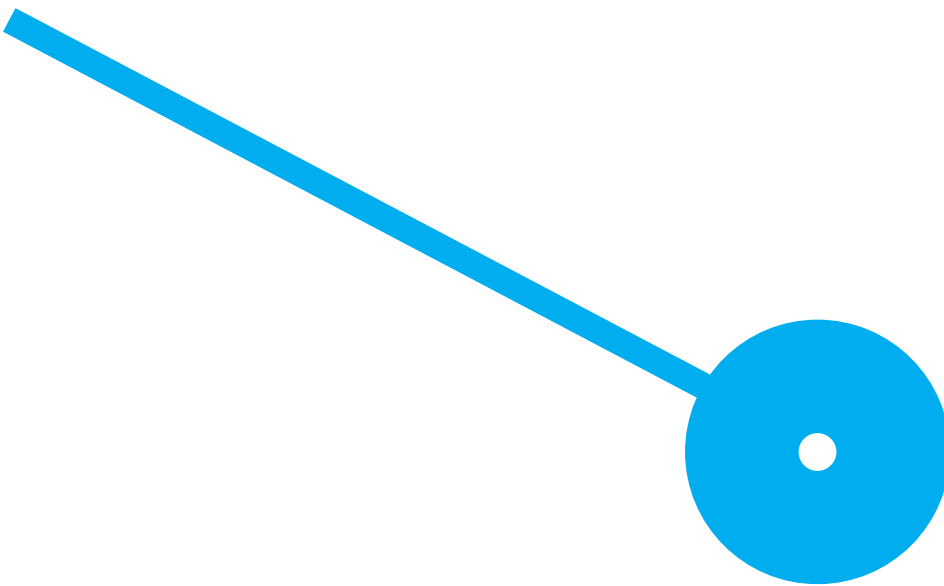


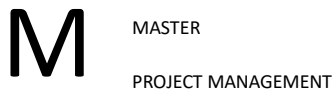
Mapping Risk Management Practices for Scrum Framework

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DECEMBER/2024



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Mapping Risk Management Practices for Scrum Framework

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Dissertation submitted in fulfilment of the requirements for the master's degree in project management in the School of Management and Technology of the Polytechnic of Porto.

DECEMBER/2024

Integrity Statement

I, Francisco Oliveira Sá, student nº 8180139, of the master's degree in project management of the School of Management and Technology of the Polytechnic of Porto, declare that I have not plagiarized or self-plagiarized, therefore the work entitled "Mapping Risk Management Practices for Scrum Framework" is original and of my own authorship, not having been used previously for any other purpose. I further declare that all sources used are cited, in the text and in the final bibliography, according to the referencing rules adopted in the institution.

Resumo

A gestão eficaz do risco é essencial para o sucesso dos projectos de desenvolvimento de software que utilizam metodologias ágeis. Este estudo analisa as práticas de gestão de risco no método Scrum, comparando-as com as abordagens tradicionais recomendadas pelo Guia PMBOK®. Através de uma revisão da literatura sobre o estado atual do conhecimento e de um questionário aplicado a 57 profissionais, analisámos as práticas de gestão de risco na framework Scrum e as ferramentas utilizadas ao longo do ciclo de vida do Scrum. Identificamos práticas no Scrum que podem ser vistas como equivalentes às práticas tradicionais de gestão de projetos do Guia PMBOK®.

Os resultados indicam que ferramentas como Categorização de Risco, Lista de Verificação e Análise de Causa Raiz são altamente valorizadas, sendo escolhidas por 67% dos participantes do estudo. A adoção de práticas adicionais do Guia PMBOK® pode ser desnecessária, uma vez que eventos e artefactos específicos do Scrum, como o Sprint Planning, Product Backlog e Sprint Retrospective, são considerados momentos críticos para identificar, analisar e responder aos riscos.

Este estudo oferece perspectivas práticas para as equipas de desenvolvimento de software e contribui para o conhecimento da gestão de projectos de software, salientando a importância da análise qualitativa e quantitativa dos riscos durante o Sprint Planning, para além da necessidade de um julgamento especializado e da análise de dados para decisões informadas. Compreender as práticas de gestão de software e para o conhecimento em gestão de projetos de software.

Palavras-chave: Project Management; Risk Management; Software Development; Agile Methodologies; Scrum.

Abstract

Effective risk management is essential to the success of software development projects using agile methodologies. This study examines risk management practices in the Scrum method, comparing them with the traditional approaches recommended by the PMBOK Guide®. Through a literature review on the current state of knowledge and a questionnaire applied to 57 professionals, we analysed risk management practices in the Scrum framework and the tools used throughout the Scrum lifecycle. We identified practices in Scrum that can be seen as equivalent to the traditional project management practices of the PMBOK Guide®.

The results indicate that tools such as Risk Categorisation, Prompt List and Root Cause Analysis are highly valued, being chosen by 67% of the study participants. Adopting additional practices from the PMBOK Guide® may be unnecessary, as specific Scrum events and artefacts, such as Sprint Planning, Product Backlog and Sprint Retrospective, are considered critical moments for identifying, analysing, and responding to risks.

This study offers practical insights for software development teams and contributes to software project management knowledge by emphasising the importance of qualitative and quantitative risk analysis during Sprint Planning, in addition to the need for expert judgement and data analysis for informed decisions. Understanding software management practices and knowledge of software project management.

Keywords: Project Management; Risk Management; Software Development; Agile Methodologies; Scrum.

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Introduction

Software development projects require effective risk management for their success. However, traditional project management frameworks, such as the PMBOK Guide®, have established risk management practices that may not apply to Agile methodologies, such as Scrum. Although some argue that risk management is not explicitly considered in Agile approaches, others believe that there are implicit risk management practices in Scrum (Buganová & Šimíčková, 2019a). This creates an implicit scientific gap in understanding the unique risk management practices in Agile methodologies, which has important implications for software development project management.

This study aims to identify and map risk management practices in Agile methodologies, with a specific focus on Scrum. The research will compare risk management practices in traditional methodologies, such as the PMBOK Guide®, to those in Scrum. Additionally, the study will compile information on the most used methods in software development.

We explore risk management practices within Agile software development projects, particularly focusing on the integration of risk management in the context of Scrum methodologies. Our journey begins with an introduction to the fundamental concepts of risk management, followed by an examination of its application in traditional project frameworks. Transitioning into the realm of Agile methodologies, we delve into the historical context, core values, and specific nuances of Agile approaches, with a dedicated focus on Scrum as a redefined Agile methodology. Central to our investigation is the exploration of the integration between Scrum and risk management, aiming to enhance project resilience and address challenges inherent in Agile environments.

By critically reviewing and analysing previous studies, we have identified gaps and opportunities for future research, culminating in a methodological approach that allows us to gather knowledge and present results that contribute to the wider discourse on risk management in agile software development.

Literature Review

1. Introduction to Risk Management

Effective risk management is essential to the success of software development projects, serving as a pillar of potential challenges and promoting project success. This segment aims to improve understanding of the fundamental principles of risk management, providing a theoretical basis of study for subsequent methodologies.

1.1 Definitions and Foundational Concepts of Risk Management

A meticulous exploration of the key terms and fundamental concepts associated with risk management reveals the inherent complexity of this field. The chapter "Definitions and Foundational Concepts of Risk Management" in Chapman and Ward's (2003) book provides a comprehensive analysis of the concepts of uncertainty, probability, and impact, outlining the conceptual foundation that underpins contemporary project risk management practices. This exhaustive analysis is crucial to developing a solid understanding and establishing the necessary foundations for applying these principles in software development projects.

Chapman and Ward (2003) highlight the importance of understanding the fundamental principles of risk management holistically, emphasising the interaction between uncertainty, probability, and impact. The authors' systematic approach emphasises the need to examine these elements in depth. By understanding uncertainty as the lack of complete knowledge about future events, probability as the assessment of the chance of these events occurring and impact as the resulting consequences, project managers are better prepared to identify, assess, and respond to risks effectively.

Recent literature continues to build on these principles. For example, Fan, Lin and Sheu (2023) introduce a new framework for risk assessment called Probability-Impact-Manageability assessment, which considers the manageability of risks in addition to their likelihood and impact. This approach aims to increase the effectiveness of risk response plans by recognising

the interconnected nature of risks (Fan, Lin, & Sheu, 2023). Similarly, Mikes and Kaplan (2023) explore the psychological aspects of risk management in their study entitled "Managing Risk and Uncertainty on Projects: A Cognitive Approach". They propose that understanding cognitive tendencies and decision-making processes is crucial to effective risk management (Mikes & Kaplan, 2023). These contemporary perspectives underline the evolving nature of risk management strategies, emphasising a comprehensive and integrative approach.

Mastering these concepts is essential for implementing effective risk management practices in the dynamic software development environment. Understanding uncertainty allows for a more accurate assessment of potential risks, while analysing probability helps prioritise responses to the most likely risks. In turn, consideration of impact makes it possible to develop appropriate mitigation and contingency strategies to deal with the risks identified. Mastering these concepts is therefore fundamental to ensuring the success and security of software development projects.

1.2 Significance of Risk Management in Software Development Projects

Within the specific context of software development projects, risk management emerges as a key element for success. As underscored by Boehm (1991), the inherently uncertain and fluid nature of software development increases the importance of risk management. An exhaustive examination of risk management in this context, centred on the seminal insights of Sommerville (2011), underlines how proper implementation can improve decision-making, product quality, and client satisfaction. Conversely, lapses in risk management can precipitate delays, escalated costs, and client disappointment, as evidenced in McConnell (1996) research.

The recognition of risk management's importance, as set out by Boehm (1991) and Sommerville (2011), transcends mere crisis aversion; it metamorphoses into a driving force for excellence in software development. Recognising risk management as the basis for judicious decision-making and increased quality underlines its central position in the software development sphere.

This incisive focus on the significance of risk management within software development projects will serve as a fulcrum for substantiating the rationale behind further exploration into specific practices within the Scrum framework. Throughout this dissertation, these conceptual and theoretical bases will provide the requisite support for a comprehensive analysis of risk management practices within the Scrum environment, enriching the reader's comprehension of the link between theory and pragmatic application within this dynamic and exigent domain.

2. Risk Management in Traditional Projects

Within traditional projects, risk management plays a crucial role in the success of any project. This section seeks to identify the risk management practices established in traditional frameworks, such as the PMBOK Guide®, in order to understand the foundations laid before specifically addressing the agile context of Scrum.

2.1 Review of Risk Management Practices in Traditional Frameworks, such as PMBOK Guide®

A comprehensive review of risk management practices established in traditional frameworks, with specific emphasis on the PMBOK Guide®, provides an insightful overview of widely recognised methodologies. Brown and White (2018) conducted a case study evaluation of risk management processes in IT projects based on the PMBOK Guide® guidelines to assess their effectiveness and identify areas for improvement.

In their study, Brown and White (2018) explore the application and effectiveness of risk management processes in project management contexts, focusing particularly on IT projects. Based on the PMBOK Guide® guidelines, they provide a detailed examination of how risk management practices are implemented and utilised throughout the project lifecycle. They examine processes such as Risk Management Planning, Risk Identification, Qualitative Risk Analysis, Quantitative Risk Analysis, Risk Response Planning and Risk Monitoring and Control, elucidating their application and effectiveness in project management contexts.

Brown and White (2018) explain how Risk Management Planning helps define strategies to proactively identify, analyse and respond to risks. In addition, they elucidate how Risk Identification allows project teams to identify potential risks specific to IT projects, considering factors such as technology, stakeholders, and project scope. In addition, they delve into the qualitative and quantitative aspects of risk analysis, highlighting how these processes allow project managers to systematically assess the likelihood and impact of identified risks.

In addition, Brown and White (2018) discuss the importance of Risk Response Planning in developing strategies to mitigate, transfer or accept risks, emphasising the need for a proactive approach in addressing potential threats to project success. They also examine how Risk Monitoring and Control enables the continuous monitoring and evaluation of risks throughout the project, ensuring that appropriate action is taken to manage risks effectively.

Overall, Brown and White's (2018) research provide valuable insights into the practical application of risk management processes in the dynamic and complex environment of IT projects. Their findings emphasise the importance of integrating risk management practices into project management frameworks to improve project outcomes and mitigate potential challenges and uncertainties.

The exhaustive review of risk management practices in the PMBOK Guide® emphasises the importance of proactive identification, in-depth analysis, and appropriate response to risks. Schwalbe (2018) emphasises the comprehensiveness of these practices, but a critical analysis, as suggested by Hillson and Simon (2007), reveals potential gaps in their practical application. These gaps can manifest themselves in inconsistencies between theory and practice, challenges in integrating risk management into project workflows or limitations in adapting to rapidly evolving project environments. Consequently, uncertainties arise about the effectiveness of risk management practices in dynamic software development environments.

Although Schwalbe (2018) emphasises risk management as a continuous process, questions remain about the adaptability and agility of these practices. How can organisations fill the gaps identified to ensure the seamless integration of risk management into project management processes? What strategies can be used to increase the flexibility of risk management practices, enabling them to effectively address the evolving needs and

complexities of software development projects? These questions highlight the ongoing discourse around the practical application of risk management frameworks in dynamic and rapidly changing project environments.

2.2 Highlight of Conventional Risk Management Approaches and Tools

By examining Boehm and De Marco's (2004) analysis of conventional approaches and traditional risk management tools, a deeper understanding of their application in software development projects emerges. The insights provided by this analysis highlight the relevance and effectiveness of these consolidated methodologies, while also pointing out their limitations.

Boehm and De Marco (2004) offer an insightful look at how qualitative and quantitative risk analysis are applied in the specific context of software development projects. They stress the importance of understanding how these tools are used, highlighting their strengths and areas where they may not be as effective. For example, they can highlight the difficulty of quantifying certain risks or the tendency to underestimate certain aspects in a qualitative analysis.

However, conventional risk management tools are not without their criticisms and limitations. Chapman (2007) offers a critical view of these practices, pointing to their inherent flaws and contextual limitations. One of the common criticisms is the lack of flexibility to deal with the dynamic and complex nature of risks in software projects. In addition, he can highlight the tendency of these approaches to focus mainly on technical aspects, neglecting human and organizational factors that can also pose significant risks.

Therefore, Boehm and De Marco's (2004) analysis offers a deeper understanding of conventional risk management approaches, while Chapman's (2007) critique adds critical context and points to the limitations of these practices. These combined insights provide a solid basis for in-depth reflection on how risk management can be improved and adapted to meet the complex and ever-changing demands of software development projects.

The review highlights the prevalence of qualitative and quantitative risk analysis, demonstrating their applicability in diverse contexts. Boehm and de Marco's (2004) work emphasizes the importance of these tools in proactive identification and systematic evaluation of risks. However, Chapman's research (2007) highlights the intrinsic limitations of these approaches, especially when confronted with the inherent dynamics of software development.

3. Agile

This thorough review of practices in traditional projects will be the essential foundation for understanding the fundamental differences in risk management approaches when compared to the agile environment of Scrum, to be explored in subsequent sections of this dissertation.

3.1 Historical Context and Core Values of Agile Methodologies

In February 2001, a pivotal meeting convened in Utah, United States, bringing together seventeen representatives from diverse software user groups. The objective was ambitious yet crucial: to forge a novel project management methodology tailored specifically for the dynamic realm of software development. This historic gathering yielded the Agile Software Development Manifesto, a seminal document that continues to shape the ethos of modern software engineering (Dingsøyr *et al.* (2012); Dikert, Paasivaara, & Lassenius (2016); Conboy (2009)). Born from a collective desire to streamline processes and enhance collaboration, the Manifesto laid down four foundational values that underpin Agile methodologies:

Individuals and Interactions: Elevating the importance of human connection and teamwork over rigid processes and hierarchical structures.

Working Software: Prioritising tangible results and functional outcomes over exhaustive documentation and theoretical frameworks.

Customer Collaboration: Embracing active engagement with stakeholders to ensure that software solutions align closely with user needs and expectations.

Responding to Change: Recognising the inevitability of change in software development and advocating for adaptability and flexibility in response.

These values, succinctly articulated in the Manifesto, heralded a paradigm shift in the approach to software development, emphasising agility, responsiveness, and customer-centricity.

3.2 Understanding Agile Methodologies

In the intricate and rapidly evolving domain of software development, agile methodologies stand out as a lighthouse of innovation, offering practitioners a flexible and responsive framework for navigating the uncertainties and flux inherent in the field. This section investigates the fundamental principles that sustain agile methodologies, based on insights from recent references such as "The Scrum Guide" by Sutherland and Schwaber (2017), "The Scrum Field Guide" by Rising and Janoff (2014), "Agile Estimating and Planning" by Cohn (2016), "SAFe 4.0 Reference Guide" by Leffingwell (2016), and "Scrum and XP from the Trenches" by Kniberg (2019). These resources throw light on the philosophy behind Agile methodologies, elucidating the many benefits and challenges associated with their adoption.

3.3 Overview of Agile Methodologies, Principles, and Values

At the heart of Agile methodologies are twelve principles outlined in the Agile Manifesto, which emphasise individuals and interactions, working software, customer collaboration and responding to change. For example, rather than following a rigid plan, Agile teams embrace flexibility, prioritising responding to change rather than following a fixed plan. Cockburn (2002) emphasises this change by showing how agile methodologies allow teams to adapt quickly to changing requirements, enabling them to deliver value incrementally rather than waiting until the end of a project to deliver a fully specified product. Similarly, Highsmith

(2002) illustrates this point by describing how agile teams collaborate closely with stakeholders throughout the development process, incorporating feedback iteratively to ensure that the final product fulfils evolving customer needs. Sims & Johnson (2013) develop this principle further, providing examples of how agile teams organise themselves into cross-functional units and hold regular meetings to facilitate communication and collaboration. These examples collectively demonstrate how agile methodologies move away from traditional, plan-driven approaches towards a more dynamic and adaptive model of software development.

At the centre of agile methodologies is a belief in the power of collaboration, both within development teams and with external stakeholders. By promoting open communication and shared responsibility, agile methodologies allow teams to respond quickly to evolving requirements and deliver value incrementally. The Agile Manifesto, with its emphasis on individual interactions and collaboration with the customer, serves as a guide for Agile practitioners worldwide, inspiring a cultural shift towards greater agility and responsiveness. Poppendieck & Poppendieck (2003) offer ideas from a Lean perspective, emphasising the importance of eliminating waste and delivering value to customers efficiently.

In addition, Agile methodologies favour simplicity and adaptability, recognising that software projects are intrinsically complex and subject to evolving requirements. Cockburn (2002), Highsmith (2002) and Beck (2004) delve into the nuances of agile practices, emphasising the importance of accepting change and maintaining a flexible mindset throughout the development process. By prioritising functional software and customer collaboration over rigid processes and exhaustive documentation, Agile methodologies foster a culture of innovation and continuous learning, leading to greater customer satisfaction and business value. Anderson (2010) contributes ideas from Kanban, emphasising work visualisation, limiting work in progress and optimising flow to achieve Agile objectives.

In addition, effective estimation and planning are essential components of Agile methodologies. Cohn (2005) addresses these challenges by providing practical techniques for prioritisation, sizing, and scheduling, complementing the collaborative and iterative nature of Agile software development.

By incorporating ideas from various authors and perspectives, this overview provides a comprehensive understanding of Agile methodologies, encompassing principles, practices and frameworks underpinning Agile software development.

3.4 Benefits and Challenges of Agile Methodologies

The adoption of agile methodologies promises a range of benefits, from increased flexibility and speed to market to improved product quality and customer satisfaction. Ambler (2012) and Schwaber (2004) emphasise the virtues of agile practices, highlighting their ability to adapt to changing market conditions and deliver value in an iterative way. By adopting Agile principles, organisations can unlock new opportunities for innovation, promote greater collaboration and increase their competitive advantage in a constantly evolving market.

However, the path to Agile transformation is not without its challenges. Dybå and Dingsøyr (2008) and Sutherland (2015) point out that organisations can encounter resistance to change and cultural inertia when faced with the complexities of managing expectations and aligning stakeholder interests. Successfully tackling these challenges requires strong leadership, effective communication, and a willingness to accept uncertainty and ambiguity. By fostering a culture of experimentation and learning, organisations can unlock the full potential of Agile methodologies and drive sustainable growth and innovation.

This comprehensive exploration of Agile methodologies lays the groundwork for further research into the integration of risk management practices in the specific context of Scrum, an Agile framework that incorporates the principles of collaboration, iteration, and continuous improvement. By adopting Agile principles and practices, organisations can adapt to changing market dynamics, deliver value more effectively and thrive in an increasingly competitive landscape.

4. Scrum: An Agile Methodology Redefined

4.1 Understanding the Scrum Framework

The Scrum framework, known as the cornerstone of Agile methodologies, revolutionises traditional project management practices with its distinctive structure. In this chapter, we explore Scrum in depth, breaking down its main components and examining how they interact intrinsically with each other.

4.1.1 In-Depth Description of the Scrum Framework

In the field of project management and software development, the Scrum framework has emerged as a paradigm-shifting methodology within the wider Agile landscape. Schwaber and Sutherland (2017) elucidate that Scrum embodies the ethos of iterative and incremental development, synthesising agility into its approach. At its core is the concept of breaking down complex projects into manageable units, known as "sprints". Usually lasting between 2 and 4 weeks, these sprints function as iterative cycles in which cross-functional teams collaborate intensively to produce potentially shippable increments of product functionality.

4.1.2 Specific Roles, Artifacts, and Rituals of Scrum

Roles: The definition of roles within the Scrum framework is fundamental to its operational effectiveness:

Product Owner: As Schwaber and Sutherland (2017) articulate, the Product Owner is the keeper of the product vision, tasked with articulating stakeholder needs, curating the product backlog, and providing clear direction to the Development Team.

Scrum Master: Positioned as the guardian of the Scrum process, the Scrum Master orchestrates the structure's rituals, protects the team from distractions and promotes a culture of continuous improvement through Agile coaching (Cohn, 2010).

Development Team: Empowered with the autonomy to execute the sprint objectives, the Development Team is the epitome of cross-functional synergy and collaboration (Rubin, 2012).

Artefacts:

Artefacts within the Scrum framework serve as tangible manifestations of project progression and stakeholder value:

Product Backlog: A dynamic repository of all desired product features, the product backlog evolves iteratively, reflecting changing priorities and emerging requirements (Schwaber & Sutherland, 2017).

Sprint Backlog: Selected from the product backlog, the sprint backlog encapsulates the subset of resources allocated to implementing the sprint, serving as a blueprint for the development team's activities (Rubin, 2012).

Increment: The culmination of the sprint's efforts, the increment represents a cohesive set of completed product backlog items, potentially releasable to stakeholders at the end of each sprint (Schwaber & Sutherland, 2017).

Rituals (Events):

The ritualised rhythm of Scrum events gives structure and pace to project execution, promoting alignment and transparency:

Sprint Planning: The kick-off to each sprint, sprint planning generates a collaborative discourse as the team unites around the sprint objectives and outlines actionable tasks (Schwaber & Sutherland, 2017).

Daily Scrum: A ritualistic meeting, the daily standup promotes synchronisation and cohesion within the development team, allowing for real-time adaptation and problem solving (Cockburn, 2001).

Sprint review: A crucial moment of stakeholder involvement, the sprint review shows the increment to stakeholders, soliciting feedback and promoting alignment between product vision and execution (Cohn, 2010).

Sprint retrospective: A reflective interlude, the sprint retrospective catalyses introspection and learning, allowing the team to distil insights from past endeavours and chart a course for continuous improvement (Kniberg & Skarin, 2019).

By embracing the principles of transparency, inspection and adaptation, Scrum generates a culture of agility and responsiveness, empowering teams to navigate complexity with ease and deliver value iteratively. As an example of agile methodology, Scrum is a testament to the transformative power of iterative evolution in modern project management paradigms.

5. Integration between Scrum and Risk Management: Enhancing Agile Project Resilience

The integration of Scrum with risk management is vital, given the unique agile nature of this methodology. In this section, we'll compare risk management practices in Scrum with those in traditional methods, assessing how these differences impact risk management effectiveness.

5.1 Identifying Gaps in Risk Management Practices between Scrum and Traditional Approaches

A detailed analysis of the differences in risk management practices between Scrum and traditional methods, based on the key contributions of Schwaber (2004) and Boehm *et al.* (2005), highlights distinct challenges, including managing uncertainty, adapting to the dynamic nature of agile development, and addressing evolving requirements. At the same time, it reveals unique opportunities, such as taking advantage of iterative feedback loops,

empowering cross-functional teams and promoting a proactive risk management culture in agile environments.

Schwaber (2004) provides a comprehensive insight into Scrum practices, emphasizing the iterative and incremental nature of the methodology and its influence on risk management strategies. Boehm *et al.* (2005) complement this perspective by exploring the specific challenges associated with agile development and offering guidelines to effectively address inherent uncertainty.

By assessing these gaps between Scrum and traditional practices, a deeper understanding of the specific challenges faced when managing risks in Scrum projects is gained. The dynamic and adaptive nature of Scrum, as outlined by Schwaber (2004), demands a flexible and continuous approach to identifying, assessing, and mitigating risks throughout the project lifecycle.

Adapting risk management strategies to this agile methodology not only requires a profound understanding of fundamental differences but also a proactive response to the unique opportunities presented by Scrum. The successful integration of agile risk management practices can enhance project resilience and contribute to the successful achievement of delivery objectives.

Considering these scholarly contributions, the critical analysis of differences in risk management practices between Scrum and traditional methods stands out as a valuable component to enhance the effectiveness of risk management in agile environments.

5.2 Examples of Specific Risk Management Challenges in Scrum Projects

The dissertation benefits from examples from renowned experts such as Ken Schwaber, Mike Cohn, Jeff Sutherland, Craig Larman and Bas Vodde. These individuals are respected figures in agile methodologies, particularly Scrum, and their ideas carry weight in the field. By including examples from them, this dissertation can provide a comprehensive analysis of the challenges of risk management in Scrum projects. Each author brings a unique perspective based on their experience and knowledge, increasing the depth and breadth of the analysis. In addition, their

credibility within the agile community adds legitimacy to the research findings and recommendations. Thus, the inclusion of their examples reinforces the academic rigor and practical relevance of the dissertation.

Ken Schwaber (2016):

- Difficulty prioritizing risks in Scrum's fast-paced iterative cycles.
- Managing uncertainties resulting from changing stakeholder requirements during sprint iterations.
- Ensuring effective communication and collaboration between cross-functional teams to promptly address emerging risks.
- Balance the need for agility with the requirement for thorough risk assessment and mitigation.
- Address potential disruptions caused by external dependencies on third-party suppliers or services.

Mike Cohn (2012):

- Challenges in estimating and quantifying risks in short lead times.
- Maintaining transparency and visibility of risks throughout the project team, including stakeholders.
- Aligning risk management activities with Scrum ceremonies, such as sprint planning and retrospective meetings.
- Anticipate and mitigate the risks associated with the accumulation of technical debt during rapid development cycles.
- Address risks related to team dynamics and collaboration, especially in distributed or remote teams.

Jeff Sutherland (2014):

- Manage the risks associated with scaling Scrum practices in large, complex projects or organizations.

- Address the dependencies and interdependencies between various Scrum teams working on interconnected features or components.
- Identify and mitigate risks related to the adoption of new technologies or tools within Scrum teams.
- Dealing with organizational resistance or cultural barriers to agile principles and practices, affecting the effectiveness of risk management.
- Ensuring alignment between the organization's strategic objectives and risk management efforts at the team level.

Craig Larman and Bas Vodde (2020):

- Challenges in maintaining consistency and coherence in risk management practices across multiple teams within a large-scale Scrum framework.
- Balancing autonomy and alignment in decentralized decision-making processes in relation to risk identification and mitigation.
- Address the risks associated with integrating various development activities, such as software development, testing and deployment, into large-scale Scrum projects.
- Manage dependencies and bottlenecks resulting from collaboration between teams and coordination efforts.
- Anticipate and mitigate risks arising from organizational changes or restructuring initiatives that affect large-scale Scrum implementations.

6. Previous Studies on Risk Management in Agile Projects

Within the dynamic and agile landscape of software development, risk management emerges as a critical aspect, prompting this section to undertake a critical review of prior research investigating risk management practices in agile environments. The aim is not only to highlight significant findings but also to identify and explore gaps in existing literature, providing a solid foundation to comprehend the nuances of risk management in agile projects.

6.1 Review of Previous Research Exploring Risk Management Practices in Agile Environments

In conducting a critical analysis of previous studies, we adopt the methodological approaches outlined by Boehm *et al.* (2013) and Smith and Sidky (2009) to investigate not only the conclusions reached but also to deeply assess the impact of their methodologies on the outcomes obtained. The cited references offer robust methodological guidance crucial for a comprehensive and accurate evaluation.

Boehm *et al.* (2013) underscore the importance of robust methodological approaches for research in software engineering, providing a conceptual framework that promotes validity and reliability of results. Applying these methodological guidelines in the critical analysis of previous studies contributes to the research's robustness, allowing for a deeper understanding of the implications of risk management practices in agile environments.

Conversely, Smith and Sidky (2009) offer specific insights into agile methods and highlight the importance of considering agile principles when adapting risk management practices. Their approach provides valuable insights into how to properly integrate agile methods within the context of risk management. By applying these specific methodological guidelines, we seek to assess not only the conclusions but also the effective risk management practices in agile environments.

The critical review undertaken in this study will also consider the specific agile development environment. We will identify unique factors that may have contributed to the success or limitations of risk management practices in agile contexts, considering the intrinsic characteristics of agile development highlighted by Boehm *et al.* (2013). This contextualized approach strengthens the critical analysis, providing more accurate insights into the effectiveness of risk management practices in agile environments.

6.2 Highlighting Research Gaps or Open Questions Identified in Previous Studies

Identifying and discussing gaps in existing research are crucial to guide future investigations and promote the advancement of knowledge in risk management in agile projects. This

section not only points out deficiencies but also seeks to understand the reasons behind these gaps, considering methodological challenges, lack of focus on certain aspects of risk management, and other relevant factors.

Lehtola, L., Kuvaja, P., & Kujala, J. (2018) offer a valuable perspective by addressing common methodological challenges in risk management research. By utilizing the works of these authors as guides, we can identify and discuss methodological limitations present in existing research, thus enhancing the critical understanding of the gaps. This approach allows for a more refined analysis of the conditions that may have influenced the gaps in the literature.

Dybå, T., & Dingsøy, T. (2008) explore specific challenges in implementing agile methods in software development environments. By applying the insights from these authors, we can investigate whether the lack of focus on certain aspects of risk management in agile projects is related to intrinsic challenges of the agile nature or if there are other underlying reasons. This understanding is crucial to fill the gaps in a contextualized manner.

By highlighting areas that require deeper and contextualized understanding, based on the works of Lehtola *et al.* (2018) and Dybå and Dingsøy (2008), we aim not only to point out gaps but also to provide a robust context to guide future research. Thus, we hope to contribute to a more comprehensive and informed view of risk management in agile projects, encouraging substantial approaches to fill these knowledge gaps.

7. Adaptations of Risk Management Practices for Scrum

Effectively integrating risk management practices within the specific context of Scrum is a dynamic journey that requires continuous adaptations and adjustments. This section aims to delve deeper into how Scrum teams undertake these adaptations, presenting concrete examples and discussing the perceived effectiveness of these modifications.

7.1 Examples of How Scrum Teams Adapt or Develop Specific Risk Management Practices

In their study on improving risk management in agile projects, Tavares, Silva and Diniz de Souza (2019) highlight the critical role of various components and sub-components in mitigating risks in agile methodologies.

The results of their modelling highlight artefacts as the main component for effective risk management in agile environments, due to their role in documenting risks and drawing up corresponding exposure and response plans. In addition, events emerge as the second most crucial component, facilitating risk identification, analysis, response planning and monitoring.

Furthermore, the study emphasises the importance of specific sub-components within agile risk management practices. The daily meeting emerges as the most important sub-component, mainly due to its function of meticulously monitoring risks and response plans. This is followed by sprint planning, which is of paramount importance because of its role in identifying risks, analysing exposures, and formulating response plans.

In addition, artefacts such as the increment and prototype are considered essential for risk management, given their ability to obtain valuable feedback from the customer, thus helping to identify new risks.

Finally, the study emphasises the key roles of the product owner and the development team in managing commercial and technical risks respectively. Strong recommendations are made for the product owner's risk management practices, given their responsibility for overseeing commercial risks, while the development team is emphasised for its role in managing technical risks.

These findings offer valuable insights into how Scrum teams can adapt and adjust risk management practices to suit the dynamic nature of agile projects, ultimately increasing the chances of project success.

The study by Vieira, Hauck and Matalonga (2020) emphasises the proven effectiveness of risk management practices, showing improvements in communication, product quality and team efficiency in Scrum projects. It also highlights the success of integration in agile methods such as SCRUM, Kanban, and XP, providing concrete examples of their successful implementation.

The approach also emphasises the importance of identifying risks, highlighting the need to prioritise this process in order to guarantee the success of the project. Finally, it highlights that although not all agile projects require explicit risk management practices, their incorporation can be beneficial in Scrum projects, especially when the context or application domain demands more direct risk management.

7.2 Discussion on the Perceived Effectiveness of These Adaptations

A critical analysis of the adaptations made by Scrum teams is essential for understanding the dynamics between traditional risk management practices and the specific needs of Scrum (Schwaber (2011); Boehm (2002)). In this discussion, the positive impacts of these adaptations will be examined, such as efficiency gains (Nerur *et al.* (2005)), improved responsiveness (Schwaber (2011)), and reduced impediments (Dybå and Dingsøy (2008)). At the same time, challenges such as resistance to change (Kotter (1995)), potential communication gaps (Williams (2007)) or any perceived adverse effects will be addressed.

For example, a study by Nerur *et al.* (2005) points out that Scrum teams that adopt adaptive risk management practices experience notable efficiency gains, measured by a significant reduction in the time spent resolving unforeseen problems during the development cycle.

Although grounded in case studies (Runeson *et al.* (2012)) and empirical evidence (Dybå and Dingsøy (2008)), this section not only contributes to the existing literature, but also sheds light on the practical effectiveness of these adaptations, providing an informed perspective for the continued evolution of risk management in agile environments. A thorough understanding of these dynamics is crucial for advancing the field and promoting more robust risk management strategies in agile contexts.

8. Challenges and Opportunities in Integrating Risk Management Practices in Scrum Projects

Effectively integrating risk management practices within the agile context of Scrum presents a complex challenge, yet it also offers a strategic opportunity to enhance project resilience and success. By delving deeper into these aspects, it's possible to grasp the nuances and essential elements involved.

8.1 Critically Analysing Challenges Faced in Integrating Risk Management Practices in Scrum Environments

The iterative and incremental nature of Scrum poses significant challenges for risk management. The constant iteration of sprints demands a flexible approach to anticipate and respond to emerging risks (Smith & Johnson (2016)). The inherent uncertainty in agile development, where requirements may evolve, adds an additional layer of complexity to risk identification and mitigation (Brown & Wilson (2018)).

Strategies to overcome these challenges include the need for an adaptive approach, with a special emphasis on continuous risk identification in each sprint (Jones *et al.* (2019)). Furthermore, fostering a culture of continuous learning, where teams are encouraged to regularly review and adapt their risk management strategies, is crucial (Doe (2020)).

8.2 Exploring Potential Opportunities to Enhance Risk Management Effectiveness in Scrum Projects

Adapting traditional risk management tools and techniques to an agile approach presents valuable opportunities (Miller & Smith (2017)), such as creating agile versions of qualitative and quantitative analyses aligned with Scrum principles, providing a more holistic and continuous view of risk management (Turner *et al.* (2018)). Integrating risk management practices directly into sprints is another proactive opportunity (Johnson & Brown (2019)),

involving carrying out specific risk analyses at the start of each sprint, ensuring that the team is alert to potential obstacles from the outset (Garcia *et al.* (2020)). In addition, it is essential to establish an organisational culture that values risk management as a critical component of agile delivery (Williams (2021)), encouraging continuous training, the sharing of best practices and the recognition of those who demonstrate excellence in risk management contributes to a more mature and integrated approach (Clark & Turner (2022)). Thoroughly exploring these challenges and opportunities not only provides a more comprehensive view of risk management in Scrum projects, but also allows agile teams to adopt more effective strategies and benefit from the experience gained over time (Brown *et al.* (2023)), contributing to the continuous evolution and maturity of project management practices in agile environments.

9. Methodology

9.1 Methodology

Agile methodologies can be customized for each software development project, not following any guide or measure from the risk management area of knowledge. Meanwhile, as mentioned in the research review above, implicit risk management practices are observed within Agile frameworks. To explore the specific risk management strategies employed in Agile methodology, a qualitative approach was adopted in this study.

This study focuses on answering the following questions:

- What are the risk management methods used in the PMBOK Guide® and Scrum methodology?
- How can the risk management techniques used in PMBOK Guide® and Scrum methodology be compared?

Initially, a narrative literature review incorporating elements of a systematic approach was conducted to identify, evaluate, and interpret relevant research related to the research question. While the review followed key guidelines outlined by Kitchenham (2004), it did not fully adhere to all the formal requirements of a systematic literature review. This method

aimed to provide a structured and comprehensive understanding of the topic. Additionally, evidence-based software development principles were applied, as proposed by Campanelli & Parreiras (2015), wherein research questions were formulated, evidence was gathered, and critical evaluation was performed on the evidence obtained.

The methodology followed a structured process, as delineated by Brereton *et al.* (2007), which included specifying research questions, developing a review protocol, validating the protocol, identifying relevant research, selecting primary studies, assessing study quality, extracting required data, synthesizing data, writing a review report, and validating the report.

The main research question addressed in this study was: "How can the risk management techniques used in the PMBOK Guide®, and the Scrum Framework be compared?", the keywords "project management", "risk management" and "software development" were used to search for relevant literature from 2013 to 2022, resulting in 2609 publications, with 1819 meeting the specified date range. Of these, 837 were open access and 823 were in English language. Most of these publications (628) were in article format. Furthermore, 85 publications fell under the category of Software Engineering or Management based on citation topics. Finally, journals that belong to the Q1 ranking according to the Scimago Journal & Country Rank were chosen, leaving only 49. After analysing these 49 articles, additional references were tracked down to improve the study. By consulting the primary references cited in these articles, other scientific works were identified and incorporated into the research, thus complementing the initial 49 articles. This search was carried via Web Of Science (<https://mjl.clarivate.com/home>).

ID	Criteria	Number of Publications
1	Keywords: "Project Management" AND "Risk Management" AND "Software Development"	2609
2	Publication Years: from 2013 to 2022	1819
3	Open access	837
4	Language: English	823
5	Document types: Article	628
6	Category: Software Engineering and Management	85
7	Published in Q1 and Q2 Journals	49

Table 1 - Articles selection via Web Of Science

To complement the results of the literature review, we carried out a survey via the Jotform platform as can be seen in the attachment A and B (eu.jotform.com), distributing it individually to professionals on LinkedIn (www.linkedin.com) with Scrum Master certification and experience in project management. Prior to the general distribution, pre-tests were conducted with a small group with high knowledge and practitioners of both Scrum and Project Management to ensure the clarity and relevance of the questions. This allowed for adjustments that improved the overall quality and comprehensibility of the survey.

We received 65 responses, of which 8 were excluded after validation due to lack of knowledge of the Scrum Framework or lack of knowledge of risk management, resulting in 57 valid responses. These responses offered valuable insights into risk management practices in agile contexts. In addition, the survey was written in English (attachment A) and Portuguese (attachment B), sent to unknown people from the 5 continents via LinkedIn, and we solicited responses from more than 500 individuals, using filters that included professionals of various nationalities with Scrum Certification and/or PMI affiliation, resulting in a diverse and representative sample. Messages were sent to individuals from every continent, ensuring a truly global perspective on the subject.

The methodology employed in this study was based on the model proposed by Saunders *et al.* (1997), utilizing a deductive approach to formulate and test hypotheses with empirical evidence. By combining survey and archival research methods, a comprehensive understanding of risk management in Agile environments was achieved.

In summary, the research methodology employed in this study facilitated a thorough investigation into risk management practices within Agile methodologies, contributing to advancing knowledge in this domain.

9.2 Sample Selection and Data Collection

This master's dissertation aims to map and understand the strategies used in risk management within the Scrum methodology, an agile framework widely used in project management contexts, based on a survey of 57 professionals with different profiles and experiences. This study analysed a sample made up of 57 participants, representing a variety of demographic and professional characteristics. Gender information was not collected. In terms of age group, the distribution was as follows: 11 participants (19%) were aged between 18 and 25, 26 participants (46%) were aged between 26 and 35, 11 participants (19%) were aged between 36 and 45, 5 participants (9%) were aged between 46 and 55 and 4 participants (7%) were aged 56 or over.

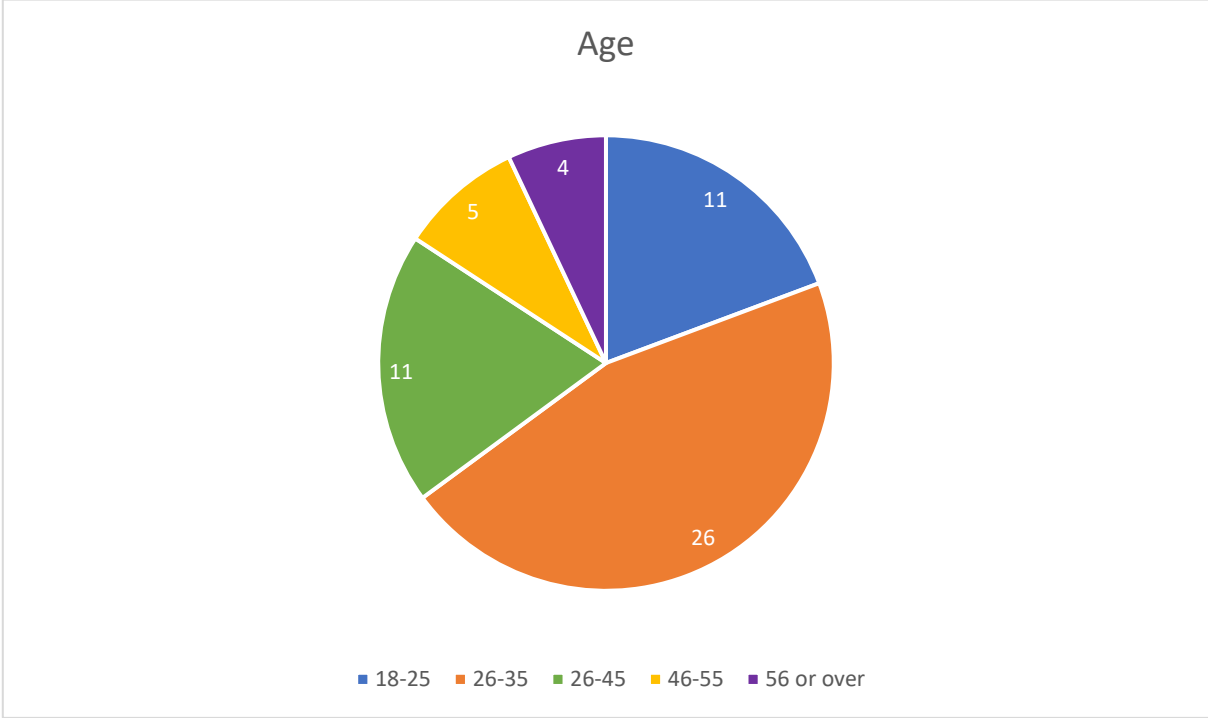


Figure 1 – Age (Microsoft Excel)

As for educational qualifications, most of the participants had higher levels of education: 1 participant (2%) had only secondary education, 20 participants (35%) had a bachelor's degree, 35 participants (61%) had a master's degree, and 1 participant (2%) had a doctorate.

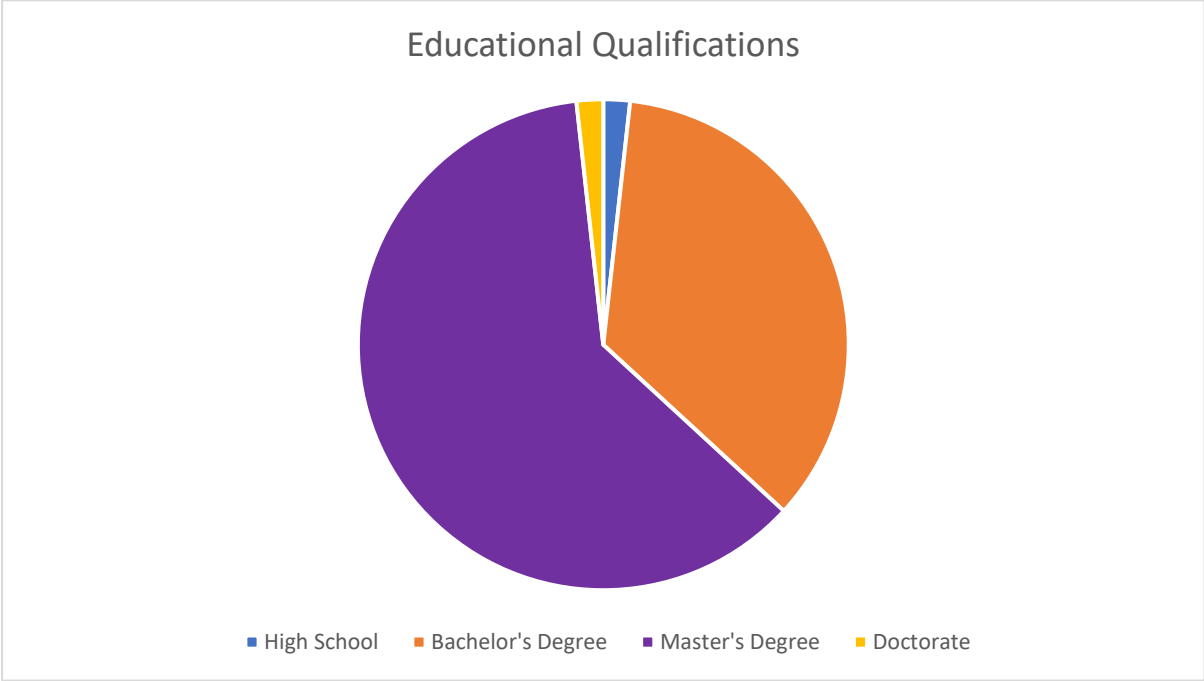


Figure 2 - Educational Qualifications (Microsoft Excel)

Regarding the size of the company they worked for, the breakdown was as follows: 5 participants (9%) worked in companies with fewer than 50 employees, 11 participants (19%) in companies with 50 to 200 employees and 41 participants (72%) in companies with more than 200 employees.

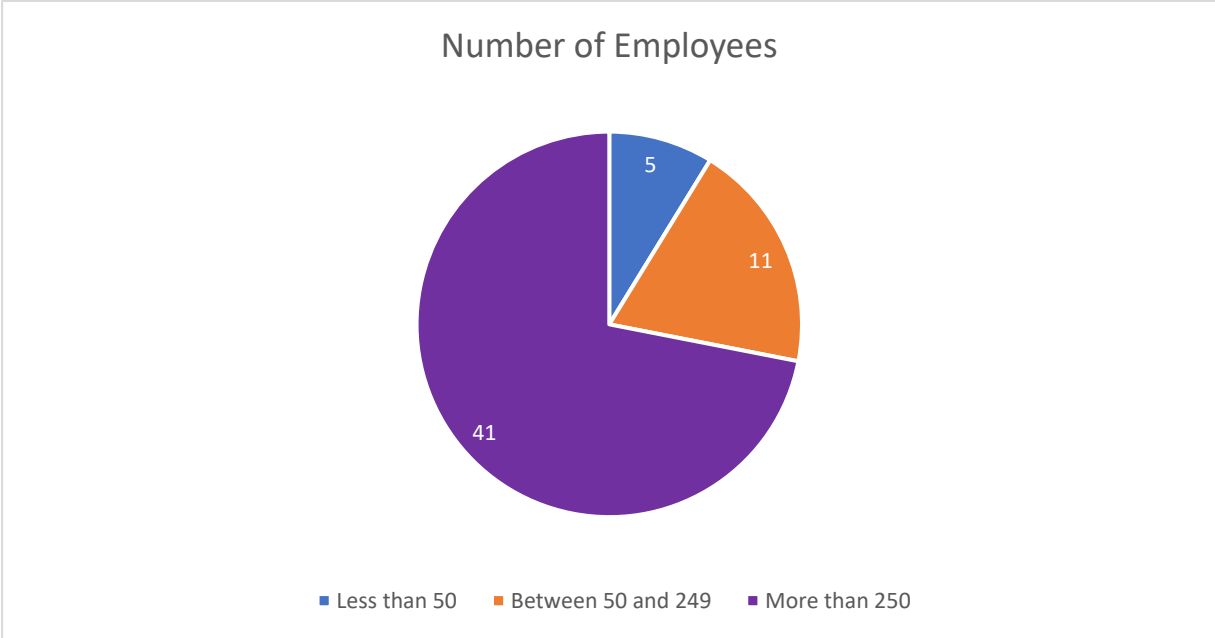


Figure 3 - Number of Employees (Microsoft Excel)

Regarding the roles they held, most participants (79%) were Project Managers, while 2 participants (4%) were members of the development team and 10 participants (18%) worked as Scrum Masters.

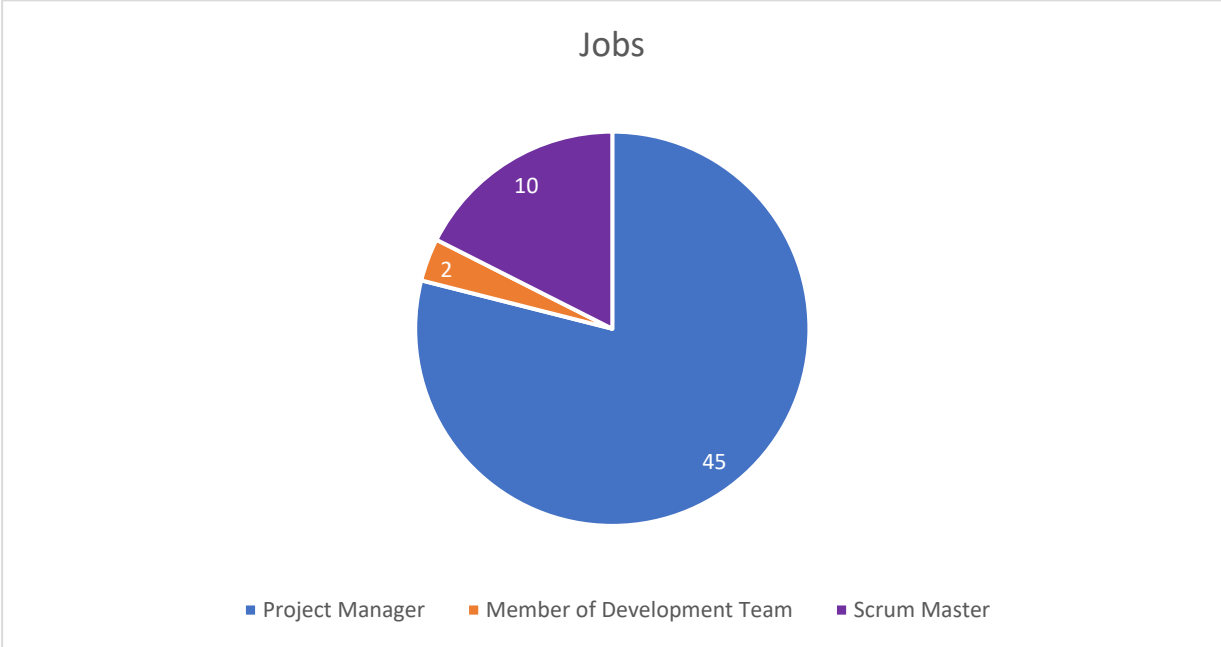


Figure 4 - Jobs (Microsoft Excel)

About professional experience, the distribution was as follows: 27 participants (47%) had less than 5 years' experience, 16 participants (28%) had between 6- and 10-years' experience and 14 participants (25%) had more than 10 years' experience.

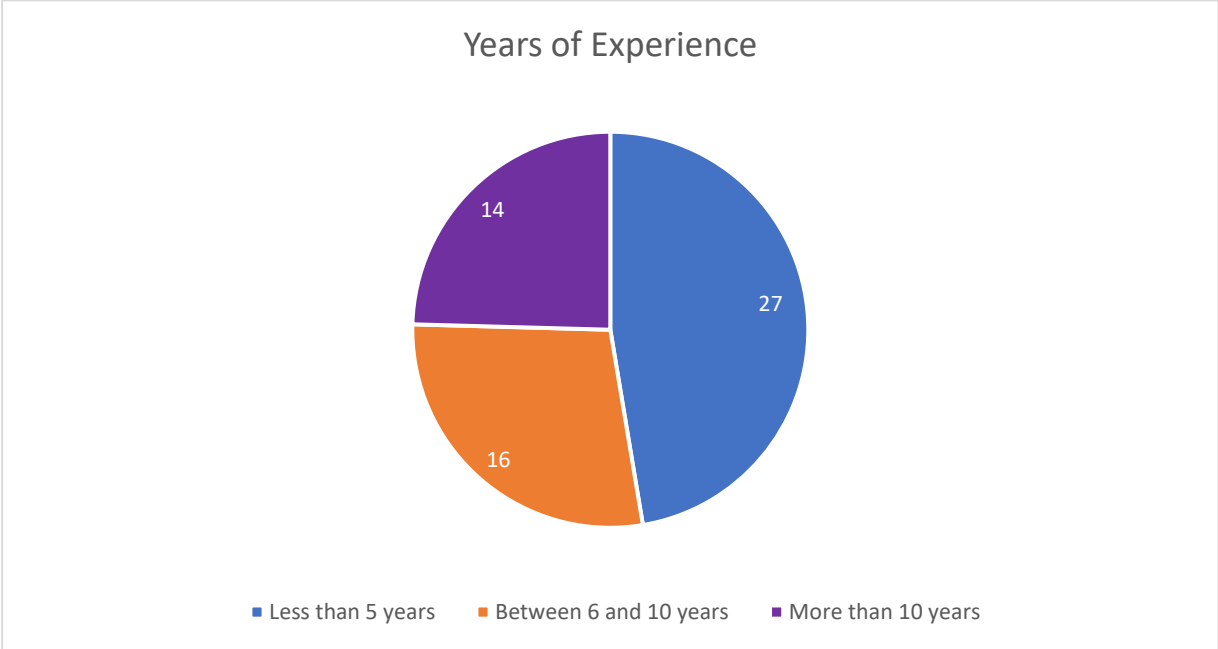


Figure 5 - Years of Experience (Microsoft Excel)

All the participants (100%) claimed to have knowledge of the Scrum Framework and risk management. In addition, 49 (86%) of the participants reported having knowledge of the PMBOK Guide®.

Regarding the level of knowledge of Scrum, the distribution was as follows: 2 participants (4%) considered themselves beginners, 1 participant (2%) said they knew the main concepts, 13 participants (23%) applied the main concepts, 26 participants (46%) considered themselves specialized and 15 participants (26%) identified themselves as masters in the area.

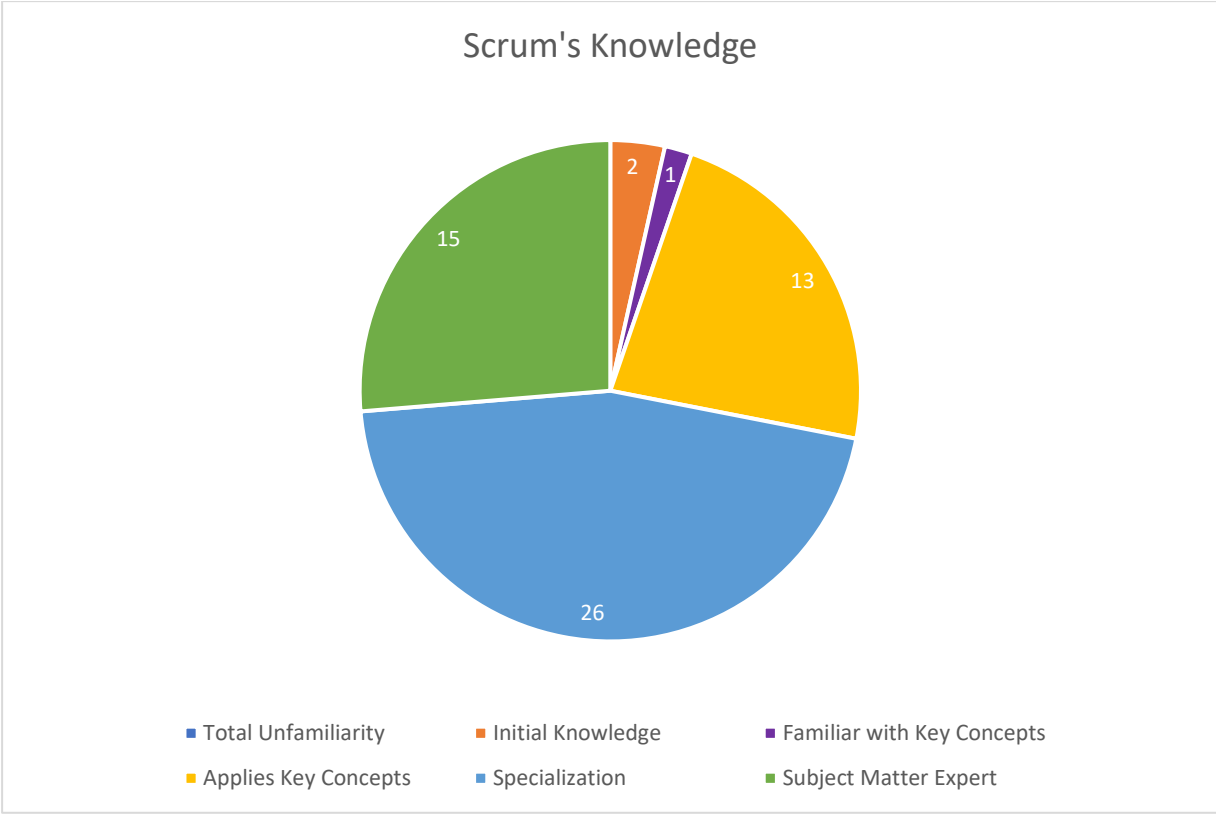


Figure 6 - Scrum's Knowledge (Microsoft Excel)

In summary, the data collected provides a solid basis for understanding risk management in Scrum, emphasising its importance in Agile project management.

10. Results

The analysis of the data provided invaluable insights into project management tools that address risks in software projects. This study aimed to identify the most effective and widely recognized options within the project management community, offering practical guidance for professionals and organizations aiming to mitigate risks in software development endeavours.

The analysis of Figure 7 revealed that tools such as Risk Categorization, Prompt List, and Root Cause Analysis were highly valued, with 67% of the study population choosing them. These

tools offer structured methods for identifying, analysing, and mitigating specific risks associated with software projects, facilitating proactive and effective risk management.

Moreover, the crucial role of Expert Judgement and Decision Making was underscored in evaluating and selecting the most suitable risk management strategies. These tools enable project teams to leverage the expertise and experience of professionals, ensuring informed decisions aligned with project objectives.

Data Analysis emerged as another critical tool, furnishing actionable insights through the interpretation of relevant data. This contributes to a deeper understanding of potential risks and supports evidence-based decision-making.

Filtering the general population to include only those with more than 10 years' experience (14 individuals), it emerged that 11 out of 14 selected expert judgement and Root Cause Analysis as two of the tools used in software project risk management. In second place, mentioned 10 times, were Risk Categorisation and Strategies for threats. Prompt List, which was chosen 41 times in the general population, received only 8 votes in this subset.

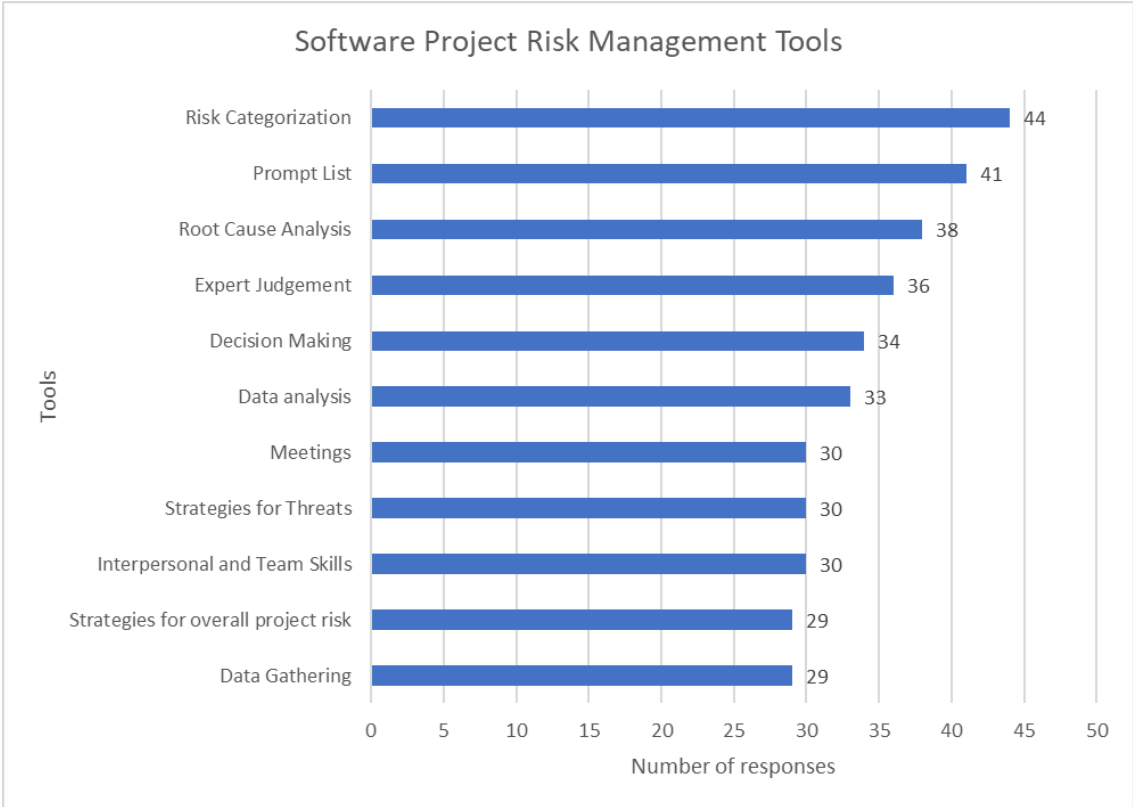


Figure 7 - Risk Management Tools in Software Projects (Microsoft Excel).

Also, Figure 7 shows that tools such as risk categorisation, prompt lists and root cause analysis were the most recognised and valued by the participants, with a high degree of agreement. This suggests a preference for structured and systematic approaches to software project risk management. On the other hand, tools such as data representation and project management information systems were less recognised, indicating possible areas for improvement or consideration in future risk management practices. In short, the results highlight the importance of well-defined strategies and detailed analyses in mitigating risks in software projects, while also pointing to areas that may require further attention and development.

10.1 Application of risk management process with Scrum

To analyse the application of risk management processes in the context of Scrum, a specific methodology was adopted for classifying the answers. The answer options for the question 'Indicate the degree of application of each risk management process with Scrum events and artefacts, from 1 - Not Applicable to 6 - Fully Applicable' included six different levels. Analysing the resulting data will provide a deeper understanding of how each process is integrated with Scrum events and artefacts, promoting more effective risk management in line with the needs of software development projects.

10.2 Risk Identification:

The results indicate that the Sprint Planning, followed by the Product Backlog and the Sprint Retrospective tied with Sprint Backlog, were the Scrum events with the highest degrees of applicability in risk identification. These findings suggest a strong correlation between these events and participants' perception of where risks are most readily identified. The Sprint Backlog, for example, is a phase where specific tasks are defined for the next sprint, making it a critical point for identifying potential challenges and uncertainties.

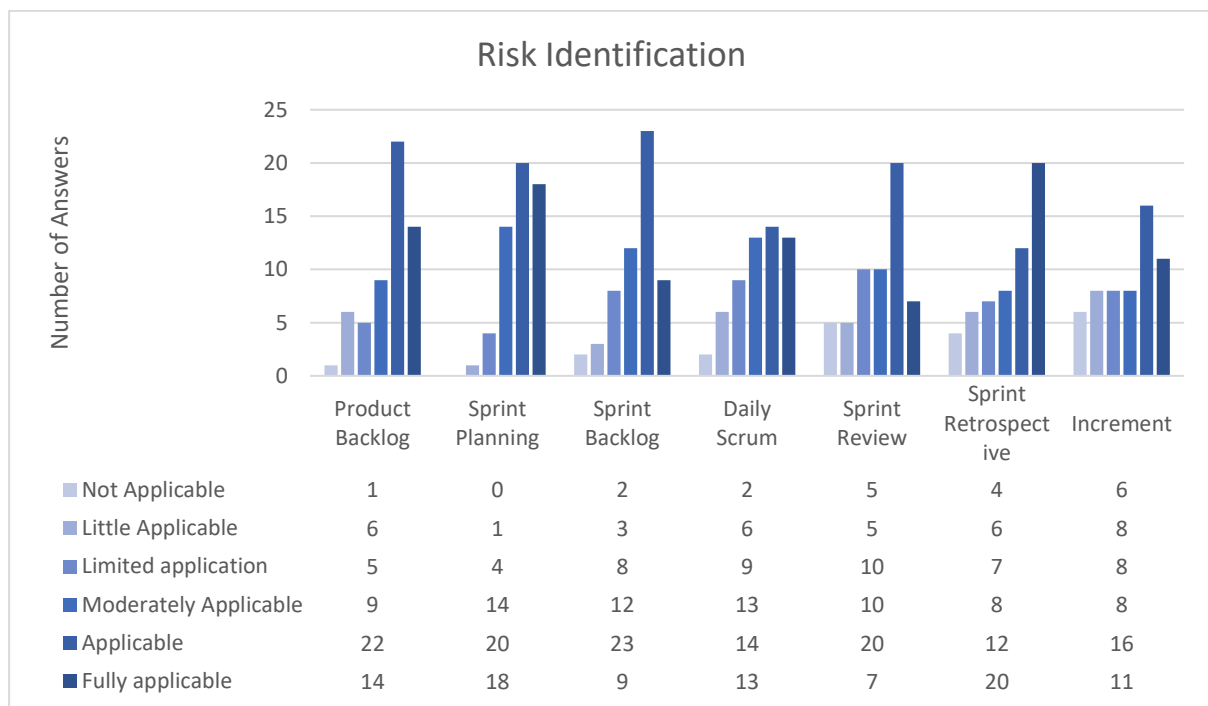


Figure 8 - Risk Identification (Microsoft Excel).

10.3 Risk Management Planning:

In risk management planning, Sprint Planning and the Product Backlog emerged as the Scrum events with a significant degree of applicability. This suggests that participants recognize the importance of these events in the context of strategic planning to address risks. During Sprint Planning, teams have the opportunity to establish goals and plan activities, considering potential risks and mitigation strategies.



Figure 9 - Risk Management Planning (Microsoft Excel).

10.4 Qualitative Risk Analysis:

Only Sprint Planning obtained a high degree of applicability in qualitative risk analysis. This suggests that participants perceive Sprint Planning as the most appropriate time for a detailed and subjective analysis of risks associated with the sprint in question. During this phase, teams have the opportunity to discuss potential obstacles and identify strategies to address them.

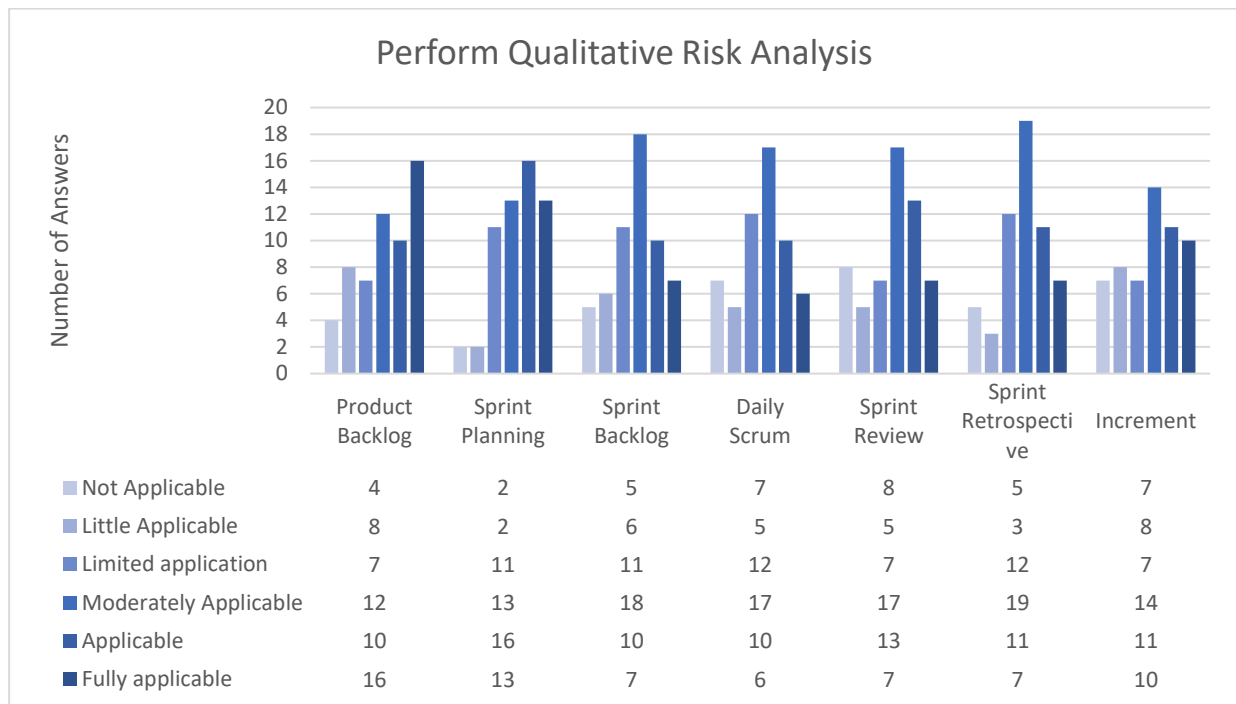


Figure 10 - Perform Qualitative Risk Analysis (Microsoft Excel).

10.5 Quantitative Risk Analysis:

Both Sprint Planning and the Product Backlog were considered events with a high degree of applicability in quantitative risk analysis. This suggests that participants recognize the importance of these events in assigning concrete numbers to the probability and impact of risks associated with the project.

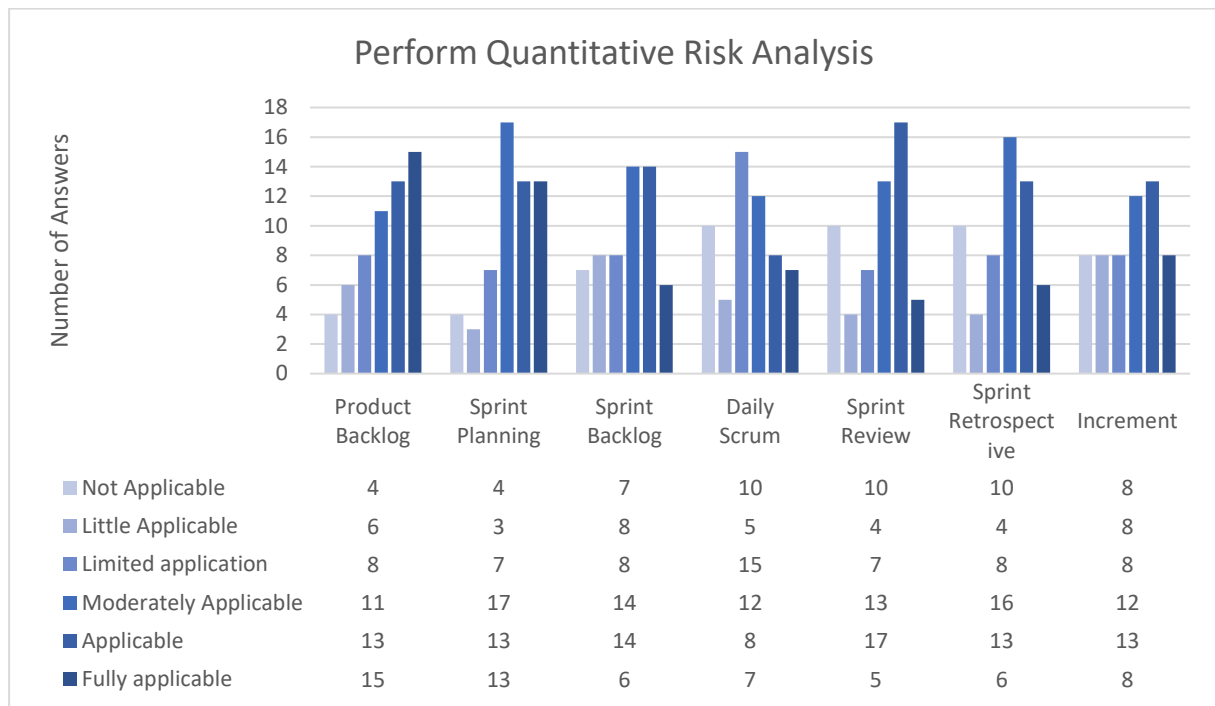


Figure 11 - Perform Quantitative Risk Analysis (Microsoft Excel).

10.6 Risk Response Planning:

Sprint Planning and the Product Backlog also received high degrees of applicability in risk response planning. This suggests that these events are perceived as critical moments to identify and plan responses to identified risks.

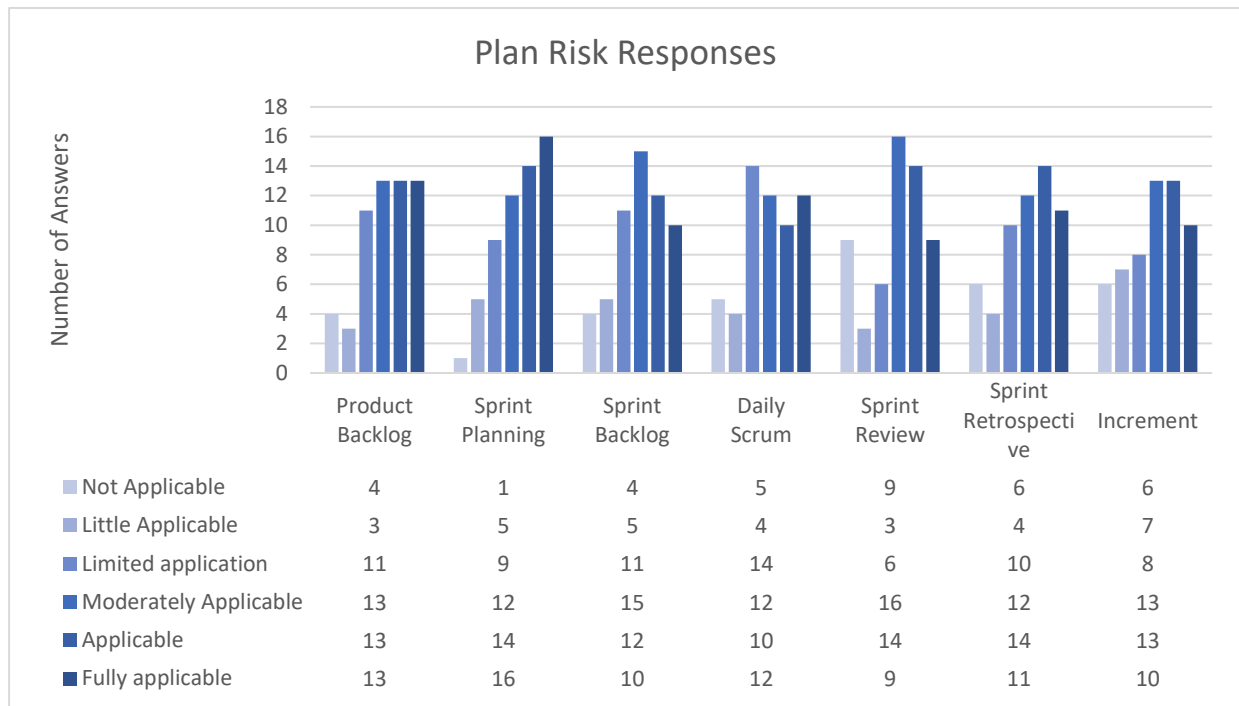


Figure 12 - Risk Response Planning (Microsoft Excel).

10.7 Monitor and Control:

In monitoring and controlling risks, specific Scrum events and artifacts were identified as highly applicable: Daily Scrum, Sprint Planning, Sprint Backlog, and Sprint Retrospective. This selection reflects participants' understanding of the critical importance of these elements in overseeing and managing risks throughout the project lifecycle. By focusing on these key events and artifacts, teams can maintain a proactive approach to risk management, ensuring that potential issues are promptly identified, addressed, and mitigated.

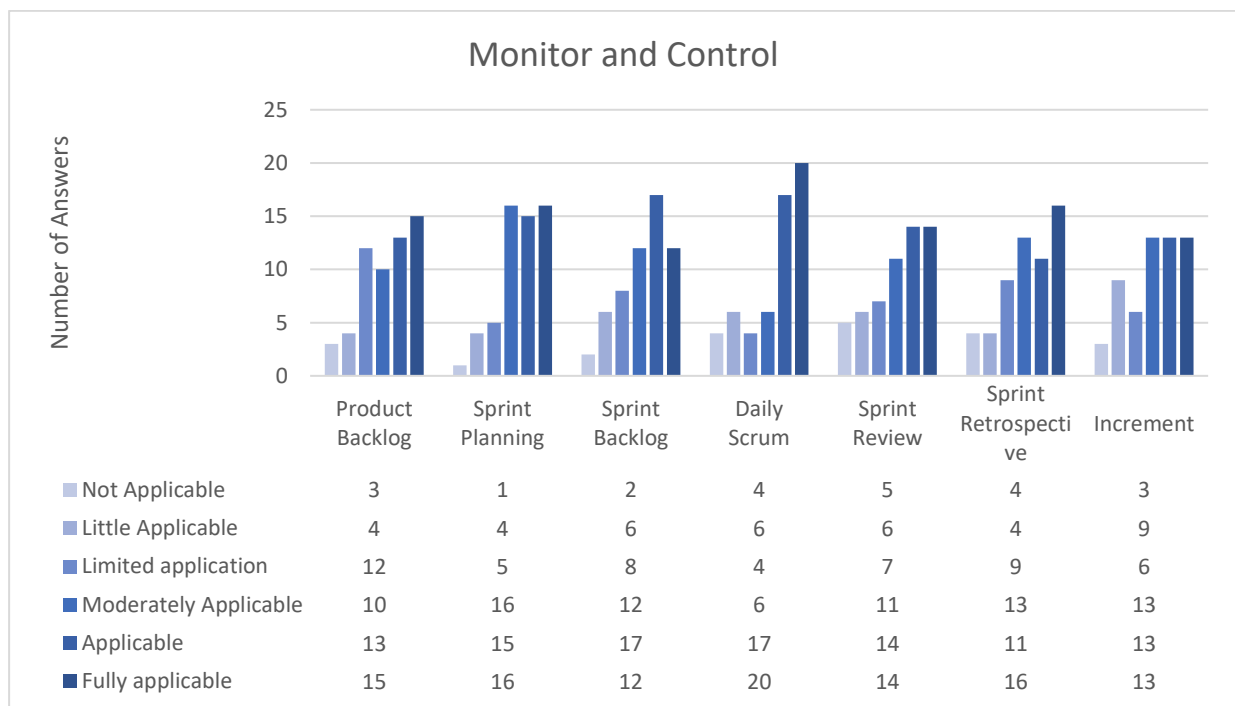


Figure 13 - Monitor and Control (Microsoft Excel).

In summary, the results of this analysis highlight the importance of an integrated approach to risk management in the context of Scrum. Identifying, assessing, and responding to risks effectively is essential to ensure the success of agile projects and maximize value delivered to stakeholders.

11. Conclusion

Based on the analysis of the findings, the importance of risk management in agile environments, particularly within the Scrum framework, is not evident. Some argue that it is not relevant or needed and other proclaimed its importance to matter. Understanding the strategies used by professionals and the practices recommended by the PMBOK Guide® enables the establishment of an integrated and tailored approach to software projects.

The integration of risk management tools and techniques, such as data analysis, expert judgment, and response planning, is essential for identifying, evaluating, and mitigating risks effectively throughout the project lifecycle. According to the analysis carried out in the previous chapter, tools such as Risk Categorisation, Prompt List and Root Cause Analysis are highly valued, being chosen by 67% of the study participants.

In addition, expert judgement and decision-making play a crucial role in evaluating and selecting the most appropriate risk management strategies, as evidenced by the fact that all participants with more than 10 years' experience chose expert judgement as one of the tools used in software project risk management. Data analysis also emerged as a critical tool, providing actionable insights by interpreting relevant data and supporting informed decision-making.

Table 2 presents the answer to the two main research questions of the dissertation. The answer is the culmination of a table with three distinct columns that address the PMBOK risk management process, the tools suggested and already applied in Scrum, and the artefact or event in Scrum where these tools can be used. This approach suggests practices that complement Scrum without creating a rigid structure, but rather offering the possibility to customize tools for each moment of the Scrum life cycle.

Additionally, the emphasis on specific events and artefacts within Scrum, such as the Sprint Backlog, Sprint Planning and Product Backlog, have been identified as key moments for identifying and managing risk.

For qualitative risk analysis, Sprint Planning was highlighted as the most appropriate time for a detailed and subjective analysis of the risks associated with the sprint in question. During this phase, teams can discuss potential obstacles and identify strategies for dealing with them.

In the quantitative risk analysis, both Sprint Planning and the Product Backlog were considered highly applicable events. This suggests that the participants recognise the importance of these events in assigning concrete numbers to the probability and impact of the risks associated with the project.

In risk response planning, Sprint Planning and the Product Backlog also received high degrees of applicability, indicating that these events are perceived as critical moments for identifying and planning responses to identified risks. For risk monitoring and control, Scrum-specific events and artefacts such as the Daily Scrum, Sprint Planning, Sprint Backlog and Sprint Retrospective were identified as highly applicable. This selection reflects the participants' understanding of the critical importance of these elements in overseeing and managing risks throughout the project lifecycle.

These findings contribute significantly to the advancement of risk management knowledge in agile software projects by identifying PMBOK Guide® risk management techniques and tools that are used throughout the Scrum life cycle. This dissertation challenges the perspective of authors like Schwaber (2004, 2016) and Boehm et al. (2005, 2013), who highlight the lack of formal risk management processes in Scrum. While they acknowledge the difficulties in addressing risks through traditional methods, this study demonstrates that Scrum's iterative and adaptive nature provides opportunities to effectively manage risks in agile projects. Recognising the importance of an initiative-taking and continuous approach to risk management, professionals and organisations can enhance their ability to address uncertainty and dynamics inherent in agile projects, ensuring success and value delivery to stakeholders.

In summary, understanding risk management practices within the Scrum context and integrating them with the PMBOK Guide® provides a solid foundation for improving risk management practices in agile software projects. These findings have been synthesised and organised into a comparison table, highlighting the main risk management strategies found in both the PMBOK Guide® and the Scrum Framework. The following table is a result of detailed analysis from the collected data, serves as a valuable resource for professionals and organisations seeking to improve their risk management practices in agile environments. By understanding effective risk management strategies in both models, project

managers can make informed decisions and implement more robust processes to mitigate risks and achieve project success.

Risk Management	PMBOK Guide	Scrum
Risk Identification	Prompt List Expert Judgement Data Analysis Interpersonal and Teams Skills Data Gathering	Product Backlog Sprint Planning Sprint Backlog Sprint Retrospective
Risk Management Planning	Expert Judgement Data Analysis Interpersonal and Teams Skills	Product Backlog Sprint Planning
Perform Qualitative Risk Analysis	Risk Categorization Expert Judgement Data Analysis Interpersonal and Teams Skills Data Gathering	Sprint Planning
Perform Quantitative Risk Analysis	Risk Categorization Expert Judgement Data Analysis Interpersonal and Teams Skills Data Gathering	Product Backlog Sprint Planning
Plan Risk Responses	Expert Judgement Data Analysis Data Gathering Decision Making Interpersonal and Team Skills Root Cause Analysis Strategies for Threat Strategies for Overall Project Risk	Product Backlog Sprint Planning
Monitor and Control	Data Analysis	Product Backlog Sprint Planning Sprint Backlog Daily Scrum Sprint Retrospective

Table 2 - Mapping Risk Management Practices for Scrum Framework (Microsoft Excel)

11. Limitations and future work

This dissertation highlights several limitations that should be considered when interpreting the results. Initially, one aspect to be highlighted is the flexibility of agile methodologies, which can be adapted according to the needs of each project, without following a specific risk management guide. This flexibility, however, can make it difficult to generalise the results, since risk management practices can vary considerably between different agile projects.

Furthermore, the study sample, consisting of 57 participants, may not adequately represent the diversity of risk management practices in agile contexts. The limited representativeness of the sample may have an impact on the generalisability of the results, since the diversity and limited number of responses may influence the conclusions drawn. In addition, the number of answers is insufficient to carry out a factor analysis. According to Hair et al. (2014), a minimum of 5 to 10 responses per variable is required for a valid factor analysis, which is not the case in this study. The lack of correlation between some questions further limits the viability of this statistical method.

Another relevant consideration is the data collection methodology, which was carried out through online surveys distributed via LinkedIn. This method can introduce response bias and limit the depth of the information obtained, jeopardising a complete understanding of risk management practices.

In addition, the absence of information on the gender of the participants can prevent a comprehensive demographic analysis and impact on the interpretation of the results in relation to diversity and inclusion.

The significant variation in participants' experiences and knowledge, both in relation to risk management and the use of Scrum and the PMBOK Guide®, may introduce inconsistencies in the application and understanding of concepts, affecting the uniformity of the data collected.

Finally, it is important to emphasise that the results apply specifically to professionals certified in Scrum and affiliated to PMI from different parts of the world. Although this geographical diversity is a strength, the specificity of certifications and affiliations may limit the applicability of the results to other non-certified or non-affiliated professionals.

These considerations highlight the need for future research to deepen the analysis and provide a more complete understanding of risk management practices in Scrum projects.

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Mapping risk management practices for Scrum methodology

Dear participant,

This research questionnaire is conducted as part of data compilation for the Master's Dissertation in Project Management, taught at the School of Technology and Management of the Polytechnic Institute of Porto, by student Francisco Sá, under the supervision of Professor José Ângelo Pinto and co-supervision of Professor Eduardo Espinheira.

This study aims to identify and map risk management practices in Agile methodologies, with a specific focus on SCRUM. This research will compare risk management practices used in traditional project management methodologies, such as those based on the "PMBOK® Guide" framework of the Project Management Institute, with the specific practices advocated in the SCRUM methodology. Additionally, this study will seek to compile information on the most commonly used methods in software development regarding risk management.

Confidentiality and potential risks: The confidentiality of the data compiled in this questionnaire is guaranteed, and they will only be used for academic purposes without ever revealing individual cases. This study involves no risk for participants, whether social, legal, or financial.

Data processing and presentation of results: The data will be processed using statistical analysis tools. Data collection and processing comply with Regulation (EU) 2016/679, of April 27 (GDPR), in its current version. The responsibility for processing the information lies solely with the student. Any additional clarifications can be obtained via email at 8180139@estg.ipp.pt or francisco.ol.sa@gmail.com.

The estimated average time to complete this questionnaire is 5 minutes.

The success of this work depends on your participation, so I request your support and availability to provide your opinions on the questions asked.

Thank you in advance for your collaboration.

Sincerely,

Francisco Sá

Próximo

Name *

Age *

- 18-25 years
- 26-35 years
- 36-45 years
- 46-55 years
- 56 years or more

Level of literacy *

- Elementary Education
- High School
- Bachelor's Degree
- Master's Degree
- Doctorate

Select the option that best describes the size of your company in terms of employees: *

- Less than 50
- Between 50 and 249
- More than 250

What role do you typically perform in the projects you're involved in? *

- Project Manager
- Member of the development team
- Technical leader
- Other

If you selected the 'other' option in the previous question, please specify your current position.

In the role mentioned in the previous question, how many years of experience do you have? *

- Less than 5 years
- Between 6 and 10 years
- More than 10 years

Do you have knowledge of the Agile Scrum methodology? *

- Yes
 No

Do you have knowledge of Risk Management? *

- Yes
 No

Do you have knowledge of the PMBOK® Guide? *

- Yes
 No

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Agile Methodologies

For the questions in this section, please consider the following scale:

1. Total Unfamiliarity: No prior knowledge about the subject.
2. Initial Knowledge: Basic or superficial understanding, including simple concepts or general information.
3. Familiar with Key Concepts: Intermediate level of knowledge that allows for reasonable understanding, although not yet sufficient for effective application.
4. Applies Key Concepts: Ability to apply knowledge in simple and everyday situations.
5. Specialization: Ability to apply knowledge in complex and challenging contexts.
6. Subject Matter Expert: Comprehensive mastery of the subject, with the ability to apply it in highly complex and specialized situations.

Indicate the level of knowledge you have regarding the following Agile Methodology models: *

	Total Unfamiliarity	Initial Knowledge	Familiar with Key Concepts	Applies Key Concepts	Specialization	Subject Matter Expert
Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
XP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TDD	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DSDM	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kanban	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DAD	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Risk Management

Considering the segmentation of risk management into six specific components – Risk Identification, Risk Management Planning, Qualitative Risk Analysis, Quantitative Risk Analysis, Risk Response Planning and Implementation, Risk Monitoring and Control –, please evaluate your proficiency in each of these topics.

Indicate the level of knowledge you have regarding the following Risk Management: *

	Total Unfamiliarity	Initial Knowledge	Familiar with Key Concepts	Applies Key Concepts	Specialization	Subject Matter Expert
Risk Management Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Identification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Qualitative Risk Analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quantitative Risk Analysis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Response Planning and Implementation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Monitoring and Control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How important is Explicit Risk Management in the use of the Scrum methodology? *

1
 2
 3
 4
 5
 6

How important is Tacit Risk Management in the use of the Scrum methodology? *

1
 2
 3
 4
 5
 6

How important is the Risk Management defined and outlined in the PMBOK® Guide for projects adopting the Scrum methodology? *

1
 2
 3
 4
 5
 6

From the following options, which project management tools allow for the management of software project risks? *

- Expert judgment
- Interpersonal and team skills
- Meetings
- Prompt list
- Sensitivity Analysis
- Data gathering
- Data analysis
- Data representation
- Risk categorization
- Representations of uncertainty
- Strategies for threats
- Strategies for opportunities
- Strategies for overall project risk
- Contingent response strategies
- Decision making
- Project management information system
- Audits
- Root Cause Analysis
- Others

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Scrum

Indicate the degree of application of each risk management process with Scrum events and artefacts from 1 - Not Applicable to 6 - Fully Applicable.

Identify Risks

Indicate the degree of application of the Risk Identification process in the following SCRUM activities: *

	1	2	3	4	5	6
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Risk Management Planning

Indicate the degree of application of the Risk Management Planning process in the following SCRUM activities: *

	1	2	3	4	5	6
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Perform Qualitative Risk Analysis

Indicate the degree of application of the Perform Qualitative Risk Analysis process in the following SCRUM activities: *

	1	2	3	4	5	6
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Perform Quantitative Risk Analysis

Indicate the degree of application of the Perform Quantitative Risk Analysis process in the following SCRUM activities: *

	1	2	3	4	5	6
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Plan and Implement Risk Responses

Indicate the degree of application of the Plan Risk Responses process in the following SCRUM activities: *

	1	2	3	4	5	6
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Risk Monitoring and Control

Indicate the degree of application of the Risk Monitoring and Control process in the following SCRUM activities: *

	1	2	3	4	5	6
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Submit

Mapping risk management practices for Scrum methodology

Caro/a participante,

Este questionário de pesquisa é realizado como parte da compilação de dados para a Dissertação de Mestrado em Gestão de Projetos, ministrada na Escola Superior de Tecnologia e Gestão do Instituto Politécnico do Porto, pelo aluno Francisco Sá, sobre orientação do Professor José Ângelo Pinto e coorientação do Professor Eduardo Espinheira.

Objetivo: Este estudo pretende identificar e mapear as práticas de gestão de riscos em metodologias Ágeis, com foco específico no Scrum. Esta pesquisa irá comparar as práticas de gestão de riscos que são utilizadas nas metodologias tradicionais de gestão de projetos, como as que são baseadas na Framework “Guia PMBOK®” do Project Management Institute, com as práticas específicas preconizadas na framework Scrum. Complementarmente, este estudo irá procurar compilar informações sobre os métodos mais comumente utilizados no desenvolvimento de software no que respeita à gestão do risco.

Confidencialidade e potenciais riscos: A confidencialidade dos dados compilados neste questionário está garantida, sendo os mesmos utilizados apenas para efeitos académicos e sem nunca se revelarem casos individuais. Este estudo não envolve, para os participantes, nenhum risco, seja social, legal ou financeiro.

Tratamento de dados e apresentação dos resultados: Os dados serão tratados utilizando uma ferramenta de análise estatística. A coleta e o tratamento dos dados estão em conformidade com o Regulamento (UE) n.º 679/2016, de 27 de abril (RGPD), na sua versão atual. A responsabilidade pelo tratamento das informações será exclusiva do aluno. Quaisquer esclarecimentos adicionais podem ser obtidos através do e-mail 8180139@estg.ipp.pt ou francisco.ol.sa@gmail.com.

Tempo de preenchimento: O tempo médio estimado para o preenchimento deste questionário é de 5 minutos.

O sucesso deste trabalho depende da sua participação, portanto, solicito o seu apoio e disponibilidade para indicar as suas opiniões sobre as perguntas realizadas.

Desde já agradeço a sua colaboração.

Atenciosamente,

Francisco Sá

Próximo

Nome *

Nome

Sobrenome

Idade *

- 18-25 anos
- 26-35 anos
- 36-45 anos
- 46-55 anos
- 56 anos ou mais

Nível de habilitações literária *

- Ensino Básico
- Ensino Secundário
- Licenciado
- Mestrado
- Doutoramento

Selecione a opção que melhor descreve o tamanho da sua empresa em termos de funcionários: *

- Menos de 50
- 50 a 200
- Mais de 200

Qual a função que exerce normalmente nos projetos em que está inserido? *

- Gestor de projetos
- Membro da equipa de desenvolvimento
- Responsável técnico
- Outra

Caso tenha selecionado a opção "outra" na pergunta anterior, diga qual o cargo que ocupa actualmente.

Na função mencionada na questão anterior, quantos anos de experiência tem? *

- Menos de 5 anos
- 6 a 10 anos
- Mais de 10 anos

Tem conhecimentos da framework Scrum? *

- Sim
- Não

Tem conhecimentos de Gestão de Risco? *

- Sim
- Não

Tem conhecimentos do Guia PMBOK®? *

- Sim
- Não

Voltar

Próximo

Metodologias Ágeis

Para as perguntas deste setor considere a seguinte escala:

1. Desconhecimento Total: Sem qualquer conhecimento prévio sobre o assunto.
2. Conhecimento Inicial: Compreensão básica ou superficial, incluindo conceitos simples ou informações gerais.
3. Conhece os principais conceitos: Nível intermediário de conhecimento que permite uma compreensão razoável, embora ainda não suficiente para uma aplicação eficaz.
4. Aplica os principais conceitos: Capacidade de aplicar o conhecimento em situações simples e do cotidiano.
5. Especialização: Habilidade de aplicar o conhecimento em contextos complexos e desafiadores.
6. Mestre no Assunto: Amplo domínio do assunto, com a capacidade de aplicá-lo em situações altamente complexas e especializadas.

Indique o grau de conhecimento que possui relativamente aos seguintes modelos de metodologias ágeis: *

	Desconhecimento	Iniciante	Conhece os principais conceitos	Aplica os principais conceitos	Especializado	Mestre
Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
XP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TDD	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DSDM	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kanban	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DAD	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Gestão de Risco

Considerando a segmentação da gestão de riscos em seis componentes específicos – Identificação de Riscos, Planeamento de Gestão de Risco, Análise de Riscos Qualitativos, Análise de Riscos Quantitativos, Plano e Implementação de Resposta aos Riscos, Controlo e Monitorização dos Riscos –, solicito que avalie a sua proficiência em cada um desses tópicos.

*

	Desconhecimento	Iniciante	Conhece os principais conceitos	Aplica os principais conceitos	Especializado	Mestre
Planeamento	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identificação de Riscos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Análise Qualitativa dos Riscos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Análise Quantitativa dos Riscos	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plano e Implementação de Respostas ao Risco	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Controlo e Monitorização	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Quão importante é a Gestão de Riscos Explícita na utilização da framework Scrum? *

1 2 3 4 5 6

Quão importante é a Gestão de Riscos Tácita na utilização da framework Scrum? *

1 2 3 4 5 6

Quão importante é a Gestão de Riscos definida e discriminada no Guia PMBOK® para projetos que adotem a framework Scrum?? *

1 2 3 4 5 6

Das opções seguintes, quais as ferramentas de gestão de projetos que permitem fazer a gestão dos riscos de projetos de software? *

- Conhecimento Especializado/ Expert judgment
- Habilidades interpessoais e de trabalho em equipe/ Interpersonal and team skills
- Reuniões/ Meetings
- Lista de riscos/ Prompt list
- Análise de sensibilidade / Sensitivity Analysis
- Recolha de dados/ Data gathering
- Análise de dados/ Data analysis
- Representação de dados/ Data representation
- Categorização de riscos/ Risk categorization
- Representação de incertezas/ Representations of uncertainty
- Estratégia para ameaças/ Strategies for threats
- Estratégias para oportunidades/ Strategies for opportunities
- Estratégia para riscos gerais/ Strategies for overall project risk
- Estratégia de resposta contingente/ Contingent response strategies
- Tomada de decisão/ Decision making
- Sistema de informação/ Project management information system
- Auditorias/ Audits
- Análise de causa-raiz / Root Cause Analysis
- Outros

Voltar

Próximo

Scrum

Identificação de Riscos/ Identify Risks

Indique a grau de aplicação do processo de Identificação de Riscos (Identify Risks) nas seguintes atividades Scrum: *

	Não Aplicável	Pouco Aplicável	Aplicação Limitada	Moderadamente Aplicável	Aplicável	Totalmente Aplicável
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Planeamento de Gestão de Risco/ Risk Management Planning

Indique a grau de aplicação do processo de Planeamento de Gestão de Risco (Risk Management Planning) nas seguintes atividades Scrum: *

	Não Aplicável	Pouco Aplicável	Aplicação Limitada	Moderadamente Aplicável	Aplicável	Totalmente Aplicável
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Análise de Riscos Qualitativos (Perform Qualitative Risk Analysis)

Indique a grau de aplicação do processo de Análise de Riscos Qualitativos (Perform Qualitative Risk Analysis) nas seguintes atividades Scrum: *

	Não Aplicável	Pouco Aplicável	Aplicação Limitada	Moderadamente Aplicável	Aplicável	Totalmente Aplicável
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Análise de Risco Quantitativos (Perform Quantitative Risk Analysis)

Indique a grau de aplicação do processo de Análise de Risco Quantitativos (Perform Quantitative Risk Analysis) nas seguintes atividades Scrum: *

	Não Aplicável	Pouco Aplicável	Aplicação Limitada	Moderadamente Aplicável	Aplicável	Totalmente Aplicável
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Plano e Implementação de Resposta aos Riscos (Plan and Implement Risk Responses)

Indique a grau de aplicação do processo de Plano de Resposta aos Riscos (Plan Risk Responses) nas seguintes atividades Scrum: *

	Não Aplicável	Pouco Aplicável	Aplicação Limitada	Moderadamente Aplicável	Aplicável	Totalmente Aplicável
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Monitorização e Controlo/ Monitor and Control

Indique a grau de aplicação do processo de Monitorização e Controlo (Monitor and Control) nas seguintes atividades Scrum: *

	Não Aplicável	Pouco Aplicável	Aplicação Limitada	Moderadamente Aplicável	Aplicável	Totalmente Aplicável
Product Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Backlog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Daily Scrum	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sprint Retrospective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Voltar

Enviar