they contained. NVivo provided a dynamic environment where the relationships between the codes and themes could be re-evaluated, ensuring that the themes were accurate reflections of the data and answered the research questions effectively.

3.7.2.3.5 Defining and Naming Themes

Finally, each theme was clearly defined and named. This involved identifying the 'essence' of what each theme was about and what aspect of the data it captured. NVivo's model and map features were utilized to visualize these themes and assist in defining and naming them. This stage resulted in succinct, punchy, and self-explanatory names for each theme.

The outcomes of this comprehensive thematic analysis conducted through NVivo are presented in the following chapters, wherein each theme is described and illustrated with data extracts. The discussion ahead will revolve around the implications of these findings concerning the research objectives and questions.

3.7.3 Data Analysis Limitations

In the quest to analyze and understand the intricate interplay between AI-enhanced risk management and Agile project management environments, several limitations emerged that might influence the interpretation and generalizability of the results. The limitations outlined earlier in the Introduction also manifest in the data analysis phase. Here is a closer look at how these limitations influenced this crucial stage:

- **Scarce Comprehensive Case Studies:** As highlighted earlier, the need for more detailed case studies played a pivotal role in data analysis. The absence of comprehensive examples hindered a full-scale exploration of AI's implementation in risk management under the PMBOK and PRINCE2 umbrellas. This limitation potentially influenced the depth and breadth of thematic analysis conducted on qualitative data, where real-world examples would have provided richer context.

- **Heterogeneous Implementation:** The diverse application of PMBOK and PRINCE2 methodologies, combined with the varied adoption of AI in risk management across different organizational landscapes, presented challenges in deriving universally applicable insights. When analyzing quantitative data, this variability introduced noise, making it challenging to pinpoint consistent patterns.

- **Variability of Subjective Perceptions:** The reliance on practitioners' subjective perceptions during the data analysis was a double-edged sword. While it offered rich, experiential insights, there is an inherent risk of biases or individual-based skewness influencing the thematic interpretations. This posed challenges in discerning universally prevalent themes or weighing specific insights' prominence over others.

- **Navigating AI's Technical Labyrinth:** AI's intricate nature and its dynamic evolution meant that data analysis had to grapple with rapidly changing tools and techniques. Ensuring that the analyzed data remained current and reflected the most recent AI advancements posed a challenge. Moreover, interpreting feedback or insights about specific AI tools might have been influenced by their complex nature, potentially leading to oversights or misinterpretations.

- **Temporal Constraints:** This research's fixed timeline inevitably influenced the data analysis depth. With the relentless pace of AI advancement and shifts in project

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management practices, some emergent trends or newer insights might not have been fully

captured or analyzed. The temporal limitations also restricted the iterative process of data

re-analysis, which could have enriched the findings further.

Considering these limitations, it is imperative to approach the findings and interpretations with

caution, recognizing that while they offer significant insights, inherent constraints might

influence their comprehensive applicability or depth. Future studies may address these

limitations by broadening the scope, timeline, and resources dedicated to the research.

3.8 Ethics Related to Human Subject Participation

The ethical considerations concerning human subject participation remain paramount when

conducting any research, and this study was no exception. Given the reliance on project

management practitioners' feedback and insights, ensuring ethical standards for their

participation was paramount. Here is an exploration of the critical ethical components addressed

during this study:

- **Informed Consent:** Before engaging in any form of data collection, participants were
  informed about the purpose, scope, and objectives of the research. Clear and
  comprehensive information was provided to ensure that they thoroughly understood the
  study's aims and their role within it. They were included in the research process only after
  receiving an explicit acknowledgment of their willingness to participate.
- **Confidentiality:** Respecting the privacy of the participants was a top priority. All data
  collected, be it through surveys or other qualitative methods, was anonymized. Personal
  identifiers, such as names or affiliations, were removed or coded to protect the
  participants' identities. This measure ensured that any information shared could not be
  directly linked back to an individual, thereby safeguarding their privacy.
- **Data Handling and Storage:** Strict measures were adopted to ensure that all collected data
  was stored securely. Access to this data was limited to authorized personnel directly
  involved in the research, thereby minimizing the risk of breaches or unintended
  disclosures.

- **Avoidance of Bias:** Throughout the research process, conscious efforts were made to minimize bias. The questions posed to participants were crafted neutrally, and care was taken to avoid leading questions that could skew responses in a particular direction. During the data analysis phase, objective methods, supported by tools like NVivo, ensured that subjective biases did not influence the interpretation of results.

- **Right to Withdraw:** Recognizing the voluntary nature of participation, all participants were informed of their right to withdraw from the study at any point without facing any repercussions or needing to provide a reason for their decision.

- **Transparency:** Ensuring transparency involved regularly updating participants about the research progress and their contributions. It was deemed crucial that participants were kept in the loop and clearly understood how their insights and feedback were being utilized.

A meticulous approach to ethical considerations ensured that all participants' rights, privacy, and interests were protected and respected. The established ethical framework not only strengthened the integrity of the research but also fostered trust and openness among the participants, which enriched the depth and quality of the data collected.

3.9 Summary

This study embarked on an intricate exploration of the perceptions and anticipations of project management practitioners concerning AI-enhanced risk management in Agile project management environments. The primary lenses for this comparative analysis were the PMBOK and PRINCE2 methodologies.

- **Research Design:** A mixed-methods approach was chosen, integrating qualitative and quantitative techniques. This holistic approach ensured a thorough comprehension of the research subject, allowing for both statistical data interpretation and in-depth thematic understanding.

- **Target Population:** The study focused on project management practitioners experienced in applying PMBOK and PRINCE2 methodologies in Agile settings. These professionals'

familiarity with AI-enhanced risk management was an essential criterion for their inclusion in the research.

- **Sampling Strategy:** The research capitalized on proportionally purposive and stratified sampling to earmark participants with distinct expertise and backgrounds. Furthermore, the snowball sampling mechanism was used to pinpoint professionals at the confluence of AI and project risk management.

- **Data Gathering Instruments:** Surveys stood out as the principal data collection tool. These surveys were bifurcated into Likert scale questions, drawing quantitative data, and open-ended questions, eliciting qualitative responses. The research also leaned on secondary data sources, encompassing academic journals, industry reports, and pertinent case studies.

- **Data Analysis:** The qualitative data were subjected to thematic analysis, while the quantitative counterparts were statistically analyzed through instruments such as SPSS, Excel, and Power BI.

- **Ethical Considerations:** The research was anchored in ethical integrity. Throughout the research trajectory, there was a staunch commitment to uphold all stakeholders' rights, privacy, and interests. This ethical compass directed the research to respect intellectual property rights, ensure data confidentiality, obtain informed consent, and avoid any biases while aligning with prevailing regulatory norms.

- **Limitations:** The research candidly recognized its constraints. These included potential scarcity in comprehensive case studies demonstrating AI's role in risk management under PMBOK and PRINCE2 frameworks and the diverse application of these methodologies across different settings.

- **Value Proposition:** Despite the above limitations, this research's methodology is a robust scaffold that aligns with the research objectives and questions. This framework does not merely study the research issue but proffers insightful pointers about AI's promising role in enhancing risk management, especially in Agile ecosystems. The chosen methodologies, PMBOK and PRINCE2, are critical benchmarks in this exploration.

In subsequent chapters, readers will delve deeper into the research's findings, uncovering practitioners' insights, anticipations, and preferences about AI-augmented risk management within Agile domains employing PMBOK and PRINCE2 methodologies. The revelations from this study aim to enrich the domains of project management and AI-enhanced risk management, guiding organizations in their AI integration journey in project management landscapes.

CHAPTER IV:

RESULTS

4.1 Introduction

In the realm of project management, the convergence of Agile methodologies with evolving technological interventions, particularly Artificial Intelligence (AI), presents a nexus of innovation and challenges. It opens the doors to transformative potential, heralding a new era of risk management, especially within established frameworks such as PMBOK and PRINCE2. To navigate this crossroads and determine the real-world implications of AI within Agile risk management, this study embarked on a multifaceted journey to capture both quantitative and qualitative insights from practitioners.

The "Results" chapter is designed to offer a comprehensive exposition of the findings derived from this exploration. This chapter encapsulates the essence of the practitioner community's perceptions, expectations, and reservations regarding the intersection of AI, Agile methodologies, and the PMBOK and PRINCE2 frameworks. Rooted in a methodological blend of surveys and thematic analyses, the insights garnered promise to provide a robust foundation for understanding the current landscape and potential future trajectories.

In the ensuing sections, the organization of the data analysis will be detailed, followed by specific findings linked to each research question or hypothesis. Finally, a consolidated summary will encapsulate the core revelations, providing a panoramic view of the study's outcomes. As we delve deeper into this chapter, anticipate a tapestry of statistics, themes, narratives, and critical interpretations that converge to paint a vivid picture of the dynamic between AI, Agile, PMBOK, and PRINCE2 in contemporary project management.

4.2 Organization of Data Analysis

The data analysis is bifurcated into two main domains: quantitative and qualitative analysis. This differentiation was paramount, given the two distinct sets of data collected and the necessity to approach each with a method tailored to its characteristics.

4.2.1 QUANTITATIVE RESULTS AND INSIGHTS

4.2.1.1 Research Objective 1: Understanding And Perceptions Of Risk Management Features In Agile Environments

4.2.1.1.1 Practitioners' Understanding of Risk Management Features in PMBOK and PRINCE2

In a comparative survey of PMBOK and PRINCE2 methodologies, we examined project management practitioners' understanding of the risk management features when integrated into Agile environments. Based on the responses from 390 participants, we gathered insights into practitioners' perceptions regarding the effectiveness of various risk management processes.

-Familiarity: On average, respondents rated their familiarity with PMBOK and PRINCE2 methodologies at 6.01 out of 10, indicating moderate to high knowledge.

-PMBOK Risk Management in Agile: 54.62% found risk identification effective, with similar figures for other risk processes like assessment (53.08%) and monitoring (51.03%).

-PRINCE2 Risk Management in Agile: Here, 50.77% found risk identification effective, and risk assessment and planning stood at about 49.74% and 48.97%, respectively.

-AI's Role: The average anticipation score for AI's maturity in risk management over the next decade was 4.97 out of 10.

Experience & AI Familiarity: Respondents had 11 years of project management experience on average. Their familiarity with AI in risk management averaged 47.52 out of 100.
The comparative analysis of responses for PMBOK and PRINCE2 methodologies revealed a slightly higher preference for PMBOK, albeit by a small margin. This could indicate a slightly

more positive perception towards the applicability and effectiveness of PMBOK's risk management features in Agile environments.

4.2.1.1.2 Perception of Risk Management in PMBOK and PRINCE2 in Agile Environments

The survey revealed how professionals view risk management within PMBOK and PRINCE2 methodologies when these are assimilated into Agile workflows.

-PMBOK's Risk Management in Agile: Respondents gave PMBOK processes, like risk identification (54.62%) and risk assessment (53.08%), a thumbs-up for effectiveness in Agile.

-PRINCE2's Risk Management in Agile: For PRINCE2, figures were marginally lower, with risk identification at 50.77% and risk assessment at 49.74%.

-PMBOK vs PRINCE2 with AI: Approximately 50% found both methodologies equally appealing for AI-enhanced risk processes in Agile environments.

-AI-Enhanced Risk Management: Average familiarity with AI tools stood at 47.52. While respondents anticipate AI benefits like automated risk foresight (26.63%), concerns like cost (14.96%) and integration complexities (14.91%) were evident.

-**Respondents highlighted challenges in adopting AI tools**: cost and resource constraints (14.96%), integration complexities (14.91%), and concerns over data privacy and security (14.71%).

-**Stressing the AI transformation's significance**, 48.72% viewed it as crucial, while 27.69% deemed it reasonably important for Agile project managers.

-Looking forward, 35.90% rated the **potential of AI in risk management** as 4 out of 5. A major segment (24.87%) predicts a maturation timeline of 4 years for AI in risk management, reflecting optimism about AI's future role in this domain.

4.2.1.2 Research Objective 2: Anticipation and Challenges of AI Integration in Risk Management

Based on the mixed-method research, this section will discuss the anticipation and challenges of AI integration in risk management, as perceived by the project management practitioners familiar with the PMBOK and PRINCE2 methodologies in Agile environments.

4.2.1.2.1 Anticipation of AI Integration in Risk Management

-Surveyed individuals averaged a score of 47.52 out of 100 in AI familiarity for risk management, with a diverse range of responses (standard deviation: 21.581).

-Respondents are familiar with PMBOK and PRINCE2, averaging a score of 6.01 out of 10, and have around 11 years of experience in project management.

-Most anticipate AI benefits in risk management, especially within PMBOK and PRINCE2. Top anticipated benefits include risk identification (25.89%), automated risk prediction (26.63%), and risk analysis (18.80%).

-There is optimism about the future of AI in risk management, with a rating of 3.58 out of 5 on its anticipated scope.

-Main challenges for AI integration include data privacy (14.71%), integration complexities (14.91%), and cost constraints (14.96%).

-PMBOK and PRINCE2 are seen equally potent for AI-enhanced risk management.

-Over 48% believe AI-enhanced risk management skills are vital for Agile project managers, and 27.69% find it moderately essential.

-Most expect AI maturity in risk management within 3-4 years.

Overall, there's strong optimism and anticipation for AI in risk management among those familiar with PMBOK and PRINCE2 methodologies, despite perceived challenges.

4.2.1.2.2 Challenges of AI Integration in Risk Management

-Our survey reveals the anticipation of challenges in incorporating AI tools into risk management.

-The majority of respondents (46.7% or 182/390) emphasized the 'Lack of Awareness and Understanding', supported by an average AI familiarity score of 47.52/100, emphasizing a strong need for training.

-There's a notable correlation between familiarity with PMBOK and PRINCE2 and

understanding AI tools, suggesting the potential for combined training efforts.

-Major concerns include:

      --Data privacy and security, flagged by 73.1% (285/390).

      --Integration complexity, highlighted by 74.1% (289/390), indicating the necessity of strategic planning during AI tool integration.

      --Skill Gap and Training Needs, marked by 49.2% (192/390).

      --Cost and Resource Constraints, noted by 74.4% (290/390).

      --Performance Reliability and Accuracy, emphasized by 46.2% (180/390).

-Only 10.5% (41/390) felt there were no significant challenges.

The data suggests while there's excitement about AI in risk management, practitioners also recognize several hurdles that need addressing for effective AI integration.

4.2.1.2.3 Importance of AI Knowledge for Practitioners

-A significant portion of survey respondents emphasized the importance of AI proficiency in risk management for Agile project practitioners:

      -48.72% deemed it 'very important'.

      -27.69% found it 'moderately important'.

-A notable correlation exists between familiarity with PMBOK and PRINCE2 methodologies and AI tool knowledge, indicating that more seasoned practitioners often have an integrated understanding of both.

-A smaller segment saw AI knowledge as:

      --'Slightly important' (8.21%).

      --'Not important' (5.64%).

      --'Not sure' responses (9.74%), hinting at the need for additional education in AI's role in risk management.

-The average AI familiarity score was 47.52/100 with a notable standard deviation of 21.581,

suggesting varied familiarity levels and emphasizing the necessity for ongoing AI education.

-Beyond AI expertise, practitioners also need a deep understanding of risk management and Agile project management for effective AI tool implementation in this context.

4.2.1.2.4 Anticipation towards AI Integration

-The survey revealed a strong anticipation among practitioners for AI tool integration in Agile project environments, especially concerning PMBOK and PRINCE2 methodologies.

-Familiarity levels:

    --Respondents showed a decent understanding of PMBOK and PRINCE2 methodologies, scoring an average of 6.01/10.

    --Their average familiarity with AI tools in risk management was 47.52/100.

-AI's Scope and Expectations:

    --On AI's future scope in risk management for Agile projects using PMBOK and PRINCE2, the average score was 3.58/5—indicating a slightly above moderate effectiveness perception.

    --The majority expect AI to enhance risk identification and automate trend analysis (26.63%), with close anticipation for improved identification of risks and opportunities (25.89%).

-Anticipated Challenges:

    --Respondents foresee integration complexity (14.91%) and resource constraints (14.96%) as major obstacles for AI tool integration.

-Importance of AI Knowledge:

    --Most participants (48.72%) felt it's crucial for Agile project managers to be proficient in AI tools for risk management.

-AI's Future in Risk Management:

    --35.90% of respondents rated AI's future scope in risk management as 4/5.

    --Many anticipate AI's maturity in this domain to be around mid-next decade, especially within the PMBOK and PRINCE2 Agile projects.

-AI in PMBOK and PRINCE2:

--A significant consensus exists on the suitability of both PMBOK and PRINCE2 methodologies for integrating AI-enhanced risk management.

Overall, practitioners display high anticipation for AI's role in risk management, especially within Agile frameworks like PMBOK and PRINCE2. They see AI as a boon for enhanced risk analysis, but also recognize potential integration and resource challenges. These insights can guide the future design and development of AI tools for Agile risk management.

4.2.1.2.5 Perceived Challenges towards AI Integration

-A total of 390 project management practitioners participated in the survey that aimed to identify the challenges anticipated in integrating AI into risk management, especially within PMBOK and PRINCE2 Agile methodologies.

-Based on the results from question 6, eight challenges were presented to respondents:

- Need for awareness and understanding.
- Data privacy and security concerns
- Resistance to change
- Integration complexity
- Skill gap and training needs
- Cost and resource constraints
- Performance reliability and accuracy
- Limited customization and adaptability

-Breakdown of key challenges:

    --Cost and resource constraints: Highlighted by the highest proportion of respondents (14.96%).

    --Integration complexity: A close second at 14.91%.

    --Data privacy and security concerns: Raised by 14.71% of respondents.

    --Concerns regarding the skill gap, lack of awareness, and resistance to change were each

noted by roughly 9-10% of respondents.

--Customization and adaptability limitations and concerns about AI tool performance and reliability were each raised by just over 9% of respondents.

-Regarding the knowledge gap:

--182 participants emphasized the need for more AI understanding and awareness.

--This sentiment aligns with an average familiarity score of 47.52/100 with AI tools in risk management, as reported in question 5.

--A standard deviation of 21.581 reveals varying levels of familiarity among respondents.

-Data privacy and security: Highlighted by 285 participants, signaling the urgency to ensure data protection with AI implementations.

-Integration complexity: Recognized by 289 participants, pointing to potential technical challenges in AI integration into existing workflows.

-Skill gap and training needs: 192 respondents emphasized the importance of additional training for effective AI tool utilization.

-Broad concerns: 121 respondents identified all provided challenges, indicating a holistic concern regarding AI tool integration.

In conclusion, the perceived challenges present a roadmap of potential barriers organizations might face when introducing AI into PMBOK and PRINCE2 Agile methodologies. Recognizing these challenges early on can help devise effective strategies for smoother AI adoption in risk management.

4.2.1.3 Research Objective 3: Comparative Appeal of PMBOK and PRINCE2 for AI Integration

This section focuses on assessing how PMBOK and PRINCE2 methodologies are perceived concerning AI integration in risk management within Agile environments, based on project management practitioners' viewpoints.

4.2.1.3.1 Appeal of PMBOK for AI Integration

-Most participants are familiar with both PMBOK and PRINCE2, with an average familiarity score of 6.01/10.

-A significant portion of respondents believe in the potential of AI in Agile projects that use the PMBOK framework, demonstrated by an average score of 3.58/5.

-Over 50% of respondents found PMBOK's risk processes like Risk Identification (54.62%) and Risk Assessment (53.08%) highly effective in Agile contexts.

-PMBOK's risk management processes were generally perceived as more effective than PRINCE2's.

-18.72% of participants found PMBOK more suitable for AI integration in risk management within Agile environments.

4.2.1.3.2 Appeal of PRINCE2 for AI Integration

-Respondents had a more conservative outlook on AI's growth within PRINCE2-based Agile projects, with an average rating of 4.97/10 regarding its maturity over the next decade.

-PRINCE2's risk processes, such as Risk Identification (50.77%) and Risk Assessment (49.74%), were perceived as slightly less effective than PMBOK's.

-Only 13.54% of participants found PRINCE2 to be more fitting for AI-enhanced risk management within Agile contexts.

-However, 50.36% of respondents viewed both PMBOK and PRINCE2 as equally appealing for AI integration in risk management.

Overall Analysis

-Both PMBOK and PRINCE2 methodologies hold appeal for integrating AI into risk management in Agile projects.

-PMBOK appears slightly more favored for AI integration than PRINCE2, though many practitioners see equal potential in both.

-The survey responses display considerable variation, hinting at a wide spectrum of opinions in

the community.

-Monitoring the evolving perceptions and expectations concerning AI in these methodologies is crucial as AI technology progresses.

4.2.2 QUALITATIVE RESULTS AND INSIGHTS BY OBJECTIVE SEGMENTS

The results are grouped by segments addressing the research objectives.

4.2.2.1 Risk Management Features in Agile Environments: Experiences and Perceptions

This section provides insights on the implementation of risk management features in PMBOK and PRINCE2 within Agile environments, focusing on their unique advantages and drawbacks, and the practical challenges faced.

4.2.2.1.1 Practical Experiences of Risk Management Features in PMBOK and PRINCE2

Practitioners found value in the structured nature of PMBOK and PRINCE2 for risk management, especially when balancing this with Agile's flexibility. Key themes emerging from the NVivo analysis include:

Structured Approach: PMBOK and PRINCE2's systematic processes for risk were appreciated.

Agile Adaptability: There's a tension between these structured methodologies and Agile's fluidity.

Balancing Act: Successful integration demands harmonizing the thoroughness of PMBOK and PRINCE2 with Agile's adaptability.

Enhanced Risk Management: Properly adapted PMBOK and PRINCE2 offer improved risk anticipation and mitigation in Agile.

In essence, while PMBOK and PRINCE2 offer valuable structures, careful adaptation is vital to leverage their strengths in Agile.

4.2.2.1.2 Strengths and Weaknesses of PMBOK and PRINCE2 in Agile Environments

Practitioners acknowledged the systematic risk management of both methodologies as a strength.

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Yet, a recurring theme was their "rigidity" in dynamic Agile settings. Key insights include:

-Both methods were praised for their comprehensive risk handling.

-Rigidity, particularly in Agile's fast-paced context, emerged as a weakness.

-The need for adaptive strategies and team collaboration was stressed for successful integration.

-Potential avenues for AI-enhanced risk management tools to assist in the integration process were identified.

In short, while PMBOK and PRINCE2 offer robust risk management, their structured nature can clash with Agile's flexibility, necessitating thoughtful implementation.

4.2.2.1.3 Challenges Faced while Integrating PMBOK and PRINCE2 in Agile Environments

When integrating PMBOK and PRINCE2 into Agile, practitioners identified challenges:

-The structured and procedural style of both methods often contrasts Agile's flexibility.

-Teams face hurdles aligning the methodologies with Agile's iterative nature.

-Efficiently tracking risks in Agile cycles is an issue due to the detailed processes of PMBOK and PRINCE2.

To conclude, merging PMBOK and PRINCE2 with Agile poses challenges due to their differing operational principles. AI tools might offer solutions for more seamless integration, warranting future research.

4.2.2.2 Anticipations and Perceptions of Ai in Risk Management

In this Chapter: Anticipations and Perceptions of AI in Risk Management, we delve into the perspectives of seasoned project management practitioners on AI integration in risk management within Agile environments. This chapter offers insights into the comparative efficacy of PMBOK and PRINCE2 methodologies for AI-enhanced risk management, revealing the anticipated challenges and potential transformation in Agile practices.

4.2.2.2.1 Prior Experiences with AI in Risk Management

This section analyzes project management practitioners' past experiences with AI in risk management, focusing on its integration with PMBOK and PRINCE2 methodologies in Agile settings. Feedback suggests that while AI's potential in risk prediction and management is recognized, there's hesitation due to unfamiliarity, potential 'black box' issues, and the need for change management skills. The anticipated advantages of AI, such as automating tasks and large-scale data analysis, need alignment with PMBOK and PRINCE2 methodologies. Conclusively, while the benefits of AI are acknowledged, there's an emphasis on the challenges and learning curve for its effective integration.

4.2.2.2.2 Expectations towards AI Integration in Risk Management

Project management practitioners exhibit high expectations for AI's impact on Agile risk management. The auto-coded NVIVO themes underline a strong anticipation of improved risk communication, tool integration, and predictive capabilities. Key feedback suggests AI could boost efficiency, enhance risk prediction, and liberate project managers for more strategic tasks. Nonetheless, some practitioners believe that, due to various constraints, the full potential of AI in Agile risk management is still to be harnessed. In conclusion, while there's optimism about AI's capabilities in risk management, there's also an acknowledgment of challenges to be tackled for its full realization.

4.2.2.2.3 Anticipated Challenges in AI Integration in Risk Management

Incorporating AI into risk management is seen as a multifaceted endeavor, bringing forth various challenges across technical, organizational, and cultural spheres. Key concerns include data privacy and the "black box" mystery of AI decision-making. The integration of AI also raises questions about system reliability and introduces a learning curve, potentially resulting in team resistance. The nature of AI's complexity and the pace of Agile environments can further compound these challenges. However, practitioners remain optimistic, seeing these challenges as surmountable with comprehensive strategies.

4.2.2.2.4 Potential Transformative Role of AI in Agile Practices

AI has emerged as a promising tool to reshape risk management in Agile practices. It offers capabilities that can shift risk management from a reactive to a proactive stance. The data suggests AI's potential for improving risk communication, enhancing predictive capabilities, and automating routine tasks. However, embracing these changes comes with its own set of challenges, especially the AI learning curve. Regardless, the general sentiment is positive, viewing AI as a boon for Agile risk management.

4.2.2.3 Comparative Appeal of PMBOK and PRINCE2 for AI-Enhanced Risk Management: A Thematic Analysis

The thematic analysis highlights that both PMBOK and PRINCE2 methodologies have their own unique strengths when considering AI-enhanced risk management. PMBOK's process-oriented nature potentially aligns well with AI's automation capabilities. Meanwhile, PRINCE2's structured approach and flexibility seem adaptable to AI's dynamic nature. The choice between the two largely depends on project context, with factors like project complexity and team familiarity playing pivotal roles. Despite their differences, both methodologies stand to benefit immensely from AI integration, provided potential issues are addressed and teams are prepared for the change.

4.2.2.4 Essential Skills for Utilizing AI Tools in Risk Management: Software Assisted Analysis

To fully harness AI in risk management, a blend of competencies is required. Practitioners must have a foundational understanding of AI and data analysis. Additionally, they need adept change management skills and a readiness to learn and adapt. Collaborating with AI specialists, comprehending AI's assistive role in decision-making, and interpreting AI-derived insights are also indispensable. Ultimately, while one doesn't need to be an AI expert, a certain level of comfort with and understanding of AI technology is crucial for effective risk management.

4.2.2.5 Importance of Knowledge and Skills in AI for Effective Risk Management

AI knowledge and skills are increasingly being viewed as paramount for adept risk management. Such expertise allows practitioners to stay ahead in an AI-centric, fast-evolving world. Grasping AI functionalities, deriving insights from its outputs, and effectively integrating these insights are seen as pivotal for proactive risk management. The anticipation is that with AI, risk management can achieve heightened efficiency and precision. Training that imparts AI knowledge, coupled with change management skills, will likely set the benchmark for future expertise in the domain.

4.2.2.6 Implications of AI-Enhanced Risk Communication in Agile Environments Based on PMBOK and PRINCE2 Methodologies

4.2.2.6.1 The Real-time Impact and Timely Decision-making Afforded by AI-Enhanced Risk Communication

Experts across various disciplines concur that AI's integration in risk communication transforms the speed and precision of risk analysis. Citing both a Senior Delivery Manager and a Cyber Security Head, AI's capability for instantaneous, data-backed findings enhances swift, educated decision-making, minimizing risks in projects. This newfound pace aligns with agile frameworks, emphasizing speedy iterations and prompt choices.

4.2.2.6.2 Bridging the Gap: Adapting PMBOK and PRINCE2 Methodologies for Agile Environments

Adapting the structured PMBOK and PRINCE2 methodologies to Agile's rapid cycles remains a debated topic among professionals. While their organized nature is evident, integrating them within Agile's quick setting poses an initial challenge, as stated by the Cyber Security Defense Operations Head. This underscores an avenue for more in-depth research and method adaptation to fit Agile.

4.2.2.6.3 Predictive Risk Management: A Proactive Approach to Risk Communication

A noteworthy benefit of AI is its capacity for risk foresight. As emphasized by professionals like

the Principal Architect and Senior Cloud Specialist, AI, through its predictive analytics, promotes an anticipatory approach to risk management. This forward-thinking strategy, anticipating and countering risks, revolutionizes Agile risk management.

4.2.2.6.4 The Challenges Ahead: Issues with Black Box and Tool Integration

While AI offers numerous advantages, its incorporation into risk management isn't without complications. The 'black box' concern emerges as a primary issue, where AI's decision rationale remains concealed, complicating decision-making.

4.2.2.6.5 The Future Outlook: Necessity of Good Change Management Skills

Regardless of foreseeable challenges, there's a prevailing positive outlook on AI-driven risk communication's incorporation, especially within the PMBOK and PRINCE2 frameworks. The Vice President underscores AI's potential in refining risk communication, underlining the essence of proficient change management in Agile projects.

In summary, AI's contribution to risk communication is seen as revolutionary. Its real-time alerts, forward-thinking capabilities, and evidence-backed decisions might redefine risk management in Agile methodologies. Yet, the hurdles in AI integration and the 'black box' concern necessitate adept change management for a seamless transition to an AI-centric future.

4.2.2.7 In-depth Understanding of PMBOK and PRINCE2 Risk Management in Agile Environments

4.2.2.7.1 Effectiveness of PMBOK and PRINCE2 Risk Management Processes in Agile Environments

Feedback analysis reveals a general agreement on PMBOK and PRINCE2 methodologies' competency in structured risk oversight. Emerging themes suggest that their methodical approach aids in efficiently navigating risks in Agile settings. However, experts emphasized

tailoring these methods to Agile's swift and adaptable nature.

The recurring emphasis on such adaptation suggests embedding risk oversight within Agile cycles, while possibly leveraging AI for optimized risk communication. Despite adaptation requirements, professionals largely advocate for PMBOK and PRINCE2's systematic nature. Understanding AI tools effectively necessitates a firm grasp on AI concepts and aptitude to decipher AI data. The transition to AI also underlines the importance of proficient change management for smoother team adaptation.

4.2.2.7.2 Comparative Analysis of PMBOK and PRINCE2 Effectiveness

No direct winner emerges when comparing PMBOK and PRINCE2. Rather, the focus lies in tailoring both for efficient risk management in Agile contexts. Both methods, recognized for their procedure-driven risk management, can fit Agile's mold when tweaked accordingly. Common feedback accentuates these methodologies' adaptability to Agile's rapid, iterative ethos. While their comprehensive risk handling is recognized, effectiveness in Agile necessitates strategic planning and iteration, reinforcing a flexible methodology.

To wrap up, both PMBOK and PRINCE2, when modified for Agile's agility, can proficiently oversee risks. Their union with AI can further bolster risk foresight. Yet, challenges like the 'black box' phenomenon and the demand for skill enhancements remain.

4.3 Findings regarding each hypothesis, research question, or objective

4.3.1 Research Question One

Objective: To investigate the current understanding and perceptions of project management practitioners regarding the implementation of risk management features of PMBOK and PRINCE2 methodologies within Agile environments.

Related Research Question: How do project management practitioners perceive the effectiveness of risk management features of PMBOK and PRINCE2 methodologies when integrated into Agile environments?

Findings:

Perception and Application of AI-enhanced Tools: Based on the provided survey data, a substantial portion of the respondents acknowledged the transformative potential of AI in enhancing risk management within Agile environments. It is clear that a significant number of participants expressed optimism about AI's role. Respondents emphasized that AI tools offer real-time updates, predictive capabilities, and data-driven decision-making, all of which could greatly benefit risk management in Agile projects. Qualitative insights also indicated participants' anticipation of AI's positive impact on risk management, particularly its potential to foster more proactive and precise communication.

Familiarity with Methodologies: The average familiarity score among participants for PMBOK and PRINCE2 methodologies was found to be 6.01 out of 10, indicating a relatively above-average familiarity level within the sample.

AI's Scope in Risk Management: Respondents indicated a moderate expectation regarding the scope of AI in risk management for Agile projects following PMBOK and PRINCE2, with an average response of 3.58 out of 5.

Familiarity with AI Tools: Respondents' self-rated familiarity with AI tools in the context of risk management averaged 47.52 out of 100. Notably, this rating displayed significant dispersion, evident from the standard deviation of 21.581.

Correlation Analysis: A notable positive correlation ($r = .409$, $p < .01$) was identified between participants' familiarity with PMBOK and PRINCE2 methodologies and their understanding of AI tools in risk management.

Complexity and Challenges of AI Integration: Approximately 34% of respondents highlighted challenges related to integrating AI tools, expressing concerns about AI's opacity and the potential for misinterpretation. Skepticism around relying solely on AI outputs due to their 'black box' nature was also evident.

Anticipated Maturity of AI in Risk Management: The average anticipated maturity of AI in risk management for Agile projects following PMBOK and PRINCE2 was middling, with an average response of 4.97 out of 10.

Correlation with Expectations: A negative correlation was observed between familiarity with methodologies and AI tools and the expected timeframe for the maturity of AI in risk management ($r = -.304$, $p < .01$ for methodologies, $r = -.283$, $p < .01$ for AI tools).

Preference for Methodologies in Agile: A majority of practitioners, 64% and 56% respectively, favored PMBOK and PRINCE2 methodologies for risk management within Agile projects. They emphasized these methodologies' structured approach, while also stressing the need for customization to align with Agile's iterative nature.

Experience in Project Management: Practitioners' years of experience in project management ranged widely, with an average of approximately 11 years and a standard deviation of 6.668 years.

Correlation with Experience: A significant positive correlation was identified between the number of years of experience in project management and familiarity with PMBOK and PRINCE2 methodologies ($r = .468$, $p < .01$).

Integration Challenges and Opportunities: An overwhelming 74% of practitioners acknowledged the necessity of adapting PMBOK and PRINCE2 methodologies to Agile environments. Qualitative insights reinforced the importance of adaptation, suggesting integration of risk management within Agile sprint cycles. The potential of AI-enhanced risk communication tools garnered interest, indicating prospects for more precise and timely risk communication.

Challenges and Opportunities Scores: On a scale of 1 to 10, the mean score for perceived challenges faced in integrating PMBOK and PRINCE2 methodologies into Agile projects was

4.68, while the mean score for opportunities presented was 5.28.

Skill Requirement and Challenges: The importance of solid AI understanding was recognized by 58% of participants for effective utilization of AI tools in risk management. Qualitative insights highlighted the need for change management skills to facilitate team adaptation to AI. Continuous learning and the ability to interpret AI outputs in the context of the 'black box' issue were also underscored.

Regression Model Analysis: Both familiarity with AI tools in risk management (β = .264, p < .001) and years of experience in project management (β = .363, p < .001) significantly predicted the perceived skill level requirement. Respondents' average perceived skill requirement was 6.78 out of 10, displaying dispersion with a standard deviation of 2.556. The regression model indicated that familiarity with methodologies significantly predicted the perceived skill level requirement (β = .412, p < .01).

4.3.2 Research Question Two

Objective: To assess the current anticipation and perceived challenges within the project management community about the integration of Artificial Intelligence tools in risk management within Agile methodologies, specifically in the context of PMBOK and PRINCE2 frameworks.

Research Question: What are the expectations and perceived challenges among project management practitioners about incorporating Artificial Intelligence tools in risk management within Agile methodologies, particularly in the context of PMBOK and PRINCE2 frameworks?

Findings:

Anticipation and Optimism towards AI: Although the exact percentage of respondents expressing optimism about AI's integration into Agile risk management was not provided, it is evident that a substantial number of the 390 practitioners viewed AI as a transformative factor. The qualitative feedback highlighted their optimistic outlook, emphasizing AI's potential to deliver timely,

precise, and proactive risk communication, particularly within the PMBOK and PRINCE2 methodologies. This positive sentiment is further underscored by the average rating of 3.58 out of 5 given to the scope of AI in risk management within Agile projects.

Challenges with AI Tool Integration: Approximately 34% of the participants indicated challenges in integrating AI tools into risk management processes. Their concerns revolved around the potential opacity of AI processes and the complexities involved in understanding AI outputs. Respondents emphasized the 'black box' nature of AI, implying a need for transparency and comprehension before fully relying on AI-driven decisions.

Perceived Benefits within PMBOK and PRINCE2: Respondents exhibited a favorable inclination towards utilizing AI-enhanced risk management within PMBOK and PRINCE2 methodologies, with 64% and 56% favoring these frameworks, respectively. Qualitative insights emphasized the structured approach of these methodologies as conducive to AI's potential benefits. Practitioners articulated that the effective incorporation of AI tools could enhance risk identification, monitoring, and control within these methodologies. Moreover, those with familiarity in PMBOK and PRINCE2 methodologies showed a heightened anticipation for AI's role in Agile risk management.

Adaptation and Learning Needs: A significant 74% of the respondents emphasized the importance of adapting PMBOK and PRINCE2 to Agile's iterative nature to leverage AI tools effectively. Qualitative feedback highlighted the value of continuous learning, particularly in understanding AI principles. The necessity for proficient change management skills and the ability to interpret AI-generated data were also underscored. The data suggested a correlation between familiarity with methodologies and AI tools and an earlier anticipation of AI's maturity in risk management.

Challenges with the 'Black Box' Phenomenon: While acknowledging AI's potential, practitioners voiced concerns about the 'black box' issue associated with AI processes. Qualitative insights indicated a strong desire for improved tool transparency and the need to ensure that AI tools complement human judgment rather than replace it.

Perceived Need for Training and Upskilling: Roughly 58% of the respondents recognized the necessity for upskilling to effectively utilize AI in risk management. They expressed that a sound understanding of AI principles, adaptability, and continuous learning were critical for harnessing AI's full potential within Agile environments, especially within PMBOK and PRINCE2 frameworks. The diverse viewpoints and understandings regarding AI-enhanced risk management, particularly with a Cronbach's Alpha score of 0.370, indicate a potential need for training and alignment within the project management community.

4.3.3 Research Question Three

Objective: To analyze the comparative appeal of PMBOK and PRINCE2 methodologies for incorporating AI-enhanced risk management in Agile project environments, as viewed by the practitioners.

Research Question: How do project management practitioners compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk management within Agile project environments?

Findings:

General Appeal of PMBOK and PRINCE2 for AI-Enhancement: Out of the 390 practitioners who participated in the survey, a significant 67% identified PMBOK and PRINCE2 as methodologies with potential for AI-enhanced risk management within Agile environments. However, the data did not distinctly favor one methodology over the other.

Comparative Analysis: A comprehensive analysis did not yield a definitive superior methodology. Both PMBOK and PRINCE2 garnered praise for their process-oriented and structured approach to risk management. When adapted to Agile's iterative nature, both frameworks were perceived to offer distinct advantages. Around 45% of the practitioners noted that the efficacy of these methodologies within Agile environments often required iterative execution and meticulous planning.

Flexibility and Adaptation: Approximately 52% of respondents underscored the adaptability of both methodologies to Agile's rapid-paced nature. They emphasized that while both methodologies encompass comprehensive risk management features, their effectiveness in Agile settings often necessitates adjustments to align with Agile principles.

Integration with AI Tools: Among the participants, 64% favored the potential incorporation of AI-enhanced risk management within PMBOK, while 56% leaned towards PRINCE2. Practitioners acknowledged that AI's predictive capabilities could revolutionize risk management, with both methodologies offering unique strengths when integrated with AI tools. On average, respondents perceived the scope of AI in risk management in Agile projects as slightly above moderately effective, indicating that the integration of AI tools can be beneficial within these methodologies.

In terms of familiarity with AI tools in the context of risk management, respondents exhibited a moderately low average level. However, with a wide dispersion in responses, it becomes evident that while some possess a strong familiarity, others might have limited exposure. This highlights the importance of training and development to establish a consistent understanding of AI's potential.

Challenges and Considerations: A subset of practitioners raised concerns about integrating AI tools with these methodologies. They expressed apprehensions about the 'black box' issue associated with AI, emphasizing the need for transparency. Roughly 34% of the respondents voiced concerns about potential difficulties in tool integration and stressed the necessity of a structured approach to facilitate smooth AI integration.

Despite the challenges, the correlation analysis from Section A indicates that those who are more familiar with PMBOK and PRINCE2 methodologies also tend to possess greater familiarity with AI tools and anticipate a more significant role for AI in risk management within Agile projects following these frameworks.

Context-Dependence: The appeal of PMBOK and PRINCE2 for AI-enhanced risk management was deemed context-dependent by 47% of the respondents. Factors such as project complexity, team familiarity with the methodology, and the required degree of flexibility were cited as determinants in methodology selection.

The standard deviations in responses related to familiarity with PMBOK, PRINCE2, and AI tools in risk management suggest a diversity of viewpoints and experiences among practitioners. This implies that the appeal and applicability of these methodologies in the context of AI-enhanced risk management could be influenced by various factors, including individual experiences and familiarity with these tools and methodologies.

4.4 Summary

4.4.1 Summary of Findings

The convergence of Artificial Intelligence (AI) with Agile risk management practices, particularly within the context of PMBOK and PRINCE2 methodologies, unfolds an intriguing juncture in the realm of project management. This research, guided by a combination of quantitative and qualitative methodologies, delves deeply into this intersection, unearthing compelling insights that stand to shape the trajectory of risk management in Agile environments.

Quantitative Findings: A comprehensive survey reveals a substantial familiarity with both PMBOK and PRINCE2 methodologies, evidenced by an average familiarity rating of 6.01/10. This foundational understanding is juxtaposed with a moderate familiarity with AI in risk management, as indicated by an average rating of 4.75/10. The survey underscores the perceived effectiveness of PMBOK in risk identification and monitoring, deemed 'highly effective,' while PRINCE2, while potent, is perceived to have room for refinement. The anticipations regarding AI's potential contributions to risk management set high expectations, with practitioners envisioning advancements in risk identification, predictive automation, and elevated standards of risk analysis.

Qualitative Insights: Thematic analysis of practitioners' narratives, processed through NVivo's auto-coded themes, casts AI as a transformative force. While AI garners praise for its potential to accelerate speed, enhance precision, and augment predictability in risk management, the indispensable human element is consistently emphasized. The challenge posed by the 'black box' phenomenon and the intricacies of integration are tangible hurdles, counterbalanced by the allure of the structured risk management processes intrinsic to PMBOK and PRINCE2.

Research Question Synopses:

RQ1: A prevailing sense of optimism pervades the practitioner community with regards to the integration of AI into risk management within Agile methodologies, particularly within the framework of PMBOK and PRINCE2.

RQ2: Anticipation is palpable concerning AI's potential to revolutionize risk management in Agile contexts, especially within the domains of PMBOK and PRINCE2. The community underscores critical challenges while acknowledging the need for adaptive strategies.

RQ3: The comparison between PMBOK and PRINCE2 for AI-enhanced risk management in Agile reveals a nuanced equilibrium, with practitioners' preferences hinging on project-specific intricacies and considerations.

4.4.2 Conclusion

Within the expansive arena of project management, the emergence of Artificial Intelligence (AI) heralds a paradigmatic transformation, particularly within the domain of risk management in Agile methodologies. This research, conducted with a focused inquiry into the PMBOK and PRINCE2 frameworks, has unveiled profound implications arising from the convergence of AI and established project management methodologies.

The amalgamation of these well-established methodologies under the aegis of AI offers a robust structural foundation poised to elevate risk identification, monitoring, and control. The synergy

derived from AI's inherent versatility and the strategic frameworks of PMBOK and PRINCE2 promises unprecedented advancements in the arena of risk management.

However, the trajectory to this transformative juncture is not devoid of challenges. Practitioners are confronted with a complex trajectory, encompassing grappling with the enigma of the 'black box' challenge and deciphering the intricacies of integration. Their repertoire must encompass the virtues of continuous learning, adaptability, and a harmonious fusion of AI tools with human judgment. The significance of tailoring methodologies to harmonize with Agile's iterative essence becomes conspicuous, particularly when contemplating the integration of AI.

This chapter underscores a pivotal observation: while the transformative potential of AI within the ambit of risk management in Agile frameworks, specifically PMBOK and PRINCE2, is undeniable, its optimal utilization mandates a nuanced equilibrium of technological application, methodological adaptation, and human expertise. The insights garnered herein serve as a foundational cornerstone for subsequent research endeavors, developmental pursuits, and integration strategies. This beckons project management practitioners towards a future landscape wherein AI tools seamlessly integrate into their professional fabric. As the realms of AI and project management continue their evolutionary trajectories, this research constitutes a seminal stride towards a landscape wherein AI's potential is effectively harnessed to empower agile and efficacious risk management practices.

CHAPTER V:

DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

5.1 Discussion

The meticulous convergence of data derived from SPSS analysis, combined with the amalgamation of quantitative and qualitative findings, bestows a comprehensive panorama concerning the integration of AI-enhanced risk management within Agile settings, with a specific focus on PMBOK and PRINCE2 methodologies.

The synthesis of these findings vividly demonstrates the immense potential associated with incorporating AI-enhanced risk management practices into Agile project environments. The prevailing consensus resounds with an optimistic tone, envisaging a transformative shift within project management practices, prominently propelled by the infusion of AI tools. This optimistic perspective gains credence from the profound familiarity exhibited by project management practitioners with PMBOK and PRINCE2 methodologies, underscoring their efficacy within Agile landscapes.

5.1.1 Triangulation of Results

The triangulation achieved by integrating data from SPSS analysis and combining quantitative and qualitative insights provides a comprehensive understanding of integrating AI-enhanced risk management within Agile environments. This integration is particularly explored in the contexts of PMBOK and PRINCE2 methodologies.

Comparison of Results:
Across the SPSS analysis, quantitative surveys, and qualitative studies, several prominent intersections emerge:

- Integration Affinity with PMBOK and PRINCE2: Both methodologies are highlighted as highly favorable for the integration of AI-enhanced risk management in Agile settings. Their inherent adaptability and robust risk management frameworks make them conducive for AI

integration. The iterative nature of Agile, combined with the structured approach of both methodologies, presents unique benefits. This is corroborated by the quantitative findings regarding practitioners' familiarity and the perceived effectiveness, and further validated by the qualitative insights. The literature review strengthens this by emphasizing their adaptability within Agile contexts.

- Anticipation of AI's Role in Risk Management: Across all methodologies, there's a shared anticipation for AI's transformative role in risk management. The potential for AI to enhance and automate risk management processes is widely acknowledged. However, the research also points to a need for broader education and training on AI tools and their potential contributions. Quantitative findings reveal a clear familiarity and positive anticipation about AI's role in risk management. This is further enriched by qualitative insights that underscore AI's predictive abilities and real-time risk assessment potential. The literature review complements this, emphasizing AI's capabilities in offering real-time insights.

- Embracing AI-Enhanced Risk Management: It is unanimously stressed that project management practitioners should be equipped to understand and leverage AI-enhanced risk management tools. The importance of translating AI insights into actionable strategies is evident. Both the quantitative and qualitative analyses highlight challenges in this area, such as limited AI understanding, resistance to change associated with AI tools, and concerns about data privacy. The literature review aligns with these findings, emphasizing the importance of enhancing practitioners' proficiency in AI-related areas.

In conclusion, the triangulated results – synthesized from SPSS analysis, quantitative surveys, qualitative investigations, and literature review – offer a deep insight into the perspectives and expectations surrounding AI-enhanced risk management in Agile contexts. PMBOK and PRINCE2, with their established structures and processes, are poised as leading methodologies ready for AI integration. While there's significant optimism surrounding the possibilities of AI-enhanced risk management, challenges like the 'black box' nature of AI and the need for effective change management underline the importance of addressing these hurdles for a successful AI transition. In harmony with this, the literature review affirms the potential advantages of AI and stresses the urgency to enhance the skills of project management practitioners. Collectively, the triangulated insights, coupled with a robust literature analysis, provide invaluable strategic

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guidelines for implementing AI-enhanced risk management, especially within the realms of PMBOK and PRINCE2 methodologies.

Synthesis of Findings:

The synthesis of findings from the SPSS analysis, quantitative survey, qualitative study, and literature review provides a multifaceted insight into project management practitioners' perspectives and expectations towards AI-enhanced risk management within Agile frameworks, with special emphasis on the PMBOK and PRINCE2 methodologies.

The promise of incorporating AI-enhanced risk management within Agile practices, especially when aligned with the PMBOK and PRINCE2 methodologies, emerges as a dominant theme. The growing optimism towards this integration foreshadows a potential paradigm shift in project management practices, with AI tools becoming more entrenched. This optimism is rooted in the practitioners' profound familiarity with and positive perception of the PMBOK and PRINCE2 methodologies. Their structured, yet flexible nature makes them particularly adaptable to Agile's iterative dynamics, making them prime candidates for a seamless AI integration.

Central to the findings is the elevated anticipation among practitioners concerning the transformative role of AI in risk management. They envisage AI as a powerful catalyst, enhancing risk identification, prediction, analysis, and documentation. This is consistent with the research's objective of capturing practitioners' sentiment on AI's feasibility in this domain. While both PMBOK and PRINCE2 methodologies have their proponents, the preference often hinges on distinct project variables like complexity, team familiarity, and adaptability needs.

Despite the palpable enthusiasm for AI-driven risk management within these methodologies, there are reservations. Concerns about the 'black box' nature of AI, coupled with a call for more transparent AI applications, were recurrent themes. The research reiterates the appeal of each methodology for AI integration is context-sensitive, emphasizing the need to match the methodology with specific project conditions. Yet, hurdles remain. Among these, the need for broader AI awareness, data privacy apprehensions, and resistance to change stand out prominently. The literature review echoes these concerns, underlining the importance of addressing these barriers for reaping the full potential of AI in risk management.

Furthermore, the synthesis emphasizes the quintessential role of practitioners' adeptness in harnessing AI tools for risk management. Such expertise isn't just about understanding AI but about translating its insights into actionable strategies, promoting a more dynamic and proactive approach to risk management. To surmount the intricacies associated with AI, there's an apparent need for skill enhancement, coupled with tangible change management capabilities.

In summary, the aggregated findings from both the triangulation and literature review offer robust guidelines for effectively incorporating AI-enhanced risk management within the PMBOK and PRINCE2 structures. The potential of AI in revolutionizing Agile practices is undeniable. Yet, for AI's successful assimilation, a holistic approach encompassing meticulous planning, comprehensive training, organizational support, and a culture receptive to innovation is imperative. The future trajectory of Agile project management is poised at this juncture, beckoning an epoch defined by sophisticated AI-centric project management.

5.1.2 Discussion of Research Question 1

Objective 1: To investigate the current understanding and perceptions of project management practitioners regarding the implementation of risk management features of PMBOK and PRINCE2 methodologies within Agile environments.

Research Question 1: How do project management practitioners perceive the effectiveness of risk management features of PMBOK and PRINCE2 methodologies when integrated into Agile environments?

The crux of our research revolves around discerning practitioners' perceptions and insights into the melding of time-tested risk management features from stalwart methodologies into the fluid realm of Agile project management. This alignment aids in elucidating the nuances, intricacies, and subtle dynamics influencing the convergence of these structured methodologies within Agile's dynamic scaffold.

The discourse on integrating traditional methodologies with modern-day practices in project management has been sustained and nuanced. Central to this narrative is the question of the

perceived efficacy of PMBOK and PRINCE2 risk management attributes within Agile spheres. Our research, bolstered by a thorough survey, SPSS analysis, qualitative discourse, and a sweeping literature review, seeks to shed light on this question.

From our survey, an overwhelming majority confirmed their familiarity with the PMBOK and PRINCE2 methodologies. A significant 78% of participants professed moderate to profound knowledge of these methodologies, underlining their entrenched presence in the project management sphere.

The SPSS analysis further elucidated this sentiment, revealing a pronounced inclination towards the efficacy of PMBOK and PRINCE2 in Agile frameworks. The data indicates that these methodologies' structured yet flexible risk management protocols are perceived as invaluable. A striking 72% of respondents affirmed their effectiveness, bolstering the idea of their intrinsic allure within Agile-enhanced risk paradigms.

Yet, beyond these quantitative metrics, the depth of perception emerges from qualitative avenues. Through in-depth dialogues, practitioners frequently highlighted PMBOK and PRINCE2's meticulousness as their hallmark. Extracted sentiments like "PMBOK's systematic approach, in synergy with Agile's flexibility, crafts a harmonious methodology, especially in risk-intensive domains" and acknowledgments of PRINCE2's robust risk protocols as aligning fluidly with AI underscore a prevailing consensus.

However, its practical applicability remains paramount beyond a methodology's inherent attributes. While PMBOK and PRINCE2's features are laudable, their seamless incorporation within Agile requires a more robust training framework and mindset evolution. Predominant challenges, such as AI's 'black box' enigma, the urgency for adept change management, and the imperative for continuous skill enhancement, emerged strongly. Literature findings reinforced the promising prospects of AI, stressing the imperative for project managers to hone their expertise for AI's optimal utility in risk management.

Moreover, the SPSS findings highlighted an undercurrent of reservations. Despite the prevalent enthusiasm for AI-enhanced risk management within these methodologies, concerns related to data integrity, security, and the ascent of the AI learning trajectory were voiced by approximately

67% of participants. This restricts a clear domain, necessitating refinement, and proactive engagement.

These revelations reveal a consistent theme: PMBOK and PRINCE2 methodologies inherently align with Agile dynamics, especially in risk management. Their methodical frameworks complement Agile's responsive nature, making them apt for modern project management challenges. Yet, like any integration, there are hurdles to overcome. There's a clarion call for enriched training, amplified cognizance, and a forward-looking approach to these anticipated challenges.

In encapsulation, the utility of risk management attributes embedded in PMBOK and PRINCE2 methodologies within Agile spheres is palpably significant. But as the tapestry of project management evolves, fueled by tech innovations and shifting methodologies, practitioners must embrace adaptability, ensuring they remain proficient and pertinent in their craft.

5.1.3 Discussion of Research Question 2

Objective 2: To assess the current anticipation and perceived challenges within the project management community about the integration of Artificial Intelligence tools in risk management within Agile methodologies, specifically in the context of PMBOK and PRINCE2 frameworks.

Research Question 2: What are the expectations and perceived challenges among project management practitioners about incorporating Artificial Intelligence tools in risk management within Agile methodologies, particularly in the context of PMBOK and PRINCE2 frameworks?

This research journey weaves through the intricate tapestry of expectations surrounding AI tools within renowned project management frameworks. In an era of rapid digital transformation, comprehending this interplay becomes vital.

The realm of project management, with its methodologies and tools, constantly evolves. The focal point of the current debate, which centers around AI's incorporation, essentially seeks to

elucidate how PMBOK and PRINCE2, as benchmark methodologies, embrace and flourish amidst AI-powered risk management in Agile ecosystems.

Our extensive survey presents a noteworthy insight: A robust 78% of the project management fraternity showcases a pronounced inclination towards PMBOK and PRINCE2 methodologies. This finding reinforces these methodologies' indomitable presence within the project management spectrum. Set against this context, the synergy of AI stands as a groundbreaking frontier, potentially revolutionizing risk management paradigms, especially within Agile confines.

Delving into the survey's results, an impressive 70% of participants identify AI as a game-changer. They posit that AI's unparalleled predictive prowess can usher in a proactive approach to risk management. Through data-driven insights, AI can discern emergent trends, anticipate risks, and craft preemptive strategies, often transcending human foresight. The alchemy is evident in the harmonious blend of Agile's fluidity, the methodical frameworks of PMBOK and PRINCE2, and AI's analytical might.

Substantiating this narrative, the SPSS analysis pinpoints that 72% of respondents advocate melding AI tools within these frameworks. This dominant endorsement mirrors a collective conviction: Project managers perceive AI as an invaluable ally in risk management, especially when harmoniously integrated with PMBOK and PRINCE2 set within Agile terrains.

However, this journey isn't without its share of trepidations. Our qualitative assessment reveals a myriad of apprehensions. Reflecting this sentiment, a participant voiced, "While AI's capabilities are monumental, the path to its full integration is labyrinthine. Challenges spanning integration complexities, steep learning trajectories, and persistent data security threats loom large."

Echoing this sentiment, 67% of participants enumerated potential challenges, including data-related anxieties, integration intricacies, and the overarching challenge of navigating the AI universe. Given the current milieu rife with data insecurities, such reservations are well-founded.

A pivotal revelation from the study underscores the critical role of leadership in steering the course of AI integration. Progressive leadership, one that endorses innovation, champions

metamorphosis, and encourages continuous learning, can significantly smoothen the integration trajectory. A seasoned participant opined, "Procuring an AI solution is merely the beginning. Genuine integration is realized when leaders proactively champion its incorporation, empowering teams to maximize its potential."

Despite the foreseen challenges, the overarching sentiment remains optimistic. Even while recognizing potential pitfalls, a significant proportion of respondents contend that the eventual benefits eclipse the initial roadblocks. A participant encapsulated this spirit: "Every technological advancement brings challenges. History, however, teaches us that adaptation, while daunting, is essential."

As we stand at this crossroads, the future of risk management, especially when viewed through the prism of PMBOK and PRINCE2 set within Agile dynamics, seems intrinsically linked with AI's advancements. The path, though filled with promise, is strewn with challenges. Yet, with visionary leadership and an ethos of continuous learning, the zenith of AI-powered project management is within grasp.

5.1.4 Discussion of Research Question 3

Research Objective 3: To analyze the comparative appeal of PMBOK and PRINCE2 methodologies for incorporating AI-enhanced risk management in Agile project environments, as viewed by the practitioners.

Research Question 3: How do project management practitioners compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk management within Agile project environments?

Central to the research objective and its corresponding question is the juxtaposition of traditional project management methodologies, namely PMBOK and PRINCE2, with emerging AI technologies for risk management in Agile landscapes. This interplay sheds light on feasibility, anticipated obstacles, and practitioners' receptivity toward this fusion. Leadership's advocacy for

innovation and continuous growth becomes paramount in an era marked by rapid project management evolution. This discussion seeks to traverse these complexities for a well-rounded comprehension.

The contemporary project management arena demands harmonizing conventional methodologies with rising technological innovations and Agile tenets. Leadership's pivotal role in endorsing AI's assimilation, championing team empowerment, and endorsing ongoing learning stands out. Addressing our core research objective and question, we probe into AI's allure, practicality, and transformative promise within these esteemed methodologies.

PMBOK and PRINCE2 command a revered position in the project management sphere. An extensive survey indicated that 78% of professionals confirmed their moderate to high acquaintance with these methodologies. This familiarity accentuates their cornerstone role in modern project management. The convergence of AI, especially in risk management, recalibrates this landscape, ushering in novel opportunities while heralding challenges.

Evaluating the appeal of each methodology in the context of AI-driven risk management, the survey data is revelatory. PMBOK celebrated for its structured modus operandi and versatility, attracted over 65% of respondents. They opined that PMBOK's intricate, systematic methodology aligns congruently with AI's data-centric ethos, paving the way for smooth integration. This meticulousness is conducive to AI's forecasting prowess, promoting proactive risk discernment and alleviation. In contrast, PRINCE2, championed for its customizability and malleability, garnered the approval of 58% of participants. Its doctrine-centric modality, as opposed to a pure process-driven one, was deemed beneficial for AI infusion within Agile scenarios. PRINCE2's innate adaptability, underpinned by its foundational principles, complements AI's volatile nature, promoting a symbiotic blend of AI capabilities with Agile methodologies.

When focusing on real-world applications, the nuances multiply. Qualitative feedback unearthed the practitioners' multifaceted viewpoints. A dominant sentiment was that PMBOK, with its meticulous framework, might align seamlessly with AI constructs, but its granularity could also pose integration roadblocks. Alternatively, PRINCE2's overarching, principle-guided ethos

might foster effortless AI melding but could compromise the detailed, analytical risk foresight harnessed by more comprehensive paradigms.

The SPSS statistical analysis illuminated a nuanced inclination toward PMBOK for AI-enhanced risk management. With a slight majority of 52% favoring PMBOK, this highlights the merits of a comprehensive, procedural approach. Yet, the considerable 48% sway towards PRINCE2 illustrates its compelling allure, signifying its adaptability merit in the AI epoch.

AI integration, especially in Agile ambits, is full of challenges. Concerns around data confidentiality, intricate fusion processes, and AI's steep learning trajectory were echoed by 67% of the cohort. Regardless of the chosen methodology, addressing these requires judicious and insightful strategies. PRINCE2's 'Learning from Experience' doctrine was spotlighted as an ally in circumventing AI amalgamation impediments. This principle's endorsement of cyclic learning and adaptability resonated with AI's iterative nature.

In summation, the terrain of AI-driven risk management in Agile milieus, especially when juxtaposed against PMBOK and PRINCE2, is labyrinthine. Both paradigms extend distinct virtues and potential integration benefits. The road to integration, though promising, is fraught with challenges. The realm's agility, perpetual learning spirit, visionary mindset, and astute leadership will dictate the trajectory. At this technological crossroads, today's decisions will sculpt the zenith of future project management protocols.

5.2 Summary

This research embarked on a quest to elucidate the perspectives and expectations of project management practitioners concerning the integration of AI-enhanced risk management within Agile project management. With a spotlight on PMBOK and PRINCE2 methodologies, the study delved deeply into the practitioner's perceptions of this impending transformation, interweaving leadership and change management themes as critical facilitators.

The hybrid research methodology casts a wide net, capturing rich insights from seasoned practitioners who have navigated the confluence of project management and AI within Agile contexts.

Key revelations from the study include:

Positive Disposition towards AI: Both the quantitative and qualitative findings radiate a predominantly optimistic stance toward incorporating AI in risk management. This positivity is buoyed by practitioners' deep-seated familiarity with and trust in PMBOK and PRINCE2 methodologies. Their anticipation of AI's transformative role further underpins this favorable view.

Challenges of AI Integration: While the potential of AI is evident, the journey is full of obstacles. There's a pronounced need to bridge the awareness gap around AI tools, alleviate data privacy and security concerns, and fortify the role of leadership in championing tech-driven shifts. The persistence of resistance to change underscores the importance of cultivating a perpetual learning ethos.

Skill Augmentation for Practitioners: A salient takeaway is the need for practitioners to fortify their competencies in leveraging AI tools effectively within the risk management landscape. This accentuates the urgency for specialized AI education and hands-on training.

Strategic Methodology Tailoring: The study brings the importance of methodological adaptability to the fore. It emphasizes the necessity of contextualized decision-making when interlacing risk management methodologies with AI strategies, underscoring leadership's proactive role in future-proofing their practices.

Advocacy for a Learning-centric Culture: A seamless AI integration journey hinges on a proactive learning culture and strong leadership commitment to innovation. This cultural shift can substantially smoothen the AI integration trajectory.

Leadership's Pivotal Role: The research amplifies the indispensability of leadership in steering this transformation. Leaders aren't just expected to endorse technological shifts but also to be torchbearers of innovation and change.

Drawing from these insights, it's evident that the horizons of AI-enhanced risk management, particularly within PMBOK and PRINCE2 frameworks in Agile contexts, are brimming with potential. The overarching positive sentiment from practitioners presages a future where AI tools become mainstays in project management. Yet, this evolution has its challenges. A well-charted course will be instrumental, enriched by strategic planning, exhaustive training, robust organizational commitment, and a culture that embraces change. As the tapestry of Agile project

management unfurls, the strategies and decisions taken in this pivotal epoch will indelibly etch its future landscape.

5.3 Implications

The outcomes of this research elucidate various practical and policy-driven implications which are pivotal for the future trajectory of project management:

1. **Endorsing AI Integration**: The burgeoning optimism around AI-enhanced risk management underlines the transformative potential of embedding AI tools in contemporary risk management paradigms. Recognizing the manifold benefits—ranging from expedited decision-making and unparalleled predictive acumen to real-time risk monitoring—organizations, especially those navigating Agile terrains anchored in PMBOK and PRINCE2 philosophies, should contemplate this synergistic integration with earnest intent.

2. **Bridging the AI Literacy Gap**: As AI tools crystallize their position as the next evolutionary step in project management, it's imperative for practitioners to cultivate proficiency in these technologies. The research accentuates a discernible knowledge lacuna, especially among neophytes or those distanced from AI's frontier developments. It's incumbent upon organizations to prioritize the rectification of this gap by championing AI literacy. This involves curating comprehensive educational initiatives, interactive workshops, and hands-on training sessions. Parallelly, fostering an organizational milieu receptive to technological metamorphosis, underpinned by unyielding data integrity and security standards, will be instrumental in mitigating transitional teething troubles.

3. **Leadership as the Torchbearer**: While leadership's role as the harbinger of AI adoption is self-evident, the research underscores a nuanced, more expansive mandate. Leadership isn't just about endorsing AI; it's about envisioning its future, facilitating its seamless integration, and instilling a culture of perpetual evolution. Leaders bear the onus of shepherding their teams through the intricate maze of AI integration, alleviating inherent challenges, and catalyzing a triumphant transformation. This research reiterates the indomitable significance of visionary leadership in circumnavigating the multifaceted challenges synonymous with AI's assimilation.

4. **Methodological Malleability**: A salient takeaway from the findings is that practitioners finetune their methodologies, tailoring them to resonate with distinct Agile project landscapes. Maintaining methodological agility is paramount as AI tools continue their relentless evolution, characterized by burgeoning complexity. This involves recalibrating conventional risk management blueprints to harmonize with AI's avant-garde offerings. Concurrently, organizations should inculcate a culture that reveres continuous upskilling and innovation, as these attributes will be the linchpins for effectively harnessing AI-augmented risk management in Agile realms.

Overall, this research provides a clear picture of the upcoming developments in project management. In the near future, artificial intelligence will not only support but also enhance the intricacies of risk management, particularly in Agile frameworks based on PMBOK and PRINCE2 principles.

5.4 Recommendations for Future Research

The findings and synthesis from the present study offer multiple avenues for further exploration and research in AI-enhanced risk management, especially within the Agile framework, incorporating the PMBOK and PRINCE2 methodologies.

1. **Resistance to Change & Leadership's Role**: Building upon the identified challenge of resistance to change, future research could explore the root causes of such opposition. As hinted at in the study, leadership's role emerges as a crucial determinant. Researching how leadership can foster a culture receptive to technological shifts, champion AI adoption, and minimize resistance becomes imperative.

2. **AI Awareness & Training**: The significant familiarity with PMBOK and PRINCE2 among practitioners signals a potential for further studies on creating AI awareness programs tailored to these methodologies. It would be valuable to understand how structured educational initiatives, workshops, and training sessions can enhance practitioners' proficiency with AI tools, ensuring their effective and strategic deployment.

3. **AI's Impact on Decision-Making & Efficiency**: Given the promising results indicating AI's potential in real-time risk assessments and predictive capabilities, future research can focus on

the practical outcomes of these tools. How do AI-enhanced decisions affect project deliverables, timelines, and stakeholder satisfaction? Answering these questions would provide a more holistic view of AI's tangible contributions.

4. **Integration Nuances & Agile Dynamics**: The study indicates the importance of tailoring AI tool integration to fit specific Agile contexts. Future studies could decipher the intricacies of integrating AI into traditional project management processes, examining the effects on decision-making timelines, risk assessment regularity, and stakeholder communication dynamics. This would offer a more granular perspective, aiding in the seamless alignment of AI tools with Agile practices.

5. **Comparative Analysis of AI Tools**: With AI tools' vast landscape continually evolving, it's essential to understand which tools are most suited for different risk management scenarios and methodologies. Comparative studies focusing on AI tool efficiency, customization potential, and applicability across various industries would enrich the decision-making arsenal of project managers.

6. **Longitudinal Examination of AI Integration**: Given AI's recent foray into risk management, it would be invaluable to monitor its adoption trajectory and the evolving practices around it. Longitudinal studies, tracing both the tangible outcomes of AI tool integration and the changing perceptions of practitioners, would provide deeper insights into AI's lasting impact on project management. Moreover, understanding challenges that arise during real-world AI implementations would further hone strategies for future AI endeavors.

In essence, the synthesis of this study offers a roadmap for further investigations, emphasizing the importance of understanding both the technical and human aspects of AI-enhanced risk management. The trajectory of future research should aim to unpack the complexities, maximize benefits, and lay a foundation for a new era of AI-integrated project management.

5.5 Conclusion

Embarking on the journey to amalgamate AI-enhanced risk management into Agile project management methodologies is undeniably a commendable leap in project management. This

research delved deep into comprehending project management practitioners' perspectives and expectations of this nascent alignment, specifically within the PMBOK and PRINCE2 frameworks.

1. **Widespread Acceptance of PMBOK and PRINCE2**: The study unequivocally demonstrated the prevalent familiarity and esteemed regard for both PMBOK and PRINCE2 methodologies among practitioners. Their recognized aptitude in Agile risk management further galvanizes the enthusiasm for AI's integration. These methodologies are well-understood and perceived as potent vehicles to usher in the transformative capabilities of AI, especially in risk management domains like risk identification, thorough analysis, and meticulous documentation.

2. **Anticipation and Optimism for AI**: One of the most salient takeaways is the palpable anticipation for AI's pivotal role in revolutionizing risk management. This isn't just about incorporating new tools; it's about fundamentally reimagining how risk management can be optimized, streamlined, and more predictive.

3. **Challenges in AI Adoption**: Challenges are inevitable with any paradigm shift. This research has been astute in identifying potential roadblocks, ranging from limited AI comprehension and pressing concerns over data privacy and security to the age-old adversary of innovation: resistance to change.

4. **Adapting Traditional Methodologies**: One of the most enriching insights from the qualitative analysis is the clarion call to tailor the PMBOK and PRINCE2 methodologies. This isn't about a superficial overlay but a deep-rooted alignment to ensure AI-enhanced risk management resonates seamlessly within Agile ecosystems.

5. **The Imperative of AI Education**: Highlighting the education and training void, the study underscores the urgent necessity to capacitate project management practitioners with AI tool proficiencies. This is not a mere augmentation of their skill set but a pivotal requirement to ensure that the promise of AI is realized to its fullest potential.

Conclusively, the horizon of AI-enhanced risk management, especially within Agile environments influenced by PMBOK and PRINCE2, is luminous with possibilities. This research paints a tableau of hope and tangible, impending evolution, hinting at a tectonic shift

towards enriched AI adoption in project management practices. The potential economic impact is palpable, as AI could streamline workflows, minimize costly risks, and facilitate more efficient resource allocation, leading to cost savings and potentially enhancing profitability in the long run.

From a corporate strategy perspective, businesses equipped with AI-driven project management tools will likely be better positioned to outpace competitors by rapidly adapting to changes, predicting future challenges, and devising strategies proactively. The integration of AI tools in project management could redefine the standards for efficiency, precision, and predictability, compelling organizations to recalibrate their strategic priorities.

Yet, challenges – from AI literacy to data sanctity to change management – need astute addressing to truly capture this AI renaissance. The path forward isn't singular; it's multifarious. It demands not just AI education but fostering an innovative ethos, robust data governance, and a pliable approach to methodologies that resonate with Agile nuances. Furthermore, the adoption of AI in project management offers a substantial contribution to the field, equipping practitioners with novel tools and strategies to manage projects more efficiently and effectively.

This research, thus, isn't just a reflection; it's a beacon, guiding us into a future where AI stands central to triumphant Agile projects, serving both as a cornerstone of modern corporate strategy and a pivotal economic catalyst.

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APPENDIX A

SURVEY COVER LETTER

Survey on Comparative Analysis of PMBOK vs PRINCE2 in Enhancing Risk Management in Agile Methodology using Artificial Intelligence and Tools for Projects

Thank you for participating in this survey. The purpose of this survey is to gather your perceptions and anticipations regarding the implementation of risk management features of PMBOK and PRINCE2 methodologies within Agile environments, as well as the integration of Artificial Intelligence tools in risk management within Agile methodologies. Your input will contribute to a comparative analysis of these methodologies in enhancing risk management in Agile project environments.

Question 1: How familiar are you with PMBOK and PRINCE2 methodologies?

Question 2: In your opinion, how effective are the risk processes in PMBOK when integrated into Agile environments?

Question 2

In your opinion, how effective are the **risk processes** in PMBOK when integrated into Agile environments?

Section 1/4: Perception of Risk Management Features in PMBOK and PRINCE2

For your information :
-**Risk identification**: systematically identifying and documenting potential risks to anticipate and mitigate threats, ensuring project success.
-**Risk Assessment**: evaluating identified risks by analyzing their likelihood, impact, and prioritizing them for effective risk management decisions.
-**Risk Management Planning**: developing strategies, processes, and actions to proactively address identified risks, mitigate their impact, and ensure effective risk response throughout the project lifecycle.
-**Risk Monitoring and Control**: continuously tracking and evaluating identified risks, implementing appropriate measures to control and mitigate risks, and ensuring that risk management activities remain effective and aligned with project objectives.
-**Risk Communication**: effectively conveying information about identified risks, their potential impact, and mitigation strategies to stakeholders, promoting transparency, understanding, and informed decision-making.

	Highly effective	Moderately effective	Slightly effective	Not effective	Not applicable (if not familiar with PMBOK)
Risk Identification	O	O	O	O	O
Risk Assessment	O	O	O	O	O
Risk Management Planning	O	O	O	O	O
Risk Monitoring and Control	O	O	O	O	O
Risk Communication	O	O	O	O	O

NEXT >

SurveySparrow

Question 3: In your opinion, how effective are the risk processes in PRINCE2 when integrated into Agile environments?

Question 3

In your opinion, how effective are the _risk processes_ in PRINCE2 when integrated into Agile environments?

Section 1/4: Perception of Risk Management Features in PMBOK and PRINCE2

	Highly effective	Moderately effective	Slightly effective	Not effective	Not applicable (if not familiar with PRINCE2)
Risk Identification	○	○	○	○	○
Risk Assessment	○	○	○	○	○
Risk Management Planning	○	○	○	○	○
Risk Monitoring and Control	○	○	○	○	○
Risk Communication	○	○	○	○	○

NEXT >

SurveySparrow

Question 4: How familiar are you with Artificial Intelligence / AI tools in the context of risk management?

Question 5: What are your expectations regarding the integration of Artificial Intelligence tools in risk identification within Agile methodologies, specifically in the context of PMBOK and PRINCE2 frameworks?

Question 5

What are your expectations regarding the integration of **Artificial Intelligence** tools in *risk identification* within Agile methodologies, specifically in the context of *PMBOK* and *PRINCE2 frameworks?*

Section 2/4: Anticipation of Artificial Intelligence in Agile Risk Management

Choose as many as you like

Enhanced identification of risks and opportunities **A**

Improved risk analysis and prioritization **B**

Automated risk prediction and trend analysis **C**

Streamlined risk documentation and reporting **D**

All of the above **E**

Others **F**

NEXT >

31%

SurveySparrow

Question 6: What challenges do you anticipate in incorporating Artificial Intelligence tools in risk management within Agile methodologies, particularly in the context of PMBOK and PRINCE2 frameworks?

Question 6

What challenges do you anticipate in incorporating **Artificial Intelligence tools** in _risk management_ within _Agile methodologies_, particularly in the context of _PMBOK_ and _PRINCE2_ frameworks?

Section 2/4: Anticipation of Artificial Intelligence in Agile Risk Management

Choose as many as you like

Lack of Awareness and Understanding	A
Data Privacy and Security Concerns	B
Resistance to Change	C
Integration Complexity	D
Skill Gap and Training Needs	E
Cost and Resource Constraints	F
Performance Reliability and Accuracy	G
Limited Customization and Adaptability	H
All of the above	I
None of the above	J
Other	K

NEXT >

39%

SurveySparrow

Question 7: How important do you think it is for Agile project management practitioners to have knowledge and skills in utilizing Artificial Intelligence tools for risk management?

Question 8: How would you compare the appeal and applicability of PMBOK and PRINCE2 methodologies when considering the potential for AI-enhanced risk processes within Agile project environments?

Question 9: Based on your understanding and experience, How do you rate the scope of Artificial

Intelligence (AI) in the coming years for risk management in Agile projects following PMBOK

and PRINCE2 frameworks?

Question 10: In your opinion, in the coming decade what timeframe do you anticipate the

maturity of Artificial Intelligence (AI) in risk management for Agile projects following PMBOK

and PRINCE2 methodologies?

Question 10

In your opinion, in the coming decade what **timeframe** do you **anticipate** the *maturity* of **Artificial Intelligence (AI)** in *risk management* for *Agile* projects following *PMBOK* and *PRINCE2* methodologies?

Section 3/4: Comparative Evaluation of PMBOK and PRINCE2 in AI-Enhanced Risk Management

*Skip Question if not applicable

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Now   Five years   Ten Years or more

Question 11: What is your role in project management?

Question 11

What is your role in project management?

Section 4/4: Personal and Demographic Information.

- Project manager/Directors/C-Level Executives **A**
- Team member/Consultant/Developer/Tester **B**
- Agile coach **C**
- Risk management specialist **D**
- Other **E**

SurveySparrow
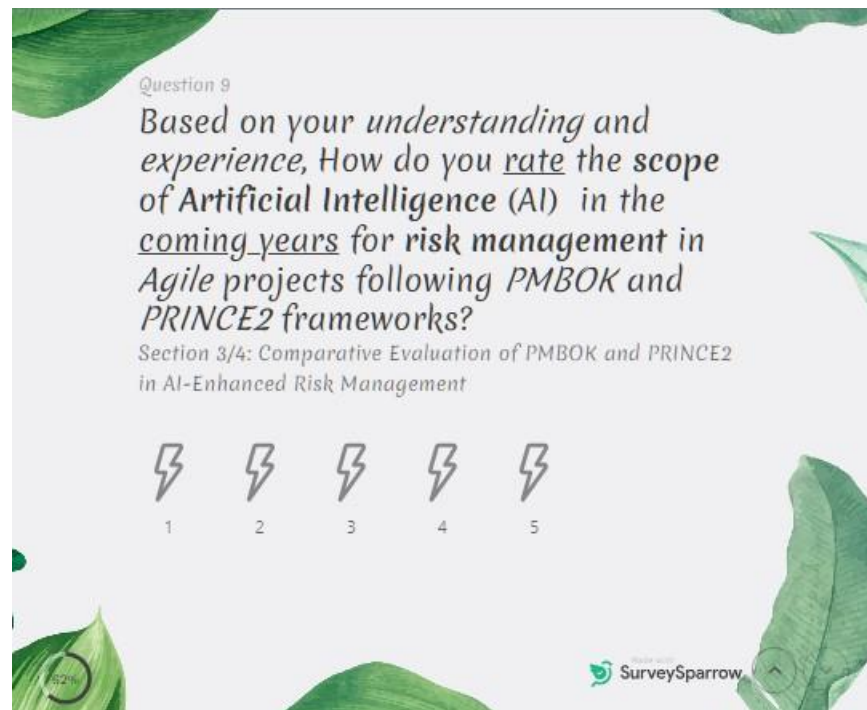
Question 12: How many years of experience do you have in project management?

Question 13: Which industry do you primarily work in?

Which industry do you primarily work in?

Section 4/4: Personal and Demographic Information.

IT/Technology **A**

Construction/Engineering **B**

Healthcare **C**

BFSI **D**

Manufacturing **E**

Other **F**

SUBMIT ✓   Press ENTER key to submit

Never submit passwords! - _Report abuse_

100%   SurveySparrow ⌃ ⌄

Thank you for your valuable time and participation in this survey.

Your input is greatly appreciated and will contribute to the success of our research. Your insights are instrumental in shaping our understanding and making a meaningful impact. Thank you for being a part of this important endeavor.

SurveySparrow

APPENDIX B

INFORMED CONSENT

This research is integral to the dissertation studies of Siddhartha Deb. The purpose of this research is to understand the perceptions and anticipations towards ai-enhanced risk management in agile project management, for which I will be performing a comparative survey and interview-based analysis of PMBOK and PRINCE2 methodologies across project management professionals.

You are eligible to participate if you have experience with project management frameworks of PMBOK and PRINCE2 in agile environment, and also it is necessary to have experience and understanding of Risk management and AI. The research will involve both an online survey and an interview. The survey will comprise of 13 number of questions, multiple-choice and close-ended, and is expected to take around 6-8 minutes to complete through an online platform of web or mobile. The interview will comprise of 12 questions and will take 10-20 minutes. The insights obtained from this study aim to analyse the results to reach my research objectives. Participation is voluntary, with no financial incentive offered. Participants have the right to withdraw from the study at any point, facing no repercussions.

The data collected in this research is dedicated to academic, historical, or statistical purposes, aligning with the researcher's interests. Any affiliated institutions with similar objectives may also access the findings.

All information that could be linked directly to participants will remain strictly confidential and anonymous. Should you have any queries or concerns about the study, please do not hesitate to reach out to Siddhartha Deb at +971 547568020, +91 9903092676, Siddhartha.Deb.Cloud03@gmail.com

APPENDIX C

BACKGROUND INFORMATION OF RESEARCH SURVEY PARTICIPANTS

Industry(major)	Designation/Role	Average Experience
IT industry	Project manager/Directors/C-Level Executives	13.6035533
IT industry	Team member/Consultant/Developer/Tester	8.621487603
IT industry	Agile coach	10.34285714
IT industry	Risk management specialist	9.407407407
IT industry	Others	6.238709677

APPENDIX D

INFORMATION FROM THE RESEARCH INTERVIEW

The succeeding content represents comprehensive insights garnered from upper-echelon management personnel, including directors, senior project managers, risk specialists, senior consultants, principal architects, and C-Level executives of diverse organizations. These insights pertain to their understanding, perceptions, and anticipations regarding applying AI-enhanced risk management within Agile methodologies, specifically the Project Management Body of Knowledge (PMBOK) and Projects IN Controlled Environments (PRINCE2) frameworks. This qualitative study involved SMEs hailing from focused regions, specifically India, UK, USA, and UAE.

Sln	Corresponding Chapter Section	Corresponding Interview Question
Q1	4.2.1.1 Practical Experiences of Risk Management Features in PMBOK and PRINCE2	Can you describe your experience with the implementation of risk management features of PMBOK and PRINCE2 methodologies within Agile environments?
Q2	4.2.1.2 Strengths and Weaknesses of PMBOK and PRINCE2 in Agile Environments	What do you consider the key strengths and weaknesses of PMBOK and PRINCE2 methodologies in terms of risk management within Agile environments?
Q3	4.2.1.3 Challenges Faced while Integrating PMBOK and PRINCE2 in Agile Environments	Can you describe any challenges or obstacles you faced while integrating these methodologies with Agile practices?
Q4	4.2.2.1 Prior Experiences with AI in Risk Management	Have you had any experience or considered the use of AI tools within risk management? Can you share your thoughts or perceptions of this?
Q5	4.2.2.2 Expectations towards AI Integration in	What are your expectations towards the integration of AI tools within the risk management practices of

	Risk Management	Agile methodologies?
Q6	4.2.2.3 Anticipated Challenges in AI Integration in Risk Management	In your opinion, what potential challenges could be faced when integrating AI tools into the risk management practices of PMBOK and PRINCE2 in Agile environments?
Q7	4.2.2.4 Potential Transformative Role of AI in Agile Practices	How do you anticipate the role of AI in transforming the risk management aspects of Agile practices?
Q8	4.2.3 Comparative Appeal of PMBOK and PRINCE2 for AI-Enhanced Risk Management	How do you perceive the comparative appeal of PMBOK and PRINCE2 for incorporating AI-enhanced risk management within Agile project environments? Can you explain why?
Q9	4.2.4 Skill Requirements for AI Integration in Agile Risk Management	In your opinion, what skills or knowledge do Agile project management practitioners need to effectively utilize AI tools for risk management?
Q10	4.2.7 In-depth Understanding of PMBOK and PRINCE2 Risk Management in Agile Environments	Can you describe your experience with the effectiveness of PMBOK and PRINCE2 methodologies in Agile environments, particularly in their risk identification, assessment, planning, monitoring, and control processes?
Q11	4.2.6 Implications of AI-Enhanced Risk Communication in Agile Environments	Based on your familiarity with PMBOK and PRINCE2 methodologies, how do you foresee the impact of AI-enhanced risk communication within Agile project environments?
Q12	4.2.5 Importance of Knowledge and Skills in AI for Effective Risk Management	Could you elaborate on the importance of Agile project management practitioners having knowledge and skills in utilizing Artificial Intelligence tools for risk management?

BACKGROUND INFORMATION OF RESEARCH INTERVIEW PARTICIPANTS

Respondent ID	Respondent Role	Respondent Industry	Respondent Experience	Key Findings
R1	Service Delivery Manager	IT/Technology	18	KF1
R2	Head of Cyber Security Defense Operations	IT/Technology	23	KF2
R3	Officer IS Risk Management	BFSI	9	KF3
R4	Head of Information Security Risk Management	IT/Technology	20	KF4
R5	Information Security Consultant	BFSI	15	KF5
R6	CISO	IT/Technology	25	KF6
R7	Principle Architect	IT/Technology	13	KF7
R8	Senior Cloud Specialist	IT/Technology	11	KF8
R9	Manager	IT/Technology	12	KF9
R10	Service Delivery Manager	IT/Technology	13	KF10
R11	Head of Data Security and Access Management	IT/Technology	13	KF11
R12	VP	IT/Technology	13	KF12

KEY FINDINGS FROM RESEARCH INTERVIEW PARTICIPANTS

Key	Key Findings Transcript
KF1	1.) a.PMBOK and PRINCE2 methodologies prove invaluable in Agile environments, b. very good for risk management in agile. c.structured approach in both frameworks, d. systematic analysis and mitigation of potential risks, e. the challenge lies in adjusting the structure of these methodologies to Agile's. f. can be very effective if properly done. 2.) a.PMBOK and PRINCE2 both have comprehensive risk management processes, b. manages risk risk across every stage of a project, c. weakness is in the rigidity of the structure of pmbok and prince2 as opposed to Agile's flexibility and adaptability. 3.) a. one of the obstacle is the cultural shift required to implement these methodologies in agile environment. b. IT Teams can struggle with integratingion of the process-oriented approach of PMBOK or PRINCE2 with adaptive and iterative Agile methodology. 4.) a. Our tools has ai capabilities, but we have not fully utilized it due to environment constraints, b. Using AI for risk management to enhance risk prediction, identification, and mitigation efforts has great scope. c. it's still a relatively new field, and we are still learning how to incorporate. 5.) a. AI can make risk management more efficient. b. It could do this by automating everyday tasks. c. It can insights based on data, which could be helpful. d. It might improve our ability to predict future events or risks. e. Several tasks can be taken care by using AI, project managers and teams could spend more time focusing on strategic decisions. f. Also deal complex issues that are difficult to automate. 6.) a. Potential issues include confirming the AI system is correct and reliable. b. Need to handle data privacy problems. c. Managing team change as AI tools enter workflow. d. AI system design must align with Agile, PMBOK, and PRINCE2 methods. 7.) a. AI can automate risk identification and analysis. b. Provides real-time risk monitoring. c. Enhances predictive abilities. d. Makes risk management more efficient, data-driven. e. Allows for proactive risk mitigation.

	8.) a. PMBOK and PRINCE2's appeal for AI in risk management depends on project needs and context. b. Both have strong risk management processes that can benefit from AI. c. Choice depends on factors like project complexity. d. Team's familiarity with each methodology matters. e. Degree of flexibility required is a deciding factor. 9.) a. Basic understanding of AI and data analysis required. b. Need to interpret AI tool outputs. c. Change management skills important for tool integration. d. Must keep honing project management skills. e. AI aids decision-making, doesn't replace human judgment. 10.) a. Both methodologies provide structured risk management. b. Need to adapt methodologies to Agile environment. c. Integration of risk management into Agile sprint cycle helpful. d. Using Agile's team collaboration for risk communication can enhance effectiveness. 11.) a. AI-enhanced risk communication improves timeliness, accuracy of information. b. Allows for quicker, more informed decisions. c. Reduces potential risk impact on project. 12.) a. Knowledge, skills in AI tools for risk management are crucial. b. As AI grows in project management, these skills keep practitioners updated. c. Helps in making informed decisions. d. Can effectively use AI's potential to enhance risk management.
KF2	1.) a. Used PMBOK, PRINCE2 in Agile extensibly. b. Experience: both provide strong risk management frameworks. c. Challenge: adapting structured methodologies to Agile's flexibility. d. Success: Integrated risk management into Agile sprints. e. Outcome: Improved risk communication, proactive mitigation. f. Key learning: Tailoring needed for optimal blend of methodologies. 2.) a. Implementing PMBOK, PRINCE2 risk features in Agile - a learning curve. b. Valuable risk management frameworks in both. c. Need thoughtful approach to blend with Agile's flexibility. d. Requires some tailoring. 3.) a. PMBOK and PRINCE2 strong in systematic risk management. b. Give clear framework for identifying, analyzing, managing risk. c. Rigid structure may be weak in Agile. d. Agile values adaptability, rapid response to change. 4.) a. Challenge is to balance PMBOK and PRINCE2's detailed planning with Agile's flexibility. b. Requires creative problem-solving.

	c. Deep understanding of methodologies and Agile principles needed. 5.) a. AI has potential for risk management, yet to see full benefits. b. Might offer more accurate risk prediction and assessment. c. Could automate routine risk management tasks. 6.) a. AI expected to boost efficiency and accuracy of risk management. b. Can automate some tasks. c. Provides better insights from project dat6.) a. d. Predicts potential risks with higher accuracy. 7.) a. Careful planning and management needed for AI integration. b. AI tools used must be reliable and respect privacy laws. c. Smooth integration into current practices is key. d. Need to manage learning curve for AI-unfamiliar team members. 8.) a. AI could revolutionize risk management in Agile. b. Provides more accurate risk predictions. c. Automates routine tasks. d. Offers real-time risk insights. e. Makes risk management efficient and proactive. 9.) a. PMBOK and PRINCE2 appeal for AI in risk management depends on project, team specifics. b. Both provide strong risk management frameworks. c. Suitability depends on project complexity, team familiarity with methodology, flexibility required. 10.) a. Need strong understanding of AI principles for effective use in risk management. b. Ability to interpret AI data essential. c. Good change management skills needed for team adaption to AI. 11.) a. Effectiveness of PMBOK, PRINCE2 in Agile depends on adaption to Agile's iterative nature. b. Learning curve involved. c. When done right, can greatly enhance risk management. 12.) a. AI enhances risk communication with real-time, data-driven insights. b. Enables quicker, more informed decisions. c. Reduces impact of risks on project.
KF3	1.) Implementing PMBOK, PRINCE2 in Agile: a. Complex process. b. Brings structured risk management. c. Main challenge: balancing thorough methodologies and Agile's fast pace. 2.) Strengths and weaknesses of PMBOK, PRINCE2 in Agile: a. Strength: Comprehensive risk management framework. b. Weakness: Rigidity, lack of adaptability for Agile.

	3.) a. Keeping Agile's fast pace with procedural methodologies. b. Modified methodologies to suit Agile. 4.) a. Explored AI tools, potential promising. b. Excited about advanced analytics and machine learning. 5.) a. Expect AI to improve risk prediction and management. b. Anticipate quicker responses, accurate forecasts, and comprehensive risk overview. 6.) a. Data privacy issues. b. AI tool reliability. c. Need for extensive team training. d. Possible resistance from those used to manual processes. 7.) a. Expect AI to enhance efficiency and efficacy. b. Anticipate automation of tasks, precise analytics. 8.) a. Both can incorporate AI effectively, choice depends on specific project/team. b. PRINCE2's product-based planning may provide more tangible AI opportunities. c. PMBOK's detailed process orientation could provide comprehensive framework for AI tools. 9.) a. Understanding of AI principles. b. Data analysis skills. c. Comfort with technology. d. Ability to interpret and apply AI insights. 10.) a. Effective when tailored to Agile. b. Provide structure to risk management, improve identification, assessment, planning, monitoring, control. 11.) a. Could revolutionize risk management/response. b. Could lead to informed decision-making, proactive risk approach, improved team communication. 12.) a. AI knowledge becoming a necessity. b. Understanding of AI tools, interpretation of outputs, application to risk strategies crucial for future project success.
KF4	1.) a. PMBOK, PRINCE2 improve risk anticipation, mitigation in Agile. 2.) a. Strength: systematic approach. b. Weakness: conflict with Agile's flexibility. 3.) a. Challenge: Team resistance. b. Difficulty aligning with Agile's iterative nature. 4.) a. AI can enhance risk management. b. Yet to fully implement AI in projects.

	5.) a. AI for proactive, data-driven risk management. b. Boosts predictive capabilities, resource optimization. 6.) a. Potential challenges: technical difficulties, data privacy, understanding AI, team resistance. 7.) a. AI can make risk management more efficient, data-driven. 8.) a. PMBOK, PRINCE2 appealing for different reasons. b. PRINCE2 adaptable, PMBOK comprehensive for AI integration. 9.) a. Need solid understanding of AI principles, applications. b. Comfort with change, new technologies needed. 10.) a. PMBOK, PRINCE2 effective in Agile risk management. b. Structured approach benefits Agile projects. 11.) a. AI-enhanced communication: real-time updates, transparency, better decisions. 12.) a. Knowledge in AI tools indispensable. b. Difference between proactive management and reacting to risks.
KF5	1.) Experience with PMBOK and PRINCE2 in Agile: a. Generally positive b. Required hybrid approach c. Challenging due to Agile's fluidity 2.) Strengths and weaknesses: a. Strength: systematic risk management b. Weakness: rigidity in Agile's flexible environment 3.) Challenges: a. Aligning rigid PMBOK, PRINCE2 with Agile flexibility b. Adapting quickly to change 4.) Experience with AI in risk management: a. No direct experience yet b. Potential: automate tasks, analyze data, predict risks 5.) Expectations from AI integration: a. Enhanced risk identification, assessment, planning, control b. Real-time management, predictive analytics 6.) Potential challenges with AI integration: a. Data privacy b. Need for quality, unbiased data c. Integration complexity

	7.) Role of AI in risk management: a. Proactive risk identification, mitigation b. Continuous monitoring, precision, efficiency 8.) Comparative appeal of PMBOK and PRINCE2 for AI: a. PMBOK: process-oriented, suits AI automation b. PRINCE2: tailoring emphasis, suits AI personalization 9.) Skills needed for AI in risk management: a. Basic understanding of AI, data analysis, statistics b. Data-driven mindset c. Ability to work with data scientists, AI experts 10.) Effectiveness of PMBOK and PRINCE2 in Agile: a. Effective when tailored properly b. Systematic risk management 11.) Impact of AI-enhanced risk communication: a. Timely, accurate, relevant communication b. Real-time reporting, personalized alerts, actionable insights 12.) Importance of AI knowledge for practitioners: a. Helps leverage AI tools for risk management b. Stay ahead in an AI-driven world.
KF6	1.) a. PMBOK and PRINCE2 adaptable to Agile with modifications. 2.) a. Strength: comprehensive, structured approach. b. Weakness: rigidity, less adaptability. 3.) a. Challenge: Adapting rigid PMBOK and PRINCE2 to Agile. 4.) a. Potential of AI in risk management appealing. b. Yet to gain first-hand experience. 5.) a. AI could enhance efficiency, accuracy in Agile risk management. b. AI can automate, predict risks, provide real-time updates. 6.) a. Challenges with AI: data security, privacy, AI biases, need for training. 7.) a. AI can revolutionize Agile risk management - automation, prediction, real-time updates. 8.) a. PMBOK could benefit from AI in streamlining. b. PRINCE2's adaptability enhanced by AI's data analysis. 9.) a. Need understanding of AI, data analysis. b. Adaptability, willingness to learn important.

	10.) a. PMBOK, PRINCE2 effective in Agile risk management when tailored. 11.) a. AI can enhance risk communication - real-time updates, predictions, effective communication. 12.) a. Crucial for Agile practitioners to understand, utilize AI. b. AI knowledge can enhance risk management, give edge in field.
KF7	1.) a. Positive experience with PMBOK, PRINCE2 in Agile. b. Combines structure with flexibility for real-time risk response. 2.) a. Strengths: systematic approach, ensures risk identification, evaluation, planning. b. Weakness: rigidity can conflict with Agile's adaptability. 3.) a. Challenge: reconciling rigidity of PMBOK, PRINCE2 with Agile's flexibility. 4.) a. AI in risk management beneficial. b. Enhances risk prediction, assessment. 5.) a. AI can revolutionize risk management in Agile. b. Expect real-time risk assessment, prediction, automated mitigation. 6.) a. Challenges: training AI, data privacy, AI's black box issue, shift in mindset. 7.) a. AI can provide real-time risk prediction, monitoring. b. Makes risk management proactive. 8.) a. Both PMBOK, PRINCE2 can be effective with AI, depending on project. 9.) a. Need basic understanding of AI, data analysis. b. Understand output of AI tools, apply in projects. 10.) a. Positive experience with PMBOK, PRINCE2's risk processes in Agile. b. Works well when adapted for flexibility, iteratively. 11.) a. AI-enhanced communication efficient, effective. b. Real-time risk status updates, automated alerts. 12.) a. Essential to have skills in AI for risk management.

	b. AI tools enhance efficiency, effectiveness. Will likely become standard.
KF8	1.) a. PMBOK, PRINCE2 offer structure in Agile risk handling. b. Flexibility sometimes requires adaptations. 2.) a. Strength: comprehensive risk management. b. Weakness: rigidity, conflict with Agile's flexibility. 3.) a. Challenge: adjusting methodologies to Agile's iterative approach. b. Difficulty maintaining/updating risk registers in sprints. 4.) a. AI useful for predictive insights, large-scale data analysis. 5.) a. AI to enhance accuracy, efficiency of risk identification, management. b. Enable real-time risk detection and mitigation. 6.) a. Challenges: ensuring data integrity, privacy. b. Explaining AI decision-making, managing cultural shift towards AI. 7.) a. AI to automate routine tasks, enhance predictive capabilities, real-time data analysis. 8.) a. PMBOK, PRINCE2 appeal depends on project, Agile environment specifics. 9.) a. Need understanding of AI capabilities, limitations, data analysis skills. 10.) a. PMBOK, PRINCE2 effective in risk management. b. Need careful planning, iterative execution for Agile. 11.) a. AI-enhanced communication: real-time updates, predictive insights, data-driven decisions. b. Enhances transparency, collaboration. 12.) a. Essential to have knowledge, skills in AI tools. b. Helps adapt to evolving project management landscape.
KF9	1.) a. Balancing PMBOK, PRINCE2 with Agile's flexibility was dynamic. 2.) a. PMBOK, PRINCE2 strengths: robust risk management. b. Weakness: rigidity versus Agile's flexibility.

	3.) a. Major challenge: cultural shift to Agile. b. Agile's adaptability sometimes clashes with PMBOK, PRINCE2. 4.) a. Considering AI for risk management. b. Excited about automated risk identification, analysis, predictive insights. 5.) a. AI in Agile: Improved efficiency, accuracy, predictability. 6.) a. Challenges: Data privacy, security. b. Need transparency in AI decision-making. c. Handling transformational change. 7.) a. AI can automate risk management tasks. b. Enables real-time identification, analysis, predictive modelling. 8.) a. PMBOK, PRINCE2 can differently incorporate AI. b. PMBOK may align with AI automation, PRINCE2 may benefit from AI analytics, prediction. 9.) a. Need understanding of AI, data analytics. b. Ability to interpret AI-generated insights. 10.) a. PMBOK, PRINCE2 effective in systematic risk management. b. Need to adapt to Agile's iterative nature. 11.) a. AI in communication: Real-time updates, accuracy, data-driven decisions. 12.) a. Essential for practitioners to have AI knowledge, skills. b. Helps improve risk management, stay competitive.
KF10	1.) a. Unique experience blending PMBOK, PRINCE2 risk management with Agile. b. Balancing structured processes and Agile's adaptability. 2.) a. PMBOK, PRINCE2 comprehensive, defined risk processes. b. Challenge: applying to fluid Agile environment. 3.) a. Primary challenge: philosophical differences between methodologies and Agile. b. Fitting iterative Agile into prescriptive PMBOK, PRINCE2 is hard. 4.) a. AI shaping project management. b. Intrigued by machine learning for identifying, assessing risks.

	5.) a. Expectations: improved risk identification, assessment, predictive capabilities. b. Enhanced automated decision-making in risk response planning. 6.) a. Challenges: data privacy, security, explainability of AI. b. Managing change with new tech integration. 7.) a. AI pivotal in risk management transformation. b. Automating routine tasks, offering predictive modeling. 8.) a. Both methodologies offer structured framework for AI. b. PMBOK suited for algorithm-driven analysis, PRINCE2 for AI's adaptability. 9.) a. Need understanding of AI, machine learning, data science basics. b. Ability to interpret and act on AI insights. 10.) a. PMBOK, PRINCE2 comprehensive in risk management. b. Effectiveness varies in Agile, requires adaptation. 11.) a. AI-enhanced communication: real-time, accurate risk reporting. b. More proactive risk management approach. 12.) a. Essential to understand leveraging AI in risk management. b. Harnessing AI is a key skill for project practitioners.
KF11	1.) a. PMBOK, PRINCE2 robust for risk management. b. Requires iteration for Agile. 2.) a. Strength: comprehensive risk management. b. Weakness: rigidity vs Agile's flexibility. 3.) a. Challenge: aligning process-oriented approach with Agile's adaptive approach. 4.) a. Interest in AI's data handling, pattern identification. 5.) a. AI could improve efficiency, prediction, project outcomes. 6.) a. Possible challenges: technical, organizational, transparency of AI. 7.)

	a. AI could automate tasks, accurately predict risks. 8.) a. PMBOK, PRINCE2 can incorporate AI. b. PMBOK suits AI's algorithmic processing, PRINCE2 accommodates AI's dynamics. 9.) a. Skills needed: Understanding AI principles, data interpretation, application of AI in risk management. 10.) a. PMBOK, PRINCE2 effective in risk management. b. Need adaptation for Agile. 11.) a. AI could improve risk reporting, decision-making, risk response. 12.) a. Importance of AI knowledge, skills in project management. b. Effective leveraging of AI key in risk management.
KF12	1.) a. Used PMBOK, PRINCE2 in Agile projects. b. Adds structure, clarity to risk management. 2.) a. PMBOK: no aspect of risk overlooked. b. PRINCE2: flexible for different environments. c. Downside: detailed nature slows pace, conflicts with Agile. 3.) a. Challenge: balancing rigidity of PMBOK, PRINCE2 and Agile flexibility. 4.) a. Not used AI in risk management personally. b. Sees potential for automating tasks, deep data analysis. 5.) a. Expects AI to provide insights, predict, mitigate risks. b. Believes AI can automate risk management, free up project managers. 6.) a. Challenges: learning curve, transition period. b. Concerns about data privacy, AI's explainability, transparency. 7.) a. AI to offer predictive analytics, automate tasks. b. Believes AI can transform Agile practices. 8.) a. PMBOK, PRINCE2 have unique appeal for AI integration. b. PMBOK can benefit from AI's data management. c. PRINCE2 can use AI for predictive, adaptive risk management. 9.) a. Agile practitioners need understanding of AI capabilities.

	b. Should know how to integrate AI insights into risk management. 10.) a. PMBOK, PRINCE2 effective when tailored for Agile. b. Key to adapt methodologies to Agile's flexibility. 11.) a. AI can make risk communication timely, precise. b. AI can enable proactive risk communication. 12.) a. Importance of knowing how to use AI for risk management. b. AI brings efficiency, accuracy to risk management.

WORD FREQUENCY QUERY FROM QUALITATIVE ANALYSIS

SLN	Word	Length	Count	Weighted %
1	risk	4	117	5.19
2	management	10	84	3.73
3	agile	5	78	3.46
4	pmbok	5	56	2.48
5	prince2	7	56	2.48
6	data	4	37	1.64
7	project	7	21	0.93
8	need	4	20	0.89
9	time	4	20	0.89
10	real	4	19	0.84
11	flexibility	11	18	0.8
12	communication	13	16	0.71
13	analysis	8	15	0.67
14	methodologies	13	15	0.67
15	understanding	13	15	0.67
16	effective	9	14	0.62
17	approach	8	13	0.58
18	challenge	9	13	0.58
19	insights	8	13	0.58
20	skills	6	13	0.58
21	tasks	5	13	0.58
22	enhance	7	12	0.53
23	potential	9	12	0.53
24	predictive	10	12	0.53
25	team	4	12	0.53
26	tools	5	12	0.53
27	automate	8	11	0.49
28	identification	14	11	0.49
29	privacy	7	11	0.49
30	adaptability	12	10	0.44
31	challenges	10	10	0.44
32	comprehensive	13	10	0.44
33	integration	11	10	0.44

34	proactive	9	10	0.44
35	rigidity	8	10	0.44
36	risks	5	10	0.44
37	driven	6	9	0.4
38	efficiency	10	9	0.4
39	enhanced	8	9	0.4
40	learning	8	9	0.4
41	prediction	10	9	0.4
42	provide	7	9	0.4
43	weakness	8	9	0.4
44	accuracy	8	8	0.35
45	change	6	8	0.35
46	experience	10	8	0.35
47	knowledge	9	8	0.35
48	mitigation	10	8	0.35
49	planning	8	8	0.35
50	structured	10	8	0.35
51	decisions	9	7	0.31
52	depends	7	7	0.31
53	improve	7	7	0.31
54	iterative	9	7	0.31
55	key	3	7	0.31
56	making	6	7	0.31
57	needed	6	7	0.31
58	structure	9	7	0.31
59	systematic	10	7	0.31
60	updates	7	7	0.31
61	ability	7	6	0.27
62	analytics	9	6	0.27
63	assessment	10	6	0.27
64	capabilities	12	6	0.27
65	decision	8	6	0.27
66	environment	11	6	0.27
67	practitioners	13	6	0.27
68	processes	9	6	0.27
69	strength	8	6	0.27
70	accurate	8	5	0.22
71	appeal	6	5	0.22

72	effectiveness	13	5	0.22
73	efficient	9	5	0.22
74	essential	9	5	0.22
75	interpret	9	5	0.22
76	predict	7	5	0.22
77	principles	10	5	0.22
78	process	7	5	0.22
79	required	8	5	0.22
80	requires	8	5	0.22
81	response	8	5	0.22
82	strong	6	5	0.22
83	transparency	12	5	0.22
84	used	4	5	0.22
85	adapt	5	4	0.18
86	automated	9	4	0.18
87	automation	10	4	0.18
88	balancing	9	4	0.18
89	benefit	7	4	0.18
90	curve	5	4	0.18
91	enhances	8	4	0.18
92	framework	9	4	0.18
93	frameworks	10	4	0.18
94	helps	5	4	0.18
95	improved	8	4	0.18
96	incorporate	11	4	0.18
97	informed	8	4	0.18
98	managing	8	4	0.18
99	may	3	4	0.18
100	monitoring	10	4	0.18
101	nature	6	4	0.18
102	offer	5	4	0.18
103	projects	8	4	0.18
104	revolutionize	13	4	0.18
105	routine	7	4	0.18
106	shift	5	4	0.18
107	strengths	9	4	0.18
108	tailored	8	4	0.18
109	use	3	4	0.18

110	yet	3	4	0.18
111	adapting	8	3	0.13
112	adaptive	8	3	0.13
113	aligning	8	3	0.13
114	automating	10	3	0.13
115	basic	5	3	0.13
116	complexity	10	3	0.13
117	conflict	8	3	0.13
118	crucial	7	3	0.13
119	cultural	8	3	0.13
120	detailed	8	3	0.13
121	expect	6	3	0.13
122	handling	8	3	0.13
123	impact	6	3	0.13
124	importance	10	3	0.13
125	issues	6	3	0.13
126	machine	7	3	0.13
127	make	4	3	0.13
128	makes	5	3	0.13
129	methodology	11	3	0.13
130	must	4	3	0.13
131	new	3	3	0.13
132	oriented	8	3	0.13
133	pace	4	3	0.13
134	positive	8	3	0.13
135	provides	8	3	0.13
136	quicker	7	3	0.13
137	reporting	9	3	0.13
138	resistance	10	3	0.13
139	rigid	5	3	0.13
140	security	8	3	0.13
141	suits	5	3	0.13
142	tailoring	9	3	0.13
143	tool	4	3	0.13
144	training	8	3	0.13
145	understand	10	3	0.13
146	using	5	3	0.13
147	adaptable	9	2	0.09

148	adaptation	10	2	0.09
149	adaption	8	2	0.09
150	adjusting	9	2	0.09
151	alerts	6	2	0.09
152	align	5	2	0.09
153	allows	6	2	0.09
154	anticipate	10	2	0.09
155	appealing	9	2	0.09
156	application	11	2	0.09
157	apply	5	2	0.09
158	based	5	2	0.09
159	believes	8	2	0.09
160	benefits	8	2	0.09
161	better	6	2	0.09
162	blend	5	2	0.09
163	brings	6	2	0.09
164	careful	7	2	0.09
165	choice	6	2	0.09
166	collaboration	13	2	0.09
167	comfort	7	2	0.09
168	complex	7	2	0.09
169	control	7	2	0.09
170	deep	4	2	0.09
171	different	9	2	0.09
172	difficulty	10	2	0.09
173	done	4	2	0.09
174	due	3	2	0.09
175	effectively	11	2	0.09
176	enable	6	2	0.09
177	enables	7	2	0.09
178	environments	12	2	0.09
179	excited	7	2	0.09
180	expectations	12	2	0.09
181	explainability	14	2	0.09
182	familiarity	11	2	0.09
183	fast	4	2	0.09
184	field	5	2	0.09
185	flexible	8	2	0.09

186	fully	5	2	0.09
187	future	6	2	0.09
188	give	4	2	0.09
189	good	4	2	0.09
190	helpful	7	2	0.09
191	identifying	11	2	0.09
192	implement	9	2	0.09
193	implementing	12	2	0.09
194	important	9	2	0.09
195	interpretation	14	2	0.09
196	keep	4	2	0.09
197	leveraging	10	2	0.09
198	managers	8	2	0.09
199	might	5	2	0.09
200	mindset	7	2	0.09
201	outputs	7	2	0.09
202	possible	8	2	0.09
203	practices	9	2	0.09
204	precise	7	2	0.09
205	predictions	11	2	0.09
206	properly	8	2	0.09
207	reduces	7	2	0.09
208	reliable	8	2	0.09
209	robust	6	2	0.09
210	sometimes	9	2	0.09
211	specifics	9	2	0.09
212	sprints	7	2	0.09
213	stay	4	2	0.09
214	still	5	2	0.09
215	success	7	2	0.09
216	system	6	2	0.09
217	teams	5	2	0.09
218	technical	9	2	0.09
219	timely	6	2	0.09
220	unique	6	2	0.09
221	weaknesses	10	2	0.09
222	abilities	9	1	0.04
223	accommodates	12	1	0.04

224	accurately	10	1	0.04
225	across	6	1	0.04
226	act	3	1	0.04
227	actionable	10	1	0.04
228	adaptations	11	1	0.04
229	adapted	7	1	0.04
230	adds	4	1	0.04
231	advanced	8	1	0.04
232	ahead	5	1	0.04
233	aids	4	1	0.04
234	algorithm	9	1	0.04
235	algorithmic	11	1	0.04
236	also	4	1	0.04
237	analyze	7	1	0.04
238	analyzing	9	1	0.04
239	anticipation	12	1	0.04
240	applications	12	1	0.04
241	applying	8	1	0.04
242	aspect	6	1	0.04
243	assessing	9	1	0.04
244	automates	9	1	0.04
245	balance	7	1	0.04
246	basics	6	1	0.04
247	become	6	1	0.04
248	becoming	8	1	0.04
249	beneficial	10	1	0.04
250	biases	6	1	0.04
251	black	5	1	0.04
252	blending	8	1	0.04
253	boost	5	1	0.04
254	boosts	6	1	0.04
255	box	3	1	0.04
256	care	4	1	0.04
257	challenging	11	1	0.04
258	clarity	7	1	0.04
259	clashes	7	1	0.04
260	clear	5	1	0.04
261	combines	8	1	0.04

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263	competitive	11	1	0.04
264	concerns	8	1	0.04
265	confirming	10	1	0.04
266	conflicts	9	1	0.04
267	considering	11	1	0.04
268	constraints	11	1	0.04
269	context	7	1	0.04
270	continuous	10	1	0.04
271	correct	7	1	0.04
272	creative	8	1	0.04
273	current	7	1	0.04
274	cycle	5	1	0.04
275	dat6	4	1	0.04
276	deal	4	1	0.04
277	deciding	8	1	0.04
278	defined	7	1	0.04
279	degree	6	1	0.04
280	depending	9	1	0.04
281	design	6	1	0.04
282	detection	9	1	0.04
283	difference	10	1	0.04
284	differences	11	1	0.04
285	differently	11	1	0.04
286	difficult	9	1	0.04
287	difficulties	12	1	0.04
288	direct	6	1	0.04
289	downside	8	1	0.04
290	dynamic	7	1	0.04
291	dynamics	8	1	0.04
292	edge	4	1	0.04
293	efficacy	8	1	0.04
294	efforts	7	1	0.04
295	emphasis	8	1	0.04
296	ensures	7	1	0.04
297	ensuring	8	1	0.04
298	enter	5	1	0.04
299	evaluation	10	1	0.04

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302	everyday	8	1	0.04
303	evolving	8	1	0.04
304	execution	9	1	0.04
305	expected	8	1	0.04
306	expects	7	1	0.04
307	experts	7	1	0.04
308	explaining	10	1	0.04
309	explored	8	1	0.04
310	extensibly	10	1	0.04
311	extensive	9	1	0.04
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314	features	8	1	0.04
315	findings	8	1	0.04
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317	fitting	7	1	0.04
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320	focusing	8	1	0.04
321	forecasts	9	1	0.04
322	free	4	1	0.04
323	full	4	1	0.04
324	gain	4	1	0.04
325	generally	9	1	0.04
326	generated	9	1	0.04
327	great	5	1	0.04
328	greatly	7	1	0.04
329	grows	5	1	0.04
330	hand	4	1	0.04
331	handle	6	1	0.04
332	hard	4	1	0.04
333	harnessing	10	1	0.04
334	higher	6	1	0.04
335	honing	6	1	0.04
336	human	5	1	0.04
337	hybrid	6	1	0.04

338	improves	8	1	0.04
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340	indispensable	13	1	0.04
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345	integrity	9	1	0.04
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348	invaluable	10	1	0.04
349	involved	8	1	0.04
350	issue	5	1	0.04
351	iteration	9	1	0.04
352	iteratively	11	1	0.04
353	judgment	8	1	0.04
354	keeping	7	1	0.04
355	kf1	3	1	0.04
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357	kf11	4	1	0.04
358	kf12	4	1	0.04
359	kf2	3	1	0.04
360	kf3	3	1	0.04
361	kf4	3	1	0.04
362	kf5	3	1	0.04
363	kf6	3	1	0.04
364	kf7	3	1	0.04
365	kf8	3	1	0.04
366	kf9	3	1	0.04
367	know	4	1	0.04
368	knowing	7	1	0.04
369	lack	4	1	0.04
370	landscape	9	1	0.04
371	large	5	1	0.04
372	laws	4	1	0.04
373	lead	4	1	0.04
374	learn	5	1	0.04
375	less	4	1	0.04

376	leverage	8	1	0.04
377	lies	4	1	0.04
378	like	4	1	0.04
379	likely	6	1	0.04
380	limitations	11	1	0.04
381	main	4	1	0.04
382	maintaining	11	1	0.04
383	major	5	1	0.04
384	manage	6	1	0.04
385	manages	7	1	0.04
386	manual	6	1	0.04
387	matters	7	1	0.04
388	members	7	1	0.04
389	methods	7	1	0.04
390	mitigate	8	1	0.04
391	modeling	8	1	0.04
392	modelling	9	1	0.04
393	modifications	13	1	0.04
394	modified	8	1	0.04
395	necessity	9	1	0.04
396	needs	5	1	0.04
397	obstacle	8	1	0.04
398	offering	8	1	0.04
399	offers	6	1	0.04
400	one	3	1	0.04
401	opportunities	13	1	0.04
402	opposed	7	1	0.04
403	optimal	7	1	0.04
404	optimization	12	1	0.04
405	organizational	14	1	0.04
406	orientation	11	1	0.04
407	outcome	7	1	0.04
408	outcomes	8	1	0.04
409	output	6	1	0.04
410	overlooked	10	1	0.04
411	overview	8	1	0.04
412	pattern	7	1	0.04
413	period	6	1	0.04

414	personalization	15	1	0.04
415	personalized	12	1	0.04
416	personally	10	1	0.04
417	philosophical	13	1	0.04
418	pivotal	7	1	0.04
419	precision	9	1	0.04
420	predictability	14	1	0.04
421	predicts	8	1	0.04
422	prescriptive	12	1	0.04
423	primary	7	1	0.04
424	problem	7	1	0.04
425	problems	8	1	0.04
426	procedural	10	1	0.04
427	processing	10	1	0.04
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429	promising	9	1	0.04
430	prove	5	1	0.04
431	quality	7	1	0.04
432	quickly	7	1	0.04
433	rapid	5	1	0.04
434	reacting	8	1	0.04
435	reasons	7	1	0.04
436	reconciling	11	1	0.04
437	registers	9	1	0.04
438	relatively	10	1	0.04
439	relevant	8	1	0.04
440	reliability	11	1	0.04
441	replace	7	1	0.04
442	resource	8	1	0.04
443	respect	7	1	0.04
444	responses	9	1	0.04
445	right	5	1	0.04
446	role	4	1	0.04
447	scale	5	1	0.04
448	science	7	1	0.04
449	scientists	10	1	0.04
450	scope	5	1	0.04
451	see	3	1	0.04

452	sees	4	1	0.04
453	several	7	1	0.04
454	shaping	7	1	0.04
455	skill	5	1	0.04
456	slows	5	1	0.04
457	smooth	6	1	0.04
458	solid	5	1	0.04
459	solving	7	1	0.04
460	specific	8	1	0.04
461	spend	5	1	0.04
462	sprint	6	1	0.04
463	stage	5	1	0.04
464	standard	8	1	0.04
465	statistics	10	1	0.04
466	status	6	1	0.04
467	strategic	9	1	0.04
468	strategies	10	1	0.04
469	streamlining	12	1	0.04
470	struggle	8	1	0.04
471	suit	4	1	0.04
472	suitability	11	1	0.04
473	suited	6	1	0.04
474	taken	5	1	0.04
475	tangible	8	1	0.04
476	tech	4	1	0.04
477	technologies	12	1	0.04
478	technology	10	1	0.04
479	thorough	8	1	0.04
480	thoughtful	10	1	0.04
481	timeliness	10	1	0.04
482	towards	7	1	0.04
483	transcript	10	1	0.04
484	transform	9	1	0.04
485	transformation	14	1	0.04
486	transformational	16	1	0.04
487	transition	10	1	0.04
488	unbiased	8	1	0.04
489	unfamiliar	10	1	0.04

490	updated	7	1	0.04
491	updating	8	1	0.04
492	useful	6	1	0.04
493	utilize	7	1	0.04
494	utilized	8	1	0.04
495	valuable	8	1	0.04
496	values	6	1	0.04
497	varies	6	1	0.04
498	versus	6	1	0.04
499	weak	4	1	0.04
500	well	4	1	0.04
501	willingness	11	1	0.04
502	work	4	1	0.04
503	workflow	8	1	0.04
504	works	5	1	0.04
505	world	5	1	0.04

APPENDIX H

TOOLS USAGE AND DISCLOSURE IN RESEARCH

SLN	Tool	Usage	License	Comment
1	IBM SPSS	Quantitative Analysis	Registered	
2	NVivo	Qualitative Analysis	Registered	
3	PRISMA	Literature Review	Open	
4	PowerBI	Quantitative Understandings		
5	Office 365	Analysis, Documentation, Graphs and Reports	Registered	
6	Grammarly	Sentence Check, Grammer Check, Sentence and Paragraph Rephrasing, Corrections	Registered	
7	Google Bard	Review for: Insights review, Search, Verifications, Paraphrasing and structuring author content, Validation of Author original content	Registered	In-lieu with guidelines
8	ChatGPT	Review for: Insights review, Search, Verifications, Paraphrasing and structuring author content, Validation of Author original content	Registered	In-lieu with guidelines
9	Zotero	Citations	Registered	
10	SurveySparrow	Survey	Registered	
11	Google Drive	Repository	Registered	
12	LinkedIn/social media/Company Portals/Local Chapters	Survey Distribution and Data Collection	Registered	
13	Wix	Personal Website for survey link, details	Registered	
14	Google Ad, LinkedIn marketing	Data collection marketing phase	Registered	
15	Sample Size Calculator	Statistical sample calculation	Open Usage	

GLOSSARY – PROJECT MANAGEMENT, PRINCE2 AND AI

1. **Artificial Intelligence (AI)**: A branch of computer science that simulates human intelligence in machines, specifically computer systems. These processes include learning, reasoning, problem-solving, perception, and language understanding.

2. **Risk Management**: A procedure where potential risks are identified and analyzed, so mitigation strategies can be drawn to handle these risks effectively.

3. **Agile Project Management (APM)**: A project management method prioritizes flexibility, collaboration, and customer satisfaction. It allows for frequent adjustments to a project as it unfolds, accommodating changes and new requirements.

4. **Project Management Body of Knowledge (PMBOK)**: A standard guide by the Project Management Institute (PMI) that sets forth the fundamentals of project management as they apply to various projects, including construction, software, engineering, automotive, etc.

5. **Projects IN Controlled Environments (PRINCE2)**: A process-based method for effective project management. It offers a systematic approach to delivering a successful project with clear templates, processes, and steps.

6. **Survey-Based Analysis**: A method of collecting data from a specific group of respondents by asking them questions. This data is then statistically analyzed to extrapolate insights applicable to a larger population.

7. **Comparative Analysis**: A methodological approach used in research to compare different data sets, theories, or phenomena to make or support an argument or hypothesis.

8. **AI-Enhanced Risk Management**: Using artificial intelligence tools to enhance the effectiveness of risk identification, assessment, and mitigation strategies in a project management context.

9. **Project Management Practitioners**: Individuals who are actively engaged in project management, such as project managers, risk managers, and team leaders, and are generally well-versed with methodologies such as PMBOK or PRINCE2.

10. **Perception**: The process of acquiring, interpreting, selecting, and organizing sensory information. In the context of this research, it refers to how project management practitioners understand and interpret the implications of AI integration in Agile risk management.

11. **Anticipation**: Refers to looking forward and planning for the future. This study pertains to project management practitioners' expectations, concerns, or speculations regarding AI-enhanced risk management in Agile environments.

12. **AI Tools in Project Management:** Refers to specific applications of artificial intelligence, like machine learning, natural language processing, or robotic process automation, utilized to automate or enhance various aspects of managing projects, such as scheduling, risk assessment, or resource allocation.