The benefits of agile risk management in IT projects delivered through agile methodology

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ABSTRACT

Digital transformation and external digital disruption require South African financial services to deliver large IT software projects. Banks adopted new ways of working such as using an agile methodology to ensure IT Projects are delivered faster-to-market and early client involvement. The challenge is that risk management functions are not mandatorily involved before and during the execution of IT projects by the Scrum teams who deliver these IT projects, which means that other sources of risk and opportunity risks may not be identified early. This study investigated the role of agile risk management in the execution of IT projects with the aim of identifying the benefits of agile risk management. The study used a qualitative approach and collected data through semi-structured interviews. Findings suggest that adopting an agile risk management process leads to IT projects that are delivered quicker to market and that risks are well managed.

KEYWORDS

Agile Methodology, Agile Risk Management, Traditional Risk Management, IT Projects.

DECLARATION

I, Wandile Mazula, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Wandile Mazula Signature: W. Mazula

Signed at …Brakpan

On the 27 day of February 2022

DEDICATION

This research report is dedicated to my family and those who helped me during this study, in gratitude for their understanding, support and encouragement. This research would not have been possible without my family, friends, colleagues, fellow students (IGIKAI) and supervisor's prayers and words of wisdom to hang on to. I feel blessed and highly favoured.

This report is dedicated specifically to my wife, Vela, and my girls, Simthandile, Amahle and Zintle, for their patience with me in the last two years of my studies.

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My thanks go to God Almighty for His protection during the one-in-a-100-year event we have experienced in our lifetime with the Covid-19 pandemic. There are several people without whom this research report might not have been completed, and to whom I am grateful. This study would not have been possible without my employer, to whom I am appreciative for paying my academic fees and allowing me the time I needed to complete my studies. To my line manager and human resource employee-development manager, I thank you for your approval of and support for the essential part of the research of data collection. My thanks also go to my colleagues who participated in the interviews as respondents during the critical stage of my research and to those who went the extra mile by sharing your wisdom and additional resources such as white papers and conference papers applicable to the agile risk management approach.

A big thank you goes to my friends and fellow students who encouraged me not to give up when it seemed to be the easy option. I offer my gratitude and appreciation to my supervisor, Dr Manessah Alagbaoso. Your professionalism and prompt response and passion for research are truly encouraging. Our WhatsApp calls and discussions, which resulted in crystal clear guidance and encouragement, were most constructive and invaluable throughout this research.

To my wife and children, I am thankful to you for sacrificing our time as a family in support of my individual advancement.

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CHAPTER 1. INTRODUCTION

Digital transformation is a reality for all companies, irrespective of the industry, with digital technology impacting all companies directly or indirectly. Among the top banks in South Africa, Nedbank Group Limited (2020) recognises that the new ways of working require an agile business with a flat structure and distributed decision making. Similarly, Absa Group Limited (2020) sees the need to respond to external and internal factors on strategic progress by using agile methods. The Standard bank board aim to be digital and agile (Standard Bank, 2022). The FirstRand uses the agile approach in the audit plan on a quarterly basis (FirstRand, 2022). South African financial services companies achieve digital strategic objectives by delivering large Information Technology (IT) projects using agile methodologies. The large scale of these projects suggests that these companies must consider the risks involved in their IT projects.

1.1 Purpose of the study

This qualitative study investigates the role of agile risk management in the execution of IT software projects delivered using an agile methodology to identify the benefits of agile risk management.

1.2 Background of the study

The updated Basel Framework issued by the Bank for International Settlement (2021) recommends that banks should use an inclusive risk management process to identify, assess, monitor, report, and control or mitigate all material risks on a timely basis. Over 100 countries have adopted the Basel Framework (Hohl et al., 2018), including South Africa.

The South African Reserve Bank (2012) requires every South African bank to have in place comprehensive risk management processes, systems, procedures and policies approved by the board to identify, assess and appropriately price, treat, communicate and report all risks. Furthermore, banks need to ensure proper controls and continued compliance with the South African Regulations relating to Banks' requirements, when delivering IT projects using an agile method.

Digital transformation and external digital disruption have meant that South African financial services tend to deliver large IT software projects. For example, according to Absa Group Limited (2020), IT spend in the year 2020 was R4,1bn (2019: R3,7bn), while for the Nedbank Group Limited (2020), investment in the technology platform from 2010 to 2020 was R11,4bn (2019: R9,6bn). Other large financial services institutions in South Africa are assumed to have similar spending patterns regarding technology upgrades.

Digital transformation triggers strategies that change the organisation's approach to clients and products, such as making it more client-centric and encouraging it to migrate from a product view to client segments. According to Standard Bank Group (2020), 2021 reporting will be based on client segments (Consumer & High Net Worth; Business & Commercial; and Wholesale), each equally supported by the bank's Client Solutions business.

The Bank for International Settlement (2021) requires banks to establish clear roles and responsibilities between business and IT functions in partnership with risk managers to ensure adequate controls of the technology infrastructure. Considering this requirement, this study investigated three aspects of risk management: first, the role of risk management before and during the execution of IT projects; second, whether the involvement of risk management will enhance early risk identification; and, finally, the benefits of using an agile risk management process.

1.3 Research problem

Embracing an agile methodology requires that agile cross-functional teams, including subject matter experts such as risk managers, need to deliver IT projects through agile capabilities and mindsets using new ways of working and dynamic decision making. This is in contrast to the traditional risk management process, which relies on organising problem-solving in a process-centric and committee-driven chain. In addition, the compliance requirements in the

Regulations relating to Banks expect that all relevant risk management, control and accountable lines appropriately review and assess proposed new IT systems to ensure their independence (South African Reserve Bank, 2012).

Moran (2014) recognises that the Scrum team (products owner, scrum master, developers and technical team) refers to risk management in dealing with projects. However, risk treatment is not explicit, leading to an inability to make informed risk decisions and a poor understanding of when to engage risk management processes.

According to the traditional risk management process that is currently largely used, risk management functions are not mandatory before and during the execution of IT projects by the Scrum team. This means that other sources of risks apart from project risks may not be identified early. To counter this problem, the use of an agile risk management process instead of the current traditional process would enhance early risk identification to mitigate project risks and other sources of risk. The role and responsibility of risk managers involved in IT projects could also be identified in terms of an agile risk management approach.

The Institute of Internal Auditors Australia (IIAA) issued an agile risk management whitepaper in November 2021 (The Institute of Internal Auditors - Australia (IIAA), 2021). Table 1: in which it compares the traditional risk management and agile risk management characteristics. These are summarised in Table 1 below.

Table 1: Traditional risk management versus agile risk management characteristics

Traditional Risk Management	Agile Risk Management
Large risk frameworks and documents – These are policies, frameworks, procedures, guidelines, risk matrix, risk register.	A nimble risk management response and approach to the changing dynamics in the organisation's risk management landscape to provide a timely risk management service.
Risk management jargon – Risk culture, risk universe, risk appetite, inherent risk, residual risk.	Leveraging agile project management techniques such as sprints to split the risk management services into management activities, enable risk management practitioners and stakeholders to collaborate and work together to stay timely and quickly update the risk management focus.
Monotonous risk workshops are time-consuming.	
Challenges for the first line of defence or business executives to identify inherent risks – Risks without considering controls.	
Internal Control environment assessment not done well, if done at all.	Engaging – Risk manager actively engaging with all stakeholders to manage their risks.
The identified mitigating controls to reduce residual risk are not easily measured and, therefore, difficult to manage.	Collaboration – Manage risks through a team effort between 1st line business activities and 2nd line risk management.
Strategic and operational risks mixed.	Dynamic – Recognise there is constant change in the organisation and risk management needs to be continually re-evaluated in the risk environment.
Period risk reporting and rating never change over time.	Timely – Risk reports contain the latest up-to-the-minute risk situation.

Lengthy and complex spreadsheet reports that cannot be read easily.	
The inability of risk practitioners to articulate to stakeholders – what is the value to them by applying risk management.	Adaptable – Rapid adjustment to new risk environment conditions as they emerge.

Source: Modified from Institute of Internal Auditors Australia (IIAA) – agile risk management white paper in Nov 2021.

In recent years the use of an agile methodology has become widespread and over the past 14 years, Digital.ai has conducted an annual survey about how and why businesses use this methodology. The 14th annual State of Agile survey was completed in 2020 by more than 40,000 agile executives, practitioners, and consultants. Of the companies surveyed, 95% had adopted agile development methods, and 37% of the respondents indicated that their reason for adopting an agile methodology was to reduce project risk. Furthermore, 34% of respondents stated that technical risk identification and measurement before deployment were valuable (Digital.ai Software, 2020). The most identified benefits of implementing an agile methodology were the ability to manage changing priorities (70%) and reduce project risk (51%) (Digital.ai Software, 2020).

Figure 1 below presents the benefits of Agile according to Digital.ai Software (2020).

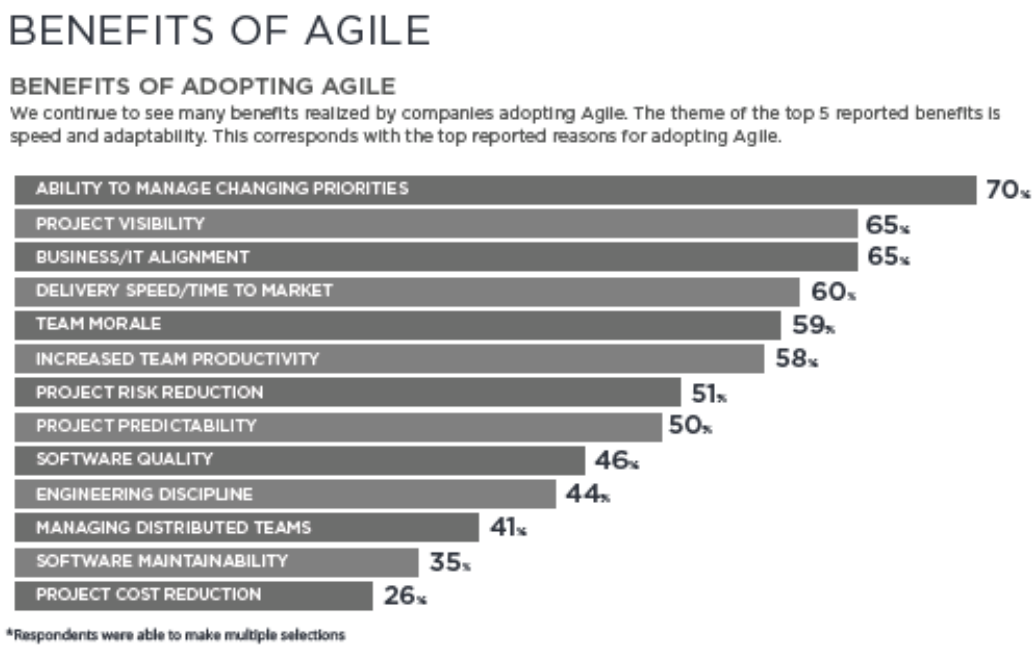


Figure 1: Benefits of Agile (Digital.ai Software, 2020)

1.4 Research objectives

The research objectives of this study are:

a) To identify the role and involvement of risk management in executing IT projects through an agile methodology.

b) To explore the tools, techniques and methods to enhance early risk identification to result in opportunities when delivering IT projects.

c) To investigate the benefits of an agile risk management process in IT projects delivered using an agile methodology.

1.5 Significance of the study

The study contributes to research and practice regarding risk management in IT projects in a number of ways. An extensive review of literature regarding risk management in an IT project involving an agile methodology was undertaken.

Initially software process models used to execute IT software projects were investigated. The objectives of a software process model are to establish an order of the software development stages and evolution to determine iteration criteria for migrating from one step to the next in carrying out a project (Boehm, 1988). Thus, the process of deploying an IT project is called the Software Development Life Cycle (SDLC), which is made up of the different phases of planning, requirements, design, development, testing, deployment and maintenance (Hijazi et al., 2012). There are several SDLC models (risk-driven Spiral Model, agile software development, DevOps methodology, waterfall model, prototype methodology and V-Model) that use different methodologies to deliver IT projects, in deciding which model to use depends on how risky the IT project is and the degree to which each methodology supports risk management (Hijazi et al., 2012).

The current literature reviewed has the following topics:

- Identifying risks in different IT software frameworks (Hijazi et al., 2012);

- Understanding the risk factors, risk management techniques and risk mapping in an organisational context so that industry practitioners can make effective decisions (Shrivastava & Rathod, 2015);
- Creating a Distribution Agile Development (DAD) risk management framework that includes high-impact risk factors on DAD projects (Shrivastava & Rathod, 2017);
- Using software agents' tools to perform risk identification, assessment and monitoring by utilising the data collected from the project environment (Odzaly et al., 2017);
- Using a risk register or risk matrix during Scrum (Buganová & Šimíčková, 2019); and
- Using identified risks in a project as an opportunity (Denney, 2020).

The literature lacks explicit guidance on the involvement of risk management functions before and during the execution of IT projects using an agile methodology. It was also difficult to determine the benefits of involving risk management functions using an agile risk management process in the South African financial services sector. This study contributes to the research in this field by investigating these factors.

The following stakeholders are expected to benefit from this report. Firstly, risk managers will understand their role and responsibility as part of the IT project Scrum team. Secondly, the product owner, Scrum master, developers and other technical team members in the Scrum team will benefit from the knowledge of

who is responsible for identifying, assessing, managing, monitoring and reporting on risks. Finally, the whole financial organisation will benefit from the early identification and mitigation of risks before they materialise, and the IT project being developed will go to market faster.

1.6 Delimitations of the study

There are several IT software agile development methodologies available, such as the Scrum Framework, Kanban, Lean product development, , Dynamic systems development method (DSDM), Crystal methodology and Adaptive Software Development (ASD).

According to Digital. Ai's 14th annual State of Agile report, the most used agile methodology is the Scrum methodology (58%) (Digital.ai Software, 2020). For this reason, this study focuses on the involvement of risk management functions in executing IT projects using the Scrum Framework as agile methodology and explores the management of risk using an agile risk management process. The study is conducted in the financial services environment in South Africa, focusing on the banking industry in particular, with other financial services sectors such as insurance, wealth management and professional advisory not covered in the study.

Furthermore, the focus is on the use of the agile risk management process in IT projects as the agile risk management processes in normal risk management activities is not considered in this study.

1.7 Definition of terms

The study uses the following key terms as defined below.

Agile methodology: According to Hijazi et al. (2012), the agile method was first introduced in 2001 and refers to a group of lightweight software development methodologies that de-emphasise a formal process step and in which development proceeds without standard requirements and design specifications.

Agile risk management: The IIA of Australia defines agile risk management as adopting new ways of working for risk managers to encourage stakeholder engagement and collaboration using dynamic methods (The Institute of Internal Auditors - Australia (IIAA), 2021).

Project Risk: The Project Management Institute describes project risk as uncertain events or conditions that, if they occur, have a positive or negative effect on at least one project objective, such as time, cost, scope or quality (Shrivastava & Rathod, 2015). This study uses this project risk definition as it is aligned to the definition of general risk as the effect of uncertainty on objectives.

Risk management: Risk management has taken place when the effect of risk has deviated from what was expected. This deviated effect can be positive, negative or both when risk is addressed and can create or result in opportunities or threats (The Institute of Internal Auditors - Australia (IIAA), 2021).

Risk manager: For this study, a risk manager is defined as an independent individual responsible for providing guidance, advice and oversight concerning the risk and controls put in place by the business and IT functions when

developing large IT projects. Risk managers also include compliance officers responsible for assisting business and IT functions to identify compliance risk.

Traditional risk management: This style of risk management is established from the risk management common body of knowledge utilising traditional methods. Traditional risk management is considered to be over-engineered, slow to react and not dynamic (The Institute of Internal Auditors - Australia (IIAA), 2021).

Scrum team – The Scrum team roles are scrum master, a product owner and developers, typically ten or fewer people. The Scrum team is multifunctional, does not rely on anyone outside the team and focuses on one objective, which is the product goal or vision (Schwaber & Sutherland, 2020).

1.8 Assumptions

The study made the assumption that risk managers have sufficient understanding of an agile Scrum Framework. However, as not all organisations involve risk managers early in IT solution development, for any risk managers that did not understand the agile framework, an explanation was provided at the start of the interview. It was also assumed that the Scrum team would understand the agile risk management process. However, if there were gaps in the understanding of the agile risk management by the Scrum team, these were explained during the interview process.

1.9 Chapter outline and structure of the report

This chapter is divided into eight sections that deal with the purpose and background of the research; the problem statement; the research objectives; and the significance of the study. This is followed by an outline of the delimitations of the study and the definitions of the key terms used in the report. Finally, the eighth section indicates the assumptions made by the study. The rest of this report is divided into the following five chapters:

Chapter 2: This chapter presents a review of literature related to the key terms and concepts of the study: agile methodology (agile Scrum Framework), agile risk management and its benefits, traditional risk management, IT projects and project risks. At the end of each section of the literature review, a proposition is presented as a possible answer to the research objectives posed in Chapter 1.

Chapter 3: This is the research methodology chapter. The chapter presents the research approach and design along with the data-collection and analysis methods. The chapter describes the population and the demographic profile of the sample chosen. Finally the transferability, credibility and dependability of the study and the ethical standards it subscribes to are discussed.

Chapter 4: In this chapter the study findings are presented and aligned to the propositions included in Chapter 2 to answer the research objectives set out in Chapter 1.

Chapter 5: This chapter discusses and explains the findings.

Chapter 6: This is the conclusions and recommendations chapter. In this chapter each research objective is addressed in turn and the study findings integrated with the propositions developed from the literature related to the research objectives. From the conclusions reached, recommendations are made for relevant role players and for future research.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of available literature on the benefits of involving risk managers and risk management processes in the execution of IT projects delivered through the agile method. The review of the literature identified the role and involvement of risk managers and the tools, techniques and methods that can enhance early risk identification. Through the literature review, various themes emerged, which formed the basis for choosing a reasonable theoretical foundation for the research and the questions used for the data-collection interviews.

The chapter begins by outlining the theoretical and organising framework that guided the study. The rest of the chapter is divided according to the three study objectives set out in Chapter 1. The chapter discusses the role of risk management in executing IT projects through an agile methodology and whether the use of risk management tools, techniques and methods before and during the execution of IT projects has the potential to enhance early risk identification. Finally, the benefits of an agile risk management process are debated for projects delivered using an agile methodology.

2.2 Theoretical and organising frameworks

2.2.1 Theoretical framework

The cultural theory was chosen as the most appropriate theory for guiding this study. The purpose of cultural theory is to “explain how people perceive and act upon the world around them”, with the theory suggesting that people’s perceptions and actions are decided by social factors and adherence to particular cultures and cultural values (Oltedal et al., 2004). Moran (2014) states that cultural theory is useful “where scientific rationalism proves insufficient for the assessment of risk assumptions, inference, and beliefs that guide us” and that “risk should be understood as a cultural construct that admits knowledge”.

Tansey and O'Riordan (1999) propose that cultural theory can contribute to the development of knowledge and understanding in the debate about risk. Cultural theory considers perceptions of risk in the form of four quadrants that present particular types of behaviours. These quadrants are distinguished by grid (belief in the importance of rules) and group (belief in the importance of being part of a group). Organisations can use the four types of behaviours as set out in these quadrants to classify individuals.

Cultural theory was used as the conceptual foundation for this research, where the four quadrants represent the involvement of risk management in an IT project using the grid and group typology.

The quadrants are defined as follows:

a) Individualists (low group with low grid) see risk as an opportunity.
b) Egalitarians (high group and low grid) prefer collective decision making.
c) Hierarchists (high group and high grid) see the individual role as clearly defined.
d) Isolates (low group and high grid) excersise self-control and no control over others.

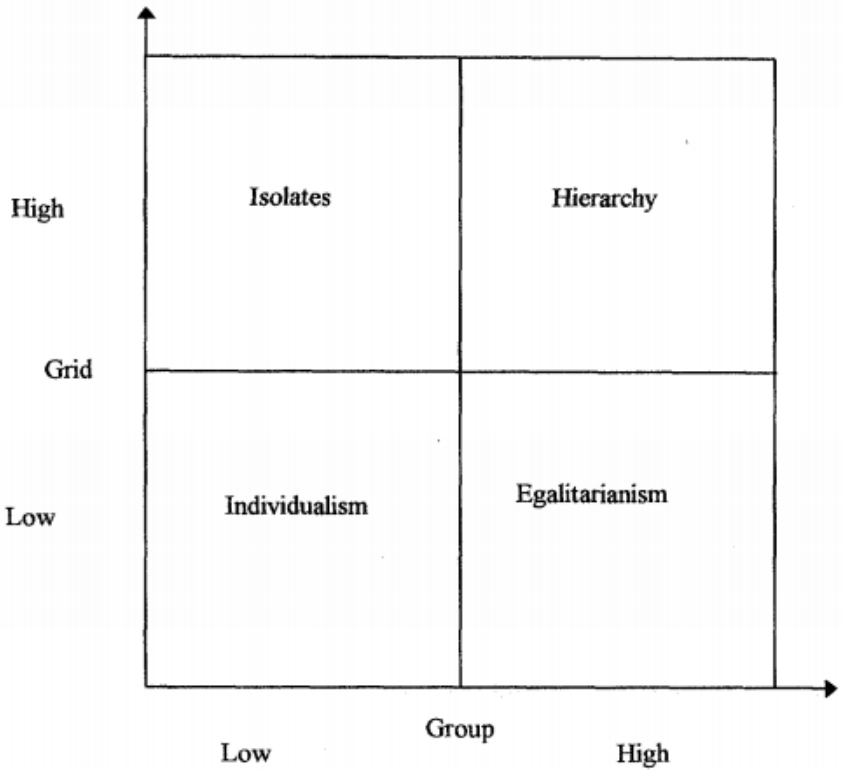


Figure 2: Cultural theory grid/group dimensions (Tansey & O'Riordan, 1999)

Cultural theory assumptions concerning the group and grid axes typology are that with group, the strength is considered to be with an individual incorporated into a group. In this study, the risk manager included in the Scrum team and forming part of the Scrum team was explored. The grid axis is the extent of an individual's

concern about rules with or without a group (Tansey & O'Riordan, 1999). The involvement of the risk manager within an IT project Scrum team and the extent to which a risk manager should be involved with the Scrum team was discussed as part of the interviews used to collect data for the study.

Interpreting the attitude to risk shown in each of the four quadrants, first, *individualists*, who are low group and low grid, fear that others will control their freedom and tend to see risk as an opportunity (Oltedal et al., 2004). Second, *egalitarians*, who are high group but low grid, prefer collective decision making and tend to be skeptical of experts (Tansey & O'Riordan, 1999). Third, *hierarchists*, who are both high group and high grid, prefer an environment where the individual role is clearly defined compared to other group members. Hierarchists respect hierarchical relationships and the technical risk management style and are consequently aligned with traditional risk management (Moran, 2014). Finally, *isolates* who are high grid and low group, are usually indifferent to risk (Oltedal et al., 2004).

The agile Scrum Framework is based on teamwork among subject matter experts (SME) with a high group focus owing to the need for continuous communication and feedback in delivering IT projects. The risk manager's role within the Scrum team could fall within any of the four quadrants. This study used the cultural theory as a guide in identifying the benefits of involving a risk manager when executing IT projects through the agile method.

2.2.2 Organising framework

As shown in Figure 3 below, the researcher developed a framework that organised the study's key concepts regarding the role of risk managers and tools for enhancing early risk identification to demonstrate the benefits of involving the risk management function in IT projects.

This framework organises the study approach by integrating the qualitative method, which was derived from the cultural theory, and how the literature review outcomes affect the research objectives.

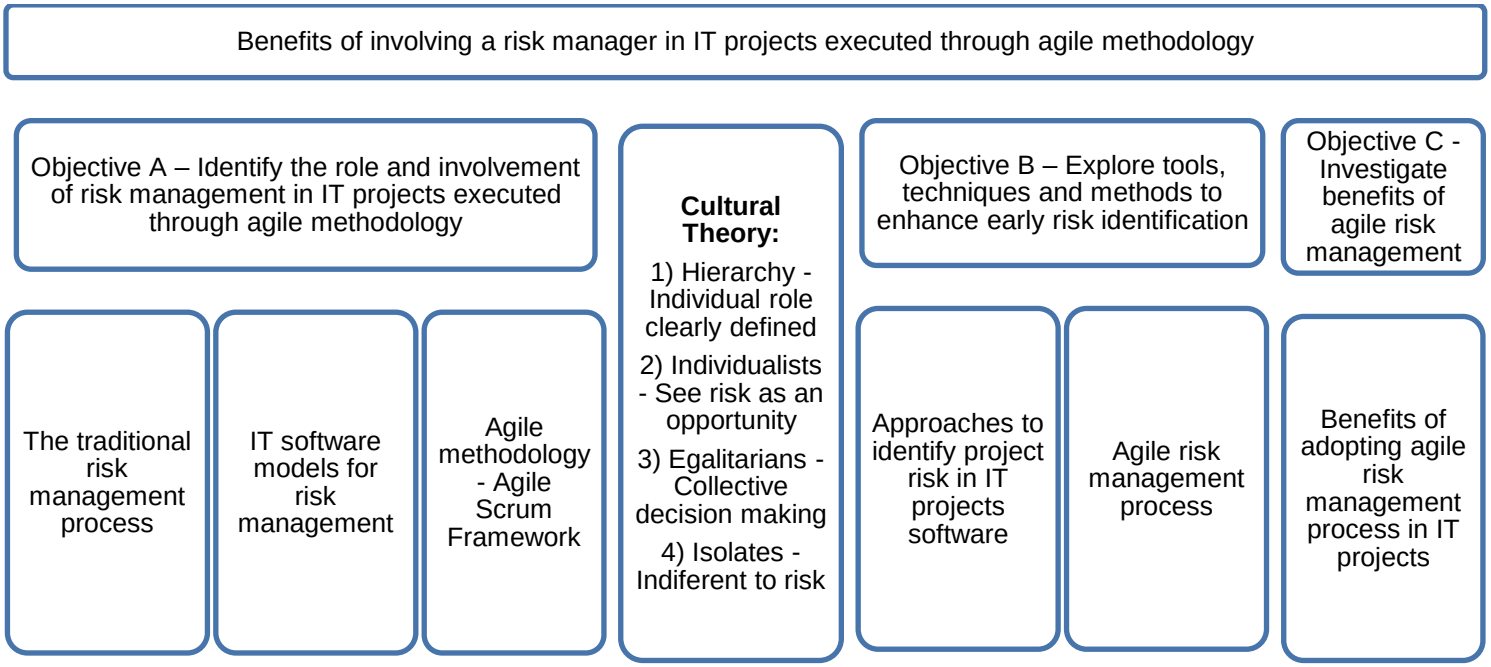


Figure 3: Organising Framework

2.3 Literature review to identify the role and involvement of risk management in executing IT projects through an agile methodology

This section presents an evaluation of the literature related to the traditional risk management process, IT software models that support risk management and the agile methodology Scrum Framework.

2.3.1 The traditional risk management process

According to Tursoy (2018), the definition of traditional risk management in banking is “the logical development and execution of a plan to deal with potential losses,” and risk management is considered a critical process in software development (Odzaly et al., 2017).

A risk manager should have knowledge and understanding of the following international standards, which are a foundation for understanding traditional risk management, specifically in the context of IT projects.

ISO/IEC Guide 73:2009 Risk Management – This standard defines common risk management terms to promote consistent understanding of and approach to risk management activities (International Organisation for Standardisation, 2009). This standard should be used to ensure consistent and unified use of the risk management process and framework.

IEC 62198:2013 Managing Risk in Project – Application Guidelines. Post the development of a common risk language to create standardisation using ISO 73:2009, it is advisable for anyone involved in managing risk to understand the principles and guidelines for managing risk and uncertainty in projects (International Organisation for Standardisation, 2013). This guideline empowers risk managers to manage risk and uncertainty in projects.

ISO 31000:2018 Risk Management – Principles and Guidelines. “The aim of this guideline is to create and protect value in organisations by managing risks, making decisions, setting and achieving objectives, and improving performance” (International Organisation for Standardisation, 2018). This guideline is used to identify other sources of risk and provides the principles of risk management.

ISO/IEC 16085:2021 Systems and Software Engineering – Life Cycle Processes – Risk Management. This standard integrates various processes, practices, techniques and tools used in systems and software engineering projects and other life-cycle activities (International Organisation for Standardisation, 2021). This standard is a good base for risk managers involved in IT projects as it integrates several tools, techniques and methods for risk management.

The convergence of traditional risk management processes could be described as involving the following stages.

Scope, context and criteria – A Scrum team manages project risk within the area and context of risk culture, risk appetite and risk tolerance (Moran, 2014). As the Scrum team does not have a mandatory requirement to include a risk manager, there is a need to establish the role of risk management when included as part of the Scrum team.

Risk identification – Risk identification is the first operational stage of the risk management process, and risks identified at this stage are recorded in a risk register. Risk identification is a critical stage as it allows a risk manager to identify any risks that could hinder the project from achieving its objectives (Machado, 2012). This is the stage in which the risk manager becomes involved in risk management during the traditional risk management process. Hence, there is a need to enquire whether the traditional risk management process is adequate for projects that use an agile methodology.

Risk assessment – Risk assessment is performed using subjective analysis or expert judgement to manage project risk (Kumar & Yadav, 2015). Moran (2014) identifies four techniques for risk assessment: expert opinion (obtained from those who are knowledgeable); data diving (reliance on data to assess impact and frequency); stochastic (use of statistical model); and cultural methods (reliance on subjective assessment of nature and likelihood) (Moran, 2014). Risk assessment is followed by risk analysis, which uses a matrix featuring probability

and impact to select the risk treatment approach (Seyedhoseini et al., 2009). The literature consulted did not clearly articulate who is responsible for performing a risk assessment.

Risk treatment – Post risk assessment, there are six options for consideration in choosing a risk-treatment strategy, according to Moran (2014). The first option is to accept the risk (no action required for low-risk exposure). The second is to reduce the risk by modifying the likelihood or impact of the event occurring. The third would be to exploit the risk (increase the frequency or impact of the medium- or high-risk events). Fourth, share the risk and rewards (for low-frequency and high-impact positive risk). Fifth, transfer the risk (a low-frequency and high-impact risk event can be transferred by taking insurance). Finally, avoid the risk (where the risk has a high probability and high likelihood, resulting in an adverse risk event) (Moran, 2014). Moran (2014) does not clearly articulate the role of a risk manager, but this manager would generally be understood to advise the business and technical experts on the best strategy for treating the risks they encounter.

Monitoring and review – Risk monitoring involves using key risk indicators to measure the likelihood of risks exceeding the tolerance set during the context stage and to track and monitor the project's risk profile (Moran, 2014). No gap in terms of monitoring and reviewing the risks identified as a risk manager was specifically mentioned in any of the literature reviewed.

Recording and reporting – The tasks performed by the risk manager are to communicate and improve activities to manage the risk outcomes, make a

decision with the information they acquire, and assist in the interaction with stakeholders, including taking responsibility and accountability for risk management activities.

2.3.2 IT software model supporting risk management

In 2012, Hijazi et al. conducted a systematic literature review of risk management in different software development methodologies. A software development methodology is an approach that describes steps to develop IT software. There are various types of software development methodology, such assequential (i.e., waterfall) or iterative (i.e., evolutionary); specification-driven (i.e., waterfall); code-driven (i.e. evolutionary); risk-driven (i.e. spiral); and conventional (i.e. traditional waterfall) or agile (i.e. Scrum). The difference between these methodologies concerns the time taken to release, quality and risk management (Hijazi et al., 2012) .

The Spiral Model, which is a risk-driven model, was developed by Boehm in 1988 (Figure 4). This model has four phases as follows and includes risk management:

a) Set objectives – Determine objectives of IT projects
b) Evaluate options, identify and resolve the risk – Identify areas of uncertainty
c) Develop and verify next-level IT software – Determine residual risk
d) Plan the subsequent phases – Minimise the residual risk

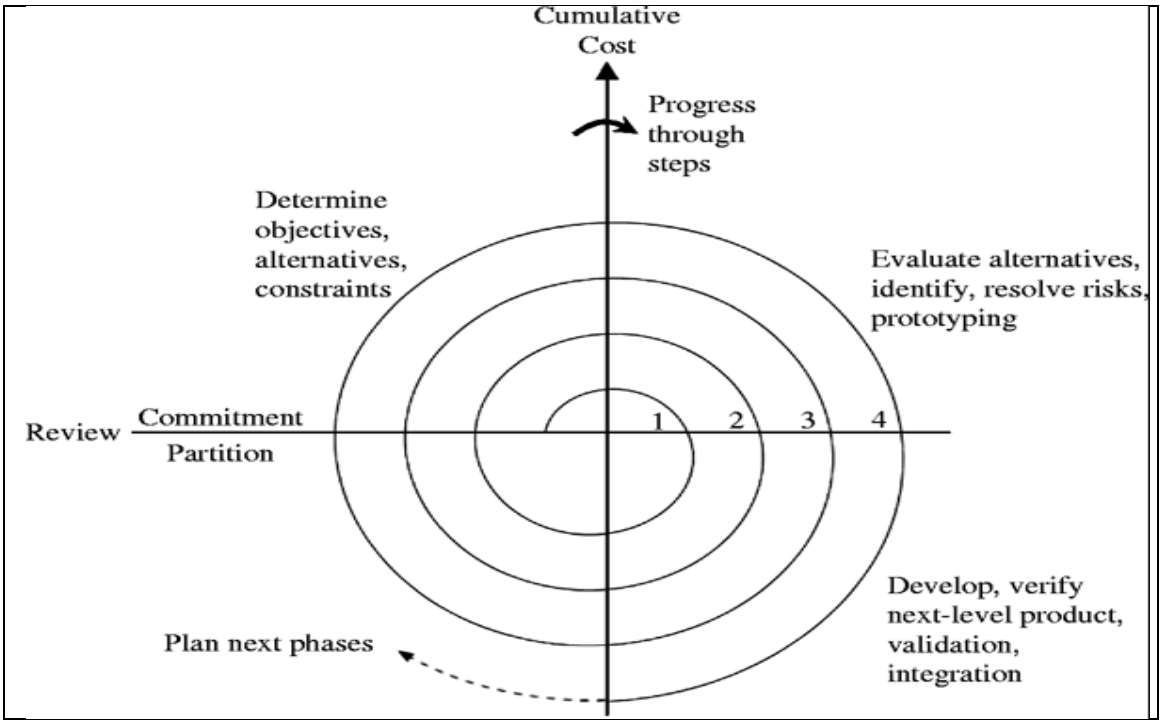


Figure 4: Spiral Model software development by Barry W. Boehm (1988)

This model provides a framework for guiding the software process and supporting risk with four phases:

- **Set objectives** – In this phase, the objectives of the IT software to be developed (e.g., performance and functionality) are determined, with the alternative ways to implement the objectives and the constraints posed by these ways (e.g., cost and schedule) identified (Boehm, 1988). As, the Spiral Model is a waterfall model, it needs to be adapted to be used dynamically by risk managers involved in IT projects executed using the agile methodology.
- **Evaluate options, identify and resolve the risk** – This phase is used to identify the areas of uncertainty with a high probability of a risk event and the likelihood of project risks materialising. As part of this phase risk treatment

strategies are developed to mitigate the project risks. Strategies include, for example, prototypes, simulations, user questionnaires and analytics modelling (Boehm, 1988). The risk manager could use this risk treatment technique as part of the Scrum team. The frequency that the technique is used will increase as risks are identified continuously during the agile approach.

- **Develop and verify next-level IT software** – This phase will determine the residual risk that remains post the risk treatment strategies. At this point, a plan for prototyping the product to reduce the critical risks is developed (Boehm, 1988).
- **Plan the subsequent phases** – This phase is implemented to minimise the residual risks if the prototype is developed (Boehm, 1988).

Each phase of the model is tested to rectify errors or mistakes before the development team moves to the next step. The Spiral Model techniques operate well in waterfall or traditional risk management approaches as risk managers can rely on the governance processes incorporated in these approaches. However, in agile projects, decisions need to be made frequently. This means that risk managers should have the mandate and power to make decisions as and when required.

2.3.3 Agile methodology – Agile Scrum Framework and risk management

In this section, the Scrum Framework is reviewed to establish expectations concerning the involvement of risk management within the framework.

Schwaber and Sutherland's 2020 *Scrum Guide* defines Scrum as "a lightweight framework to help people, teams, and organisations generate value through adaptive solutions for complex problems" (Schwaber & Sutherland, 2020, p.3).

The Scrum Framework has the following components:

- **Scrum theory** – Scrum is based on an iterative process and uses an incremental approach to maximise predictability and mitigate risks. The Scrum theory works well when the Scrum events implement and integrate the Scrum pillars of transparency, inspection and adaption into the events (Schwaber & Sutherland, 2020). The Scrum theory considers risk treatment in its process; however, it does not specifically describe the role or involvement of the risk manager.
- **Scrum values** – The Scrum team, to be successful, is expected to commit itself to the five values of commitment, focus, openness, respect and courage (Schwaber & Sutherland, 2020). The Scrum values are aligned with what is expected from a risk manager.
- **Scrum team** – The Scrum team roles are scrum master, a product owner and developers, typically ten or fewer people. The Scrum team is multifunctional, does not rely on anyone outside the team and focuses on one objective, which is the product goal or vision (Schwaber & Sutherland, 2020). The Scrum master leads the development team (group of technical and qualified members) and must create an environment in which the Scrum team can achieve the vision and goal of the project. Finally, the product owner formulates the project plan, by dividing the work according to the product

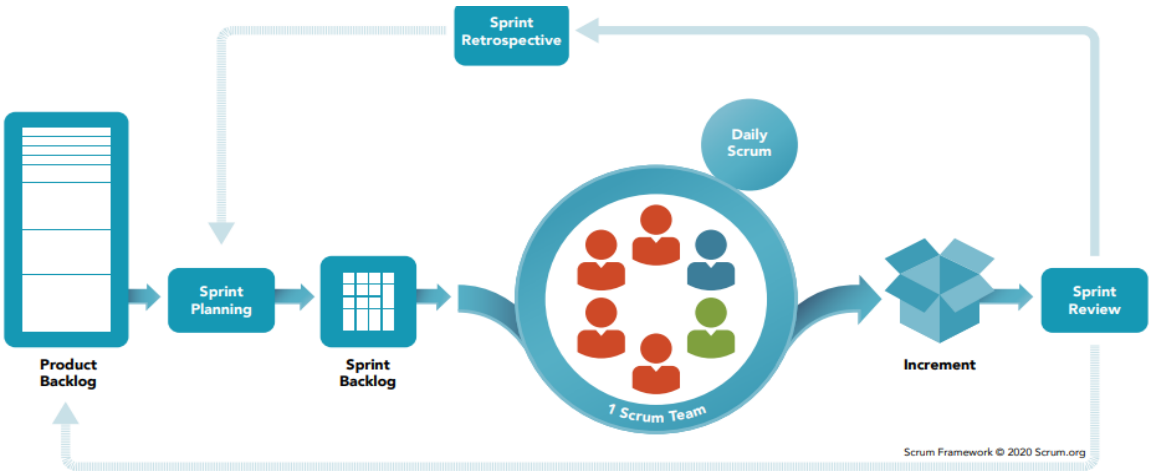
backlog (Tavares et al., 2017). The Scrum Framework is silent on risk managers forming part of the Scrum team, and this gap was explored as part of the interviews to collect data for the current study.

- **Scrum events – also known as ceremonies** – The Scrum team achieves the project vision by using a process of Scrum events (see Figure 5): the sprint, sprint planning, daily Scrum, sprint review and sprint retrospective contained with the sprint process (Schwaber & Sutherland, 2020). Sprint planning is the step taken to initiate a sprint, and a sprint is a process of transforming ideas into value within a short space of time, a month or less. Furthermore, sprint planning is a foundation for work to be performed during a sprint, and the product owner can invite other people to attend the sprint planning to provide guidance (Schwaber & Sutherland, 2020). The risk manager can attend the sprint planning as the Scrum Framework allows other people to be invited into the sprint plan where goals are discussed. The daily Scrum is a 15-minute event in which progress towards and blockers of the sprint goal are discussed. The sprint review is timeboxed (fixed time allocated to complete an activity) to review what was achieved in a sprint and any changes in the artifacts (see definition below). The risk manager can also attend the daily Scrum to identify the risks within the project. Finally, the sprint retrospective provides the Scrum team with the opportunity to discuss improvements to quality and effectiveness, and this session concludes the sprint (Schwaber & Sutherland, 2020). The events are time-based to promote transparency and allow teams to inspect the project to adapt the artifacts

(Tavares et al., 2017). This is an opportunity for a risk manager to attend and note other sources of risk from the project to ensure improvement in early risk identification in other projects.

- **Scrum artifacts** – represent the value of the work achieved, with the intention of demonstrating transparency to the whole team (Schwaber & Sutherland, 2020). The three artifacts, product backlog, sprint backlog and increment, are designed to ensure transparency and provide information that can be measured: product goal, sprint goal, and definition of done, respectively (Schwaber & Sutherland, 2020). The Scrum artifacts present the risk manager with the opportunity to discuss risks that were identified and mitigated when involved with a Scrum team.

  Figure 5 depicts a simple Scrum process.



- **Figure 5: Simplified Scrum process (Source: Scrum.org)**

2.3.4 Proposition 1

Risk management plays a role in IT projects executed through an agile methodology.

2.4 Explore tools, techniques and methods used to enhance early risk identification

This section reports on the results of a review of literature intended to establish the different tools, techniques and methods that could be used by a risk manager to enhance early risk identification in IT projects delivered through an agile method. The subsections below review approaches to identifying risk and agile risk management processes in IT projects and software development that incorporate useful tools, techniques and methods.

2.4.1 Approaches to identifying risk in IT projects or software development

The project risk management process aims to mitigate the risks of not achieving the project objective and identifying opportunities (Vliet, 2007). However, Tavares et al. (2017) note that project management neglects risk management. IT projects have inherent uncertainties, and these uncertainties result in projects not meeting deadlines, going over budget or not even meeting the customer's requirements (Machado, 2012). This makes it essential to identify project risks.

There are several drivers, factors and tools that are used to identify risks in IT software development. Kumar and Yadav (2015) propose a probabilistic software risk assessment and estimation model for software projects, as shown in Figure 6 below. This model measures product engineering risk factors, program constraints and the development environment. This model could be used to

identify risk as it incorporates the probability of risk measured in the product engineering, development environment and program constraints, and these software risk factors could be used in traditional risk or agile projects.

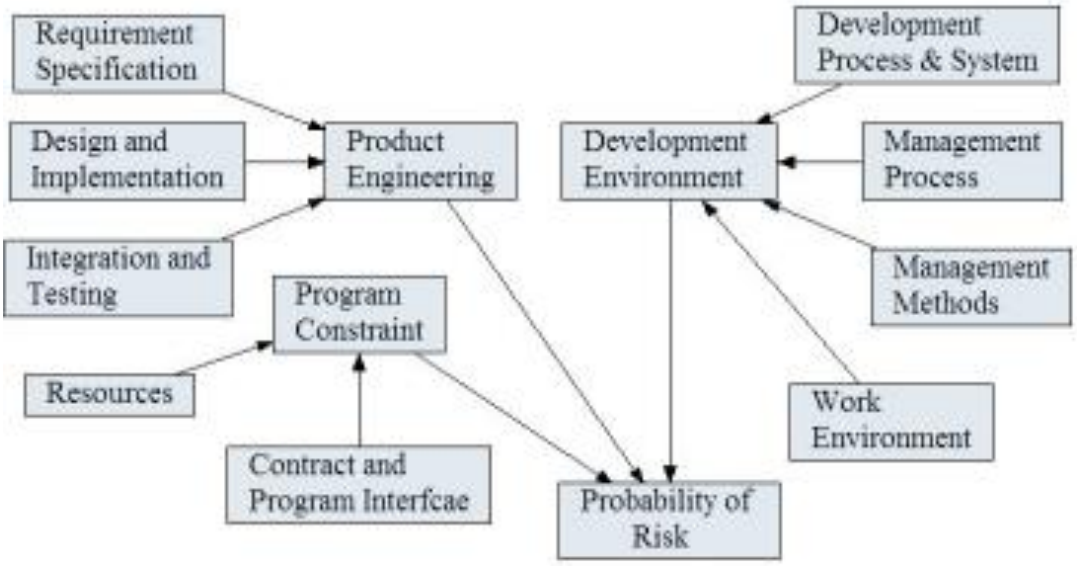


Figure 6: Kumar and Yadav's (2015) proposed probabilistic software risk assessment and estimation model

Another approach to identifying risks includes a risk matrix for risk categorisation for practitioners managing DAD projects (Shrivastava & Rathod, 2015). DAD projects have similar characteristics to IT projects delivered with an agile approach; therefore, a risk manager for this type of IT project could also use the risk matrix categorisation. However, it presents a challenge in that it cannot assist with early identification of risk.

In 2017, Shrivastava and Rathod (2017) developed a risk management framework for perceived risks in IT software development and for identifying the causes of the risks and methods for mitigating the risks. The framework is ideal for general early risk identification. However, Buganová and Šimíčková (2019)

state that each project is specific, which creates typical risks with unique reasons that must be managed and monitored for the project to succeed. Hence, there is a need to understand the existing tools, techniques and risk management methods to enhance early risk identification.

2.4.2 Agile risk management process in IT projects' software development

Moran (2014) proposes an agile risk management process that integrates aspects of the traditional project risk management and includes the spirit of the agile manifesto. Agile risk management in IT software refers to an implicit risk method and focuses on technical risk and identifying other sources of risks (Moran, 2014). Agile risk management could be used to identify risk early in IT projects executed using an agile methodology.

Tavares et al. (2020) state that 11% of IT software projects are cancelled before they start owing to a lack of effective risk management. Furthermore, in IT projects, there is a perception that risks are harmful, with less focus on risk as an opportunity (Moran, 2014). The identification of risk as an opportunity was, therefore, considered a gap to be explored with the interview respondents in the current study.

In 2020, Denney used an exploratory qualitative study to investigate how practitioners use positive risks (opportunities) in project management to improve the likelihood of successfully meeting project objectives. This study demonstrates

that opportunity risks can be identified; however, it does not guide the reader on how to identify such risks.

There are several risk management gaps in agile IT projects, such as that risk definition is not made explicit; risks in other SDLC models are not identified; little consideration is given to recording and monitoring of risks; the organisation's attitude to risk is inadequate; and nature of responsibility of risk (Moran, 2014). The Scrum Framework takes note of certain risk management activities, and risk is minimised by consistent feedback, working in small teams and the iterative process involved in the Framework, which assist with managing uncertainty and transparency (Moran, 2014). However, Scrum does not formally address the need to identify, analyse and manage risk activities (Moran, 2014). The lack of involvement of a risk manager with continuous risk identification makes it a challenge to identify risks early to mitigate these risks and see opportunity risks.

The agile risk management process (Figure 7) developed by Moran (2013, as cited by (Moran, 2014) has four phases:

a) Understanding the project objectives, context and risk environment – to establish whether the benefits outweigh the risks.
b) Risk scoping – to establish risk appetite.
c) Risk tailoring – so that the agile method can be tailored according to the risk of an IT project.
d) Risk management – which is adapted according to the Scrum team's needs.

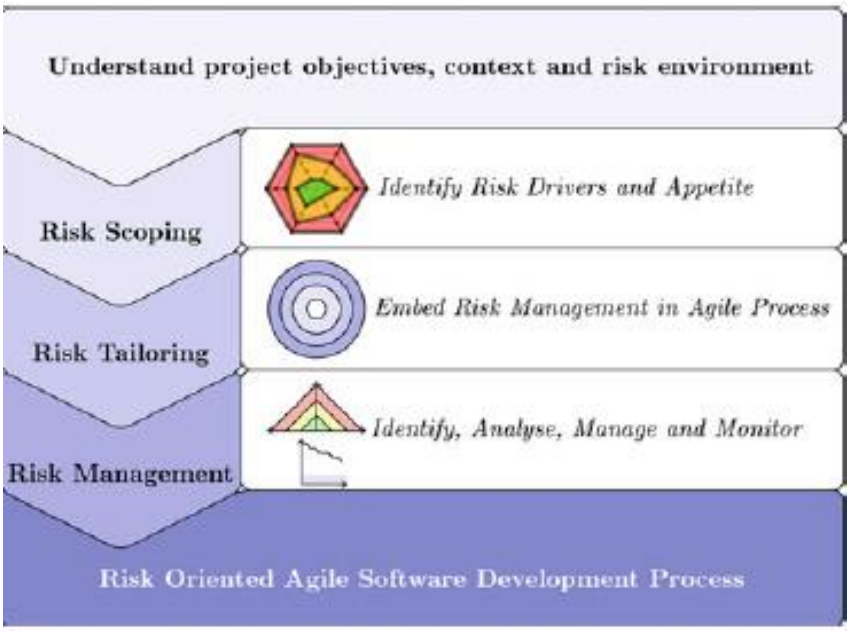


Figure 7: Agile risk management process (Moran, 2014)

The process begins with defining the project objectives, context and risk environment so that a risk assessment can be performed to establish whether the benefits of the project outweigh the risks and whether they occur at the enterprise risk management level of the organisation (Moran, 2014). This is an ideal stage to involve a risk manager; hence, this tool or framework could be adopted by a risk manager.

The next phase is used to identify risk drivers and establish risk appetite in the pre-project stage (Moran, 2014). This is a fundamental phase as the risk appetite and risk tolerance set the tone and guardrails for a project.

In the next phase the agile method is tailored according to the project's risk environment. In the final phase, the existing project risk management practices are adapted to the needs of the Scrum team. It is the responsibility of the whole

Scrum team to identify and manage risks. However, the risk manager's role should be allocated to an individual to ensure compliance and clear accountability for the risk management process (Moran, 2014). Furthermore, the risk management activities should be tracked and managed, in the same way as all Scrum processes, and discussed on a daily Scrum. The agile risk management process is based on transparency where all risk should be visible to the whole Scrum team, balancing risk and reward and flow, which acknowledges that IT projects have unavoidable risks (Moran, 2014).

2.4.3 Proposition 2

The current tools, techniques and risk management methods can enhance early risk identification to identify opportunities in IT projects.

2.5 Investigate the benefits of an agile risk management process in IT projects

This section investigates the benefits of adopting an agile risk management process within an agile methodology to deliver IT projects.

2.5.1 The benefits of adopting an agile risk management process in IT projects executed through an agile methodology

Hijazi et al. (2012) argue that risks are unavoidable in most software development methodologies and require risk management processes to be improved. From

the research conducted for this literature review, the researcher agrees with this conclusion as it is aligned with the expectation that risk managers will be involved in IT projects. There is a substantial difference in implementing the risk management process between the traditional delivery method, which follows an explicit risk management process, and the agile approach, which integrates the risk management process into each project stage and relies on regular communication, sprints and testing (Buganová & Šimíčková, 2019). Integrating risk management into each SDLC stage of an IT project will ensure continuous risk identification and management.

For Buganová and Šimíčková (2019), an explicit risk management process can be implemented within an agile approach, as long as the risks are dealt with within each development sprint. Buganová and Šimíčková (2019) recognise the management of the following risks in agile projects: the inability of individuals to carry out quality operations, an insufficient synchronisation of the teams and inadequate change management. These are project risks and do not consider other sources of risks, such as execution and operational risks, The involvement of a risk manager could assist with identifying other sources of risk.

According to Buganová and Šimíčková (2019), the Scrum Framework refers to risk identification and not on all the other risk management processes, i.e., risk analysis, risk evaluation, risk treatment, risk monitoring and review, and risk recording and reporting. There is a benefit in involving a risk manager in an IT

project that uses a Scrum Framework to ensure that the other risk management processes of risk analysis, evaluation and treatment are performed.

In 2017, Odzaly et al. produced a paper that used software agents' tools to perform risk identification and included risk assessment and monitoring using the data collected from the project environment. Risk identification involved the inputs of project goals, problem scenarios, consequences, risk indicators and project environment data, and specified risk rules using a rule-based template. There are benefits of using data and technology for the risk management process.

Moran (2014) developed generic IT risk drivers (Requirement's risk, technical risk, schedule risk, project risk, people risk) which should be considered when identifying risks in IT projects. To this list could be added compliance risk and execution risk drivers to ensure that other sources of risk are identified in IT projects.

2.5.2 Proposition 3

There are benefits in adopting an agile risk management process in IT projects delivered using an agile method.

2.6 Conclusion of literature review

Cultural theory guided this research. This theory and the organising framework of the study are outlined at the beginning of the chapter. The chapter then explores the role and involvement of risk management and risk management

tools and techniques, including a risk framework, matrix and IT risk drivers to identify risks, in agile IT projects. Lastly, the chapter considers the benefits of using agile risk management in IT projects executed through an agile method.

CHAPTER 3. RESEARCH METHODOLOGY

This chapter discusses the research approach and methodology chosen as appropriate for this study. The chapter begins by outlining the research approach and design. It then discusses the data-collection methods, the study population and sample, the research instruments, and the procedures used for data collection and data analysis and interpretation. It looks at transferability, credibility and dependability of the study, presents the demographic profile of the respondents in the form of a table and concludes with the ethical considerations.

3.1 Research approach

The study adopted a qualitative research approach, which was deemed appropriate as it was conducted by a risk manager who had engaged in risk management activities in a financial service within a South African bank for more than 15 years. The qualitative research data was collected through semi-structured interviews, hence the importance of having an experienced risk manager to collect high-quality information from the respondents.

3.2 Research design

An interpretive research design was used for the study as the data gathered from respondents was subjective and involved several social constructs (Tuli, 2010). The analysis was a subjective interpretation of data collected from semi-structured interviews with respondents who were chosen because of their knowledge of and involvement in delivering IT projects, managing risks using the

agile Scrum Framework and exposure to agile risk management. According to Tuli (2010), the interpretivism paradigm applies to real-world scenarios, and consequently a case study was conducted on a financial service industry, specifically the banking sector.

3.3 Data-collection methods

As per Tuli (2010), the interpretive approach relies on literature review, first-hand experience and actual conversation, which can be gathered through a semi-structured interview. Structured interviews are verbally presented list of pre-determined questions asked to the respondent. On the other hand, unstructured interviews conversations between two people without pre-determined questions. Semi-structured interviews are a combination of both structured and unstructured interviews. Tuli (2010) considers that the respondents should be allowed to speak freely to allow the researcher to collect rich and thick data that provides insights into the phenomena being studied. As a consequence, in the current study the respondents were allowed to speak freely, and their names were not included in the report to preserve their anonymity. The semi-structured interview enables the data collected to take the form of words rather than numbers (Antwi & Hamza, 2015). The data collected from the interviews was detailed and informed as it was provided mainly by experienced responders.

3.4 Population and sample

3.4.1 Case site

The case study was conducted within a South African financial service sector and specifically in the banking industry in one of the big five banks in South Africa. This bank has several industries within the financial service sector, with the primary industry being banking, the secondary asset management and tertiary the insurance businesses. This bank offers a wide range of wholesale and banking services, total asset size above R1 trillion, with offices in South Africa, Africa and international makes an appropriate site for the case study.

3.4.2 Sample and sampling method

A purposeful sampling technique was selected for this research. It was used to identify and select relevant respondents from whom to collect data. The sample consisted of Scrum team members with the functions of Scrum master, product owner and developers who were involved in delivering IT projects using the agile Scrum Framework. In addition, risk managers who had a technical understanding of risk management formed part of the respondents. Lastly, the sample included senior managers within the technology and risk management functions.

Vasileiou et al. (2018) argue that sample adequacy, composition and size in a qualitative study are essential in assessing the quality and trustworthiness of qualitative research. Vasileiou et al. (2018) warn that in qualitative research sample sizes tend to be too small to support the depth and nature of the enquiry. The study used the purposeful sampling as there was subjectivity, position

(managers, senior managers, heads of department, technical knowledge and product owners) as well as years of experience in areas related to the topic as a criterion. The Scrum team members had three to five years' experience delivering IT projects using the Scrum Framework; the risk managers had eight to ten years of risk management experience; and the senior IT and risk managers had more than ten years of experience.

Vasileiou et al. (2018) maintain that when respondents are interviewed by an experienced researcher, using specific research questions, the number of interviewees can be limited to 20 as little information can be generated above this number. For the current study, a professional risk manager with over 15 years of risk management experience conducted the study using a sample of 30 respondents. The semi-structured interviews were conducted using Microsoft Teams (Ms Teams). Ms Teams is a communication platform used for virtual meetings, was used because it has a capability to record the interviews and verbatim transcribed capabilities.

3.5 The research instrument

The data was collected using semi-structured interviews conducted following an interview guide (see Appendix A).

The interview guide questions were based on the objectives of the study and were guided by constructs from the cultural theory and findings of the literature review. Firstly, the interview questions addressed the first objective, which was to identify

the role and involvement of risk management in executing IT projects through an agile methodology. The cultural theory was used to establish who is responsible for identifying, assessing and monitoring risks in the agile method in terms of work function and attitude to risk.

Secondly, the interview questions explored the tools, techniques and methods used to enhance early risk identification that result in opportunities when delivering IT projects.

Finally, the interview questions investigated the benefits of an agile risk management process in IT projects delivered using an agile methodology.

3.6 Procedure for data collection

The procedure for collecting the data took the following steps. The researcher began by obtaining line manager approval and then engaged the human resources (HR) department of the bank for permission to interview the employees to ensure compliance with the organisation's policy.

He then sent an e-mail to the employees selected for participation in the study to explain the purpose of the study and request them to take part in an interview. The email included the participant information sheet (Appendix B) and requested the respondents to set a time in their diaries for the interview. Finally, before the start of the interview, the researched discussed the participant agreement form

(Appendix C) with each respondent to ensure that they understood it. Only then did the interviews start.

3.7 Data analysis and interpretation

Following guidance provided by Kumar (2011), the data obtained from the interviews was analysed to identify the sentiments that emerged from the interview recordings, transcripts and notes. The interviews were conducted one-on-one and were recorded, with notes taken during the interview and the verbatim transcript function selected through the Ms Teams app. After each interview the recording was downloaded with a verbatim transcript. The analysis process followed the four steps ((Developing a code book; Step II pre-testing the code book; coding the data; and IV verifying the coded data} proposed by Kumar (2011).

3.7.1 Identify the main sentiments

The researcher updated the verbatim transcript by using an intelligent verbatim transcription, which involved removing all the irrelevant fillers such as “yeah” and “you know”. This method resulted in the data being more readable. In certain interviews the transcripts were edited where the conversation needed clarity; for example, respondents would use the word “we” or refer to specific people’s names or use organisational internal jargon.

The researcher identified sentiments by listening to all the interview recordings, reading the intelligent transcripts and notes made during the interviews, and highlighting similar sentiments from each interview. The intelligent verbatim transcripts with highlighted sentiments for all 30 respondents were uploaded into QDA Miner 6, a qualitative data-analysis software, and the main themes were extracted using keyword retrieval. These keywords took the form of individual words, which used a keywords frequency analysis process feature for categorisation.

3.7.2 Assign codes to the main themes

The sentiments were used to assign codes to the main themes, and the keywords retrieval was selected to generate themes in the form of keywords clouds. The coding frequency category was selected as a point of reference for analysis.

3.7.3 Qualitative data analysis software – QDA Miner

QDA Miner 6 is a qualitative and mixed-method software that has a computer-assisted coding, analysis and report writing capability. The QDA Miner was used for this study to code and analyse the data from the interviews. Coding frequency was used to analyse the data. The data was uploaded into QDA Miner from an MS Excel spreadsheet. Based on the uploaded data, variables were created and the data coded.

Several retrieval features were used in the keyword frequency analysis of all keywords used by all respondents for each question. The cluster analysis was used to explore the relationships among codes and the respondents' responses to interview questions by providing a 3D multidimensional scaling graphic to assist in the identification of related codes or respondents. The clustering was set to be performed on respondents, with the similarity matrix used for clustering and 3D multidimensional scaling consisting of cosine coefficients computed on the relative frequency of the various codes. This meant that the more similar two respondents were in terms of the distribution of codes, the higher this coefficient was (Provalis Research, 2022).

The extracted key words and theme data from QDA Miner are integrated into Chapter 4, which presents the findings of the study, and the 3D multidimensional scaling included Chapter 5, which presents a discussion of the findings.

3.8 Limitations of the study

The study had the following limitations:

- There was a limited number of risk manager respondents who had been involved in delivering IT projects through an agile methodology; and
- There were a limited number of developers, Scrum master and technical team who were available to be interviewed.

These limitations were mitigated by extending the interview invitations to include respondents from the internal audit, reporting and IT strategy departments.

3.9 Transferability, credibility and dependability

3.9.1 Transferability

It should be noted that transferability was not the primary aim of the case study. The procedure for data collection and analysis allows for the transferability of the study to other similar studies, owing to the detailed documentation of the steps involved and the approach taken, and the process adopted as set out in Sections 3.6 and 3.7 of this study (cf. Kumar, 2011).

3.9.2 Credibility

The study meets the credibility criteria of using different sources of data i.e., the literature review, interviews and detail description of the Scrum Framework and risk management process, which form the basis of the research. Multivocality (focusing on the interaction between researcher and respondent) was achieved by discussing the topics of the study with multiple respondents and diverse voices from Scrum teams, risk management and senior management. According to Tracy (2010), the use of diverse voices assists with validation to ensure credibility.

To improve the credibility of the interview guide and interview process, a pilot study was conducted with a small sample of three: an executive head of risk management within the group technology, a head of information technology and a business analyst. Value was added from this pilot study, with the research

instruments changed by combining questions and suggestions made for possible respondents to include in the interviews.

3.9.3 Dependability

The data collected from the pilot study was collected from a sample of senior people with extensive IT and risk management, and the one-on-one interviews with 30 respondents took place with both males and females and with executives, heads of departments, senior managers and specialists. This improved the stability of the data collected. The research met the dependability criteria (how the processes of data collection, data analysis and theory was integrated), as the study detailed the research design and data-collection process to allow replication as per Morse (2015) for another research study to be able to replicate the study.

3.10 Demographic profile of respondents

The respondents were involved in the execution of IT projects and could provide valuable insights to address the research objectives and answer the interview questions as demonstrated by their respective roles within the organisation.

Table 2: Demographic profile of the respondents

Respondents	Category – Scrum Team	Role within the Organisation
Respondent 1	Scrum Master	Project Manager
Respondent 2	Product Owner	Head: Reporting and Communication
Respondent 3	Risk Manager	Senior Manager: Project Risk

Respondent 4	Technical – Architecture	Digital Risk Technologies
Respondent 5	Risk Manager	Business Manager: Change and Execution
Respondent 6	Product Owner	Reporting Manager
Respondent 7	Product Owner	Head: Operational Risk Intelligence
Respondent 8	Technical	Executive: Digital Fast lane
Respondent 9	Product Owner	Chief Information Security Officer
Respondent 10	Risk Manager	Senior Manager: Assurance
Respondent 11	Risk Manager	Senior Manager: Assurance
Respondent 12	Risk Manager	Senior Manager: Enterprise-wide Risk
Respondent 13	Risk Manager	Head: Operations
Respondent 14	Risk Manager	Head: Climate Risk
Respondent 15	Risk Manager	Senior Manager: Operational Risk
Respondent 16	Risk Manager	Senior Manager: Operational Risk
Respondent 17	Risk Manager	Senior Manager: IT Risk
Respondent 18	Risk Manager	Head: Strategic and Execution Risk
Respondent 19	Product Owner	Head: Strategy & Innovation
Respondent 20	Risk Manager	Head: Audit Strategic Initiatives
Respondent 21	Risk Manager	Executive Head: Enterprise-wide Risk
Respondent 22	Risk Manager	Head: Risk and Compliance
Respondent 23	Risk Manager	Head: Compliance Services
Respondent 24	Risk Manager	Senior Manager: Enterprise-wide Risk
Respondent 25	Risk Manager	Senior Manager: Enterprise-wide Risk
Respondent 26	Scrum Master	Programme Executive
Respondent 27	Risk Manager	Executive Head: Operational Risk
Respondent 28	Risk Manager	Head of Audit: Business Improvement
Respondent 29	IT Risk Manager	Senior Risk Manager – Innovation
Respondent 30	Digital Risk Manager	Risk Manager: Digital Mobile

3.11 Ethical considerations

The ethical considerations form was completed and submitted to the Graduate School of Business Administration HREC Ethics Committee (Appendix D). As the research was conducted in an organisation, approval was also obtained from the HR manager and sign-off obtained before any data collection occurred. The

respondents agreed that the consent form should be signed on their behalf as the interviews were conducted online. Finally, the respondent information sheet was completed and guaranteed anonymity to the respondents, who agreed that they were voluntarily participating in the research and understood that they could choose not to participate at any time.

CHAPTER 4. PRESENTATION OF FINDINGS

4.1 Introduction

The findings of this study are presented in the form of themes extracted from the respondents' interview responses by using a keywords' retrieval that used the responses analysis process created by WordStat 5.0. (Provalis Research, 2022). Quotations from the verbatim transcripts are included.

4.2 Findings of Proposition 1 – Risk management plays a role in IT projects executed through an agile methodology

4.2.1 Role of risk management

The respondents agreed that risk managers have a role to play in the execution of IT projects. However, there were different views on the role and involvement of risk management, as shown in the verbatim quotations provided below.

The themes identified from the responses to the question about the role and involvement of risk management in IT projects executed in an agile methodology are included in Figure 8 below. This figure presents a keyword frequency of the role of risk management in IT projects.

Figure 8: Keyword frequency – role of risk management

The answers from Respondents 1 and 8 indicate that historically risk managers have not always been involved in IT projects, although Respondent 8 felt that the risk manager should be engaged with the product.

Respondent 1: "*I'm saying is risks person will never form part of the team that will execute within the scrum methodology. At the appropriate intervals, risk will participate in the ceremonies.*"

Respondent 8: "*Risk has not traditionally been very close to execution" and "I think your risk resource or role should be very much engaging with the product".*

Respondent 11 considered that risk managers should be involved in executing IT projects and proposed that this involvement should be daily. The challenge with this proposal is limited resources for the risk manager to be involved daily in IT projects.

Respondent 11: "*I think that risk should actually be involved in all of those meetings every day. So, I think that actually, risks should play a core part in these projects.*"

Respondents 6 and 19 agreed that the role of risk manager is to identify the risk and maintain a risk register. In addition, Respondent 19 proposed a methodology with clear guidelines on risk appetite and parameters regarding when to involve risk managers in IT projects.

Respondent 6: "*So I think for the risk person it will be maybe creating that risk log and following up and ensuring we've identified the risk, what mitigation*."

Respondent 19: "*If you can create a methodology that has risk registers risk identification, so everybody within the team basically looks out for. If you ever proper risk appetite consideration. You don't have to have the risk officer in every discussion. And you just have to have clear parameters around what should be escalated and when should you consult risk at every level.*"

4.2.2 Traditional risk management

This section provides the respondents' answers to the question: Is the traditional risk management process adequate to manage risks in agile methodology? The themes that emerged from the respondents' responses are included in Figure 9, which presents a keyword frequency on the adequacy of traditional risk management.

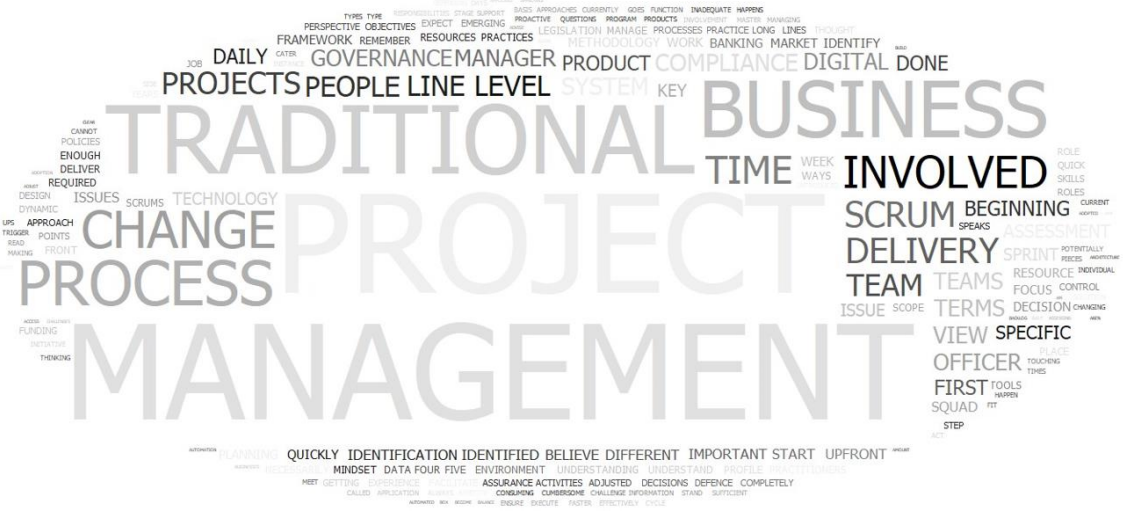


Figure 9: Keyword frequency – traditional risk management

Some of the respondents believed that traditional risk management had some use in projects using an agile methodology.

Respondent 8: *“I think I've seen teams make it work.”*

Respondent 9: “*For me, it's not either-or. It's not, you know, totally chucked, traditional, and just go agile and I think it is the balance in which you use elements of both will differ from project to project.*”

Respondent 22: “*It has its place, but the wave risk management has evolved over the recent years. As we've had to move to a more agile proactive risk management process, so working in the traditional sense of risk management. I see won't work in the old days*.”

The above responses from Respondents 9 and 22 suggest that traditional risk management still has a place in an agile methodology and Respondent 8 reported

having seen teams that have made traditional risk management work. However, the respondents seemed to hold the view that traditional risk management just needs to be adapted for the iterative agile approach through a risk-adjusted approach.

Some of the respondents did not consider the traditional approach to be useful, with Respondents 6, 7 and 30 stating that the traditional risk management is not adequate for the agile methodology.

Respondent 6: *"Absolutely not."*

Respondent 7: *"No, it's not because it needs to be a continuous thing."*

Respondent 30: "*It's not adequate. So, practices are quite cumbersome. I find that when you speak to business, they find other practices to be quite cumbersome, quite a time consuming.*"

4.2.3 Cultural theory – who is responsible for the risk management process

The four quadrants of the cultural theory were used as a basis for establishing who is responsible for the risk management process in terms of risk perception, and the respondents' views were aligned with the quadrants. From the responses to the question regarding who is responsible for identifying, assessing and monitoring risks in an IT project delivered through the agile method (i.e. the Scrum master, product owner, development or risk practitioners, or Scrum team),

particular themes were identified. These themes are demonstrated in Figure 10, which presents a keyword frequency on responsibility for the risk management process.

Figure 10: Keyword frequency – responsible for risk management process

Respondent 5 expressed the following view:

Respondent 5: *"I think maybe it can be a mixture of both. Where risk functions retain the appropriate level of independence. In terms of independently arrive at identifying risks, but also in terms risk functions need to provide advice and guidance from that point of view, there needs to be a collaboration."*

In terms of the cultural theory quadrants, this view can be aligned with the egalitarians, who prefer collective decision making.

Respondent 8: *"I think it probably would be a shared responsibility between the product owner and the Scrum master."*

The view expressed by Respondent 8 is that the risk management process is individualist as it relies on the product owner, who is there to see risk as an opportunity.

The following respondents expressed similar views that the risk management process is a collaborative effort.

Respondent 10: *“No, it's definitely a collaborative effort and everyone got to be held accountable.”*

Respondent 17: *“I think it should be a Group.”*

Respondent 18: *“So again, it's a collective because, but it is managed by the program manager or the agile coach.”*

Respondent 21: *“I would say this team and I think one did always say it risk management is not the responsibility of the risk management. I think everybody involved in business must play a role in identifying and managing risk.”*

Respondent 25: *“The owner of the risk is the business. The first line of defence, so I think it's ownership. But if it's the whole team, I would say they are responsible. And obviously risk office always pushing.”*

As seen in the above responses, Respondents 10, 17, 18, 21 and 25 agreed that the risk management process is the responsibility of the team, team and group when executing an IT project using an agile methodology, which is an egalitarian view.

4.3 Findings of Proposition 2 – The current tools, techniques and risk management methods can enhance early risk identification to identify opportunities in IT projects

4.3.1 Adequacy of tools, techniques and risk management methods

The respondents were asked for their views on the adequacy and appropriacy of the existing tools, methods or techniques used to identify risk in IT projects and other sources of risk to enhance early risk identification and opportunities. The themes that emerged from their responses are included in Figure 11, which presents a keyword frequency on the adequacy of tools, methods and techniques.

Figure 11: Keyword frequency – adequacy of tools, techniques and methods

The respondents expressed different views as indicated in the following quotations.

Respondent 2: *“They [tools and techniques] will work, but they might not be sufficient.”*

Respondent 3: *“Not 100% sure what those tools and things would be. I guess it just got to be a very short timeframe. It's got to be mean there are tools themselves need to be agile in and that they can they quickly respond to any new items.”*

Respondent 5: *“What is an important thing is that they need to be built in triggers for risk involvement that's so, those triggers need to be built in, to ensure that the moment a certain a feature is being introduced that touches on a specific organisation, an organisational area that automatically triggers the need for risk sign off at a particular level depending on what we're talking about.”*

Respondent 11: *“I do think that we have tools in in place.”*

Respondent 12*: “Definitely tools, methods or techniques need to be changed.”*

Respondent 16: *“I think the tools are there, but I don't necessarily know if it's the right tools for the right stuff.”*

The responses can be categorised into two views. The first view is that risk managers do not have the tools, techniques and methods to enhance early risk identification. The second view is that the tools are there, but would need to be updated by introducing new features or making these tools agile.

4.3.2 Opportunity risk

In addressing the question of how positive (opportunity) risks in the project are identified, assessed and monitored in IT projects delivered in agile, the themes identified from the responses are included in Figure 12, which presents a keyword frequency on opportunity risk.

Figure 12: keyword frequency – opportunity risk

The respondents expressed the following views.

Respondent 7: "*This is where the collective knowledge enhances the project altogether because we all come from different backgrounds."*

Respondent 8: *"I think there's an opportunity where risk can be a differentiator."*

Respondent 9: *"I guess on projects to identify risk opportunity, experience come in as it is difficult for a more junior person."*

Respondent 10: *"We are not trained to look for opportunities. I don't think we have the skills or the tools to be able to do that."*

Respondent 11: *“I think risk officers are really not equipped to do that yet, the risk projects and the business projects crossover are where the proper maybe the big opportunity lies.”*

Respondent 18: *“I don't think we are as to be as involved as we should be.”*

Respondent 22: *“Yes, so when it comes to if I look at your opportunities from a transparency perspective, it will give you a faster time to market. It will enhance your efficiencies as well and it will play a role in terms of your reduction of risks, post-implementation or even in execution and implementation phase.”*

The respondents were of the view that it is beneficial if identifying risk can identify benefits such as being able to go to market quicker. They also felt that there are challenges at this point, such as risk managers not being trained to see opportunities or not involved and not equipped to identify opportunities.

4.4 Findings of Proposition 3 – There are benefits in adopting an agile risk management process in IT projects delivered using an agile method

The themes identified from the responses to the question regarding the benefits of adopting an agile risk management approach are included in Figure 13, which provides a keyword frequency on the benefits of agile risk management.

Figure 13: Keyword frequency – benefits of agile risk management

Respondents identified a number of benefits to adopting an agile risk management approach.

Respondent 5: *"We are getting issues early on rather than much later in the process, that's proactive. You know there's a reduction in rework. And more informed risk planning."*

Respondent 9: *"I mean if risk officers can get things resolved quicker from a risk perspective, I guess that that could influence cost reduction."*

Respondent 14: *"So, from my perspective, as you can partner with the risk and the product owner which will enable you to move faster. So that is the one and then the second one is. It will enable the organisation to break down silos. Thirdly, organisations start thinking with the client in mind. I don't think the risk will be reduced. It will just be managed better."*

Respondent 21: *“I'm looking at, obvious like from the risk lens option project risk reduction. Delivery and time to market are also critical, delivery speed, time to market.”*

The main sentiment expressed by the respondents was that when risk management adopts an agile risk management approach, IT projects will be delivered faster to market and there will be proactive risk management.

4.5 Summary of the findings

The respondents agreed that risk management has a role to play when IT projects are executed through an agile methodology. However, there were different views in terms of at which stage involvement should occur. Most of the respondents agreed that the tools, techniques and risk management methods can enhance early risk identification to identify opportunities in IT projects. However, they felt that these tools should be enhanced and automated. They also identified benefits in adopting an agile risk management process in IT projects delivered using an agile method.

CHAPTER 5. DISCUSSION OF THE FINDINGS

5.1 Introduction

This chapter discusses the research findings related to the three propositions:

- Risk management plays a role in IT projects executed through an agile methodology.
- The current tools, techniques and risk management methods enhance early risk identification to identify opportunities in IT projects.
- There are benefits in adopting an agile risk management process in IT projects delivered using an agile method.

The respondents' responses are illustrated with 3D multidimensional figures that represent the proximity values calculated for all the respondents. In a 3D multidimensional scaling plot, each point represents a respondent and the distance between pairs of points indicates how similar two respondents are. Respondents with similar patterns of codes will appear close to each other, while respondents with dissimilar codes will be plotted far from each other. Colours are used to represent membership of specific items to different sections created using hierarchical clusters. The results of the 3D multidimensional scaling plots are useful for detecting meaningful underlying dimensions that explain similarities between respondents (Provalis Research, 2022). The sentiments extracted from the responses provided by the respondents per each question are included to explain the 3D multidimensional scaling plots.

5.2 Demographic profile of respondents

As shown in Table 4 below, the focus in the demographic profile of the respondents was on their work functions and job positions, includes different members of the Scrum team. Most respondents were within the risk management function and the highest proportion of respondents were heads of departments and senior managers. This enhanced the quality of the responses provided by the respondents.

Table 3: Demographic analysis

	Scrum Master	Risk Management	Digital & IT Risk Management	Product Owner	Technical	**Total Roles**
Manager	1	1	1	1		**4**
Senior Managers		8	2			**10**
Heads of Departments		7		3		**10**
Executive Heads	1	2			1	**4**
Specialists				1	1	**2**
Total – Roles	**2**	**18**	**3**	**5**	**2**	**30**

5.3 Discussion of Proposition 1 – Risk management plays a role in IT projects executed through an agile methodology

Regarding the role and involvement of risk management in the execution of IT projects, three questions were asked of the respondents to address the proposition:

- What is the role of risk management/managers when applying the agile methodology in IT projects?

- Is the traditional risk management process adequate to manage risks in agile methodology?
- Who is responsible for identifying, assessing and monitoring risks in the agile method (i.e. scrum master, product owner, dev or risk practitioners, or scrum team)?

From the responses to these three questions given in the interviews, it was clear that risk management can play an important role in IT projects. However, the respondents differed in terms of what they considered to be the important stages of risk management involvement within the IT projects. There was a consistent view that the traditional risk management is not adequate for the agile methodology and will need to be enhanced for agile projects. Lastly, the respondents were of the view that identifying risks in IT projects as per the risk cultural theory was the responsibility of the group.

5.3.1 Role of risk management

The following sentiments related to the role of risk management were extracted from the intelligent transcripts:

- Risk management must not be in the team in an execution mode.
- Risk should form part of the team and the role is to keep the team honest.
- The risk manager's role will be creating a risk log.
- The role really should be enabled because the risk is seen as a disabler.
- Risk has not traditionally been very close to execution.

- The risk role is there to ensure that the IT project doesn't create any other risk for the organisation and ultimately the customers.
- There are no defined roles, responsibilities of what the risk manager needs to do.
- All team members of the Scrum team have joint accountability for proactively identifying any risks, not just the risk managers.
- Risk’s role should play a core part in these IT projects; the business decision and the risk decisions should go hand in hand.
- The role of risk management provides oversight on risks identified and then facilitates work that may be required to make sure that identified risk is at an acceptable level.

According to Moran (2014), the risk manager's role should be allocated to an individual to ensure compliance and clear accountability on the risk management process. The respondents generally agreed that the risk manager should form part of the team; however, a few respondents had not seen risk involvement, and others were of the view that risk should not be involved in the IT project process.

In an IT project using the Scrum Framework, sprint planning takes place as a foundation for work to be performed during a sprint, and the product owner can invite other people to attend a sprint planning session to provide guidance (Schwaber & Sutherland, 2020). On the basis of the diverse responses from the respondents, what is required is that a clear role and responsibilities should be documented for the risk manager when they are invited onto the Scrum team.

Tavares et al. (2017) note that project management generally neglects risk management. It came out from the responses that risk management has never been involved in the execution of IT projects.

A Scrum team manages project risk within the area and context of risk culture, risk appetite and risk tolerance (Moran, 2014). The respondents were of the view that the risk manager should ensure that the identified risks are within the acceptable level, therefore should be risk thresholds should be set. The sprint retrospective provides the Scrum team with the opportunity to discuss improvements to quality and effectiveness, and this session concludes the sprint (Schwaber & Sutherland, 2020). The responses which proposed that risk management should be involved in IT projects, and during the sprint retrospective the risk managers could also identified other sources of risks which could be used in other IT projects.

Figure14 below shows 3D multidimensional scaling on the role of risk management. The figure provides hierarchical clusters. The 3D multidimensional scaling detects three colours (red, green and blue), which indicates the meaningful underlying dimensions that explain similarities between respondents. The common view provided by the respondents, which is indicated in blue, is that risk management has a role in an agile methodology.

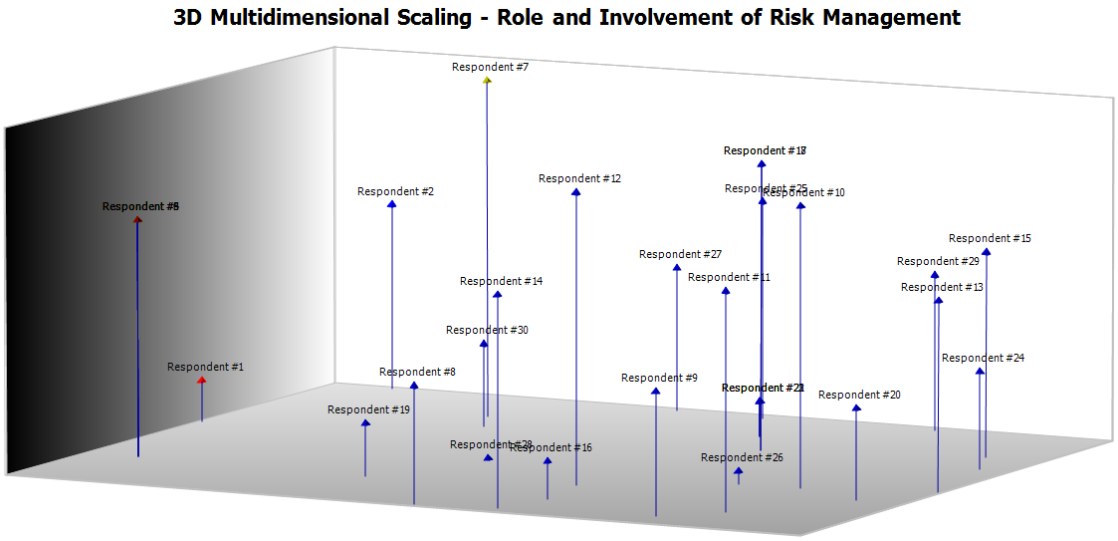


Figure 14: 3D multidimensional scaling – the role of risk management

5.3.2 Traditional risk management

The following sentiments related to the adequacy of traditional risk management in IT projects were extracted from the intelligent transcripts:

- No, because the traditional risk management approach is not risk-adjusted.
- The current traditional risk management is less successful because it's rigid and a tick box exercise.
- The risk management practices will be sufficient if adopted in risk by design fashion.
- Traditional risk management is not adequate, because it’s not continuous.
- Certain teams have made the traditional risk management work by engaging as early as possible with various risk practitioners.

- There's a need for traditional risk management. However, the risk manager needs to be able to make faster decisions.

Moran (2014) proposes an agile risk management process that integrates aspects of the traditional project risk management and includes the spirit of the agile manifesto. Some respondents agreed with the view that traditional risk management should be integrated into an agile methodology.

According to Buganová and Šimíčková (2019), the Scrum Framework only focuses on risk identification and not on all the other risk management processes. These processes include risk analysis, risk evaluation, risk treatment, risk monitoring and review, and risk recording and reporting. The respondents were aligned with the view that traditional risk management is not adequate in an agile methodology.

Figure 15 below, multidimensional scaling of responses regarding the traditional risk management process, provides hierarchical clusters. The 3D multidimensional scaling detects six colours (red, green, light green, purple, brown and blue), which show the meaningful underlying dimensions that explain similarities between respondents. The common view provided by the respondents, which is indicated in blue, is that traditional risk management has a place in an agile methodology; however, it will need to be automated and made agile.

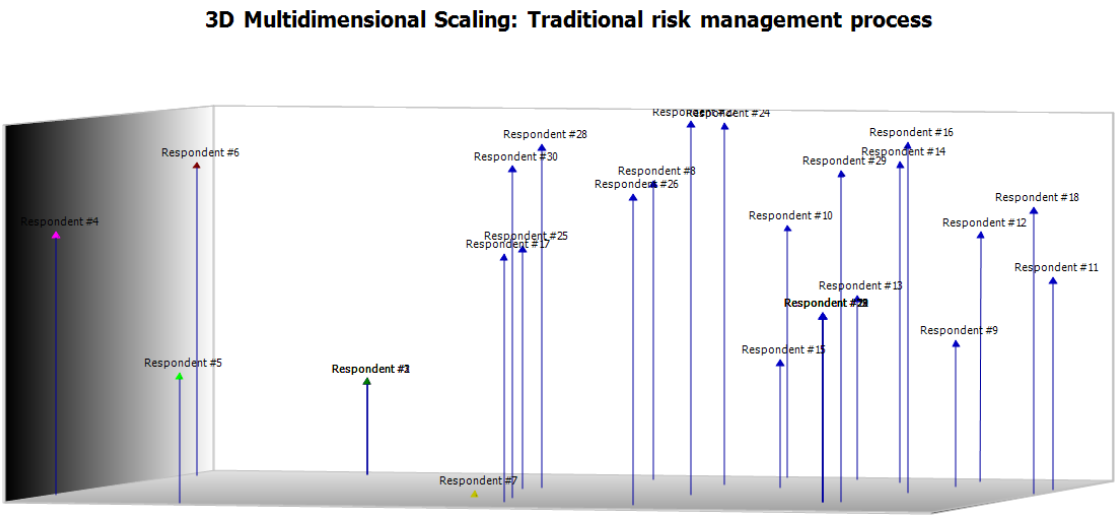


Figure 15: 3D multidimensional scaling of traditional risk management

5.3.3 Cultural theory – Responsibility for risk management process

The sentiments below were extracted from the intelligent transcripts. They were then related to the cultural theory to establish who should take responsibility for identifying, assessing, monitoring and reporting risks, i.e. the risk management process:

- It's a partnership and group accountability for the risk management process.
- All the Scrum team members are responsible for identifying risks in their different pockets.
- The risk manager is responsible for identifying any risks as an independent party.
- Assign ownership to the whole team and accounts equally across.

Scrum does not formally address the need to identify, analyse and manage risk activities (Moran, 2014). Even though there is no specific requirement for

identifying, analysing and managing risk activities in agile projects, the respondents were of the view that accountability for the risk management process lies with the team involved in the IT project.

Oltedal et al. (2004) state that egalitarians prefer collective decision making and tend to be skeptical of experts. The responses showed that the respondents saw risk identification as collective decision making, which suggests an egalitarian approach to risk. However, the Scrum team was made up of individuals who are experts in their respective areas and the respondents' views did not reveal any scepticism of experts.

Tansey and O'Riordan (1999) indicate that hierarchy exists in an environment where the individual role is clearly defined compared to other group members. Hierarchies respect hierarchical relationships and the technical risk management style and are aligned with traditional risk management (Moran, 2014). A hierarchy would not work in an IT project based on an agile methodology as revealed by the responses.

Isolates or fatalists are "unconstrained by the rules of a hierarchical institution or the strong demands of a group" (Tansey & O'Riordan, 1999). Furthermore, fatalists are indifferent about risk (Oltedal et al., 2004). The respondents showed characteristics of isolates when involved in the Scrum team.

The 3D multidimensional scaling of the responsibility of the risk management process (as shown in Figure 16) detects four colours (red, purple, brown and

blue) indicates that most of the responses to the question in blue. In answering the question of who is responsible for the risk management process point to a team responsibility. This aligns the respondents with egalitarians in accordance with the cultural theory.

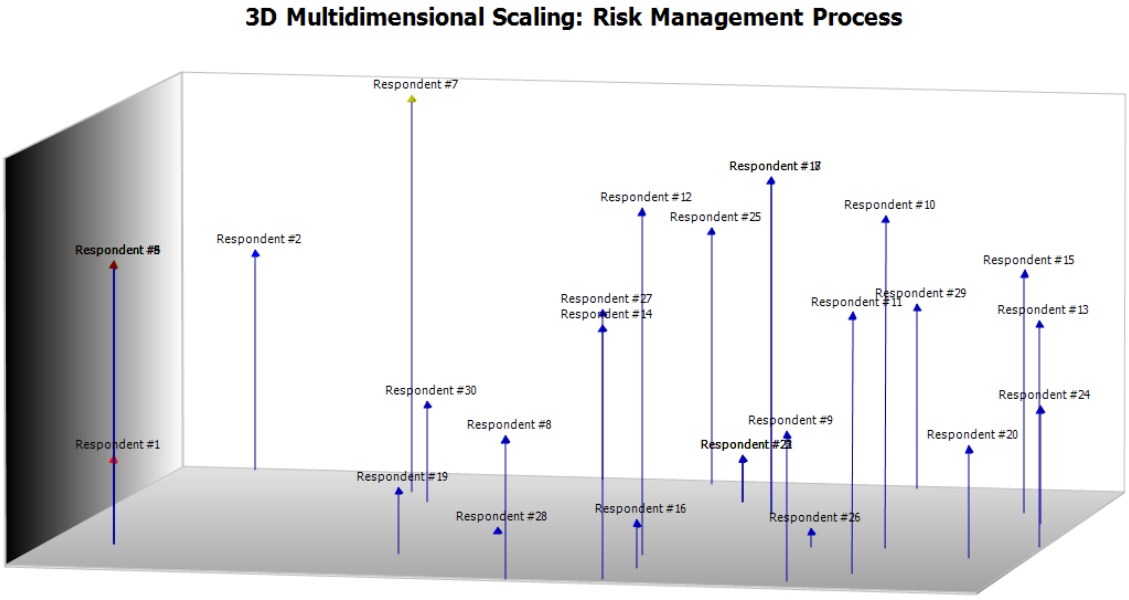


Figure 16: 3D multidimensional scaling – responsibility for risk management process

5.4 Discussion of Proposition 2 – The current tools, techniques and risk management methods can enhance early risk identification to identify opportunities in IT projects

5.4.1 Tools, methods and techniques

The respondents were asked whether they believed that the existing tools, methods or techniques were appropriate for identifying project and other sources

of risk in the agile method. The sentiments from the intelligent transcripts related to their responses are presented below:

- The current tools and techniques will work, but they might not be sufficient.
- The current tools are not relevant, because they are not predictive.
- Not adequate, there should be built-in triggers for risk involvement.
- Yes and no. Yes, as a base and/or as a checkpoint. No, because agile is fast-paced and with airdropping fast-paced. That methodology needs to be flexible enough to suit that environment.
- Tools, methods or techniques need to be changed. The systems and processes are there, but they're quite dormant.

Figure 17 presents 3D multidimensional scaling regarding tools, methods and techniques that demonstrates the respondents' interconnected responses towards the view that the current tools, techniques and methods are not adequate for IT projects delivered with an agile methodology.

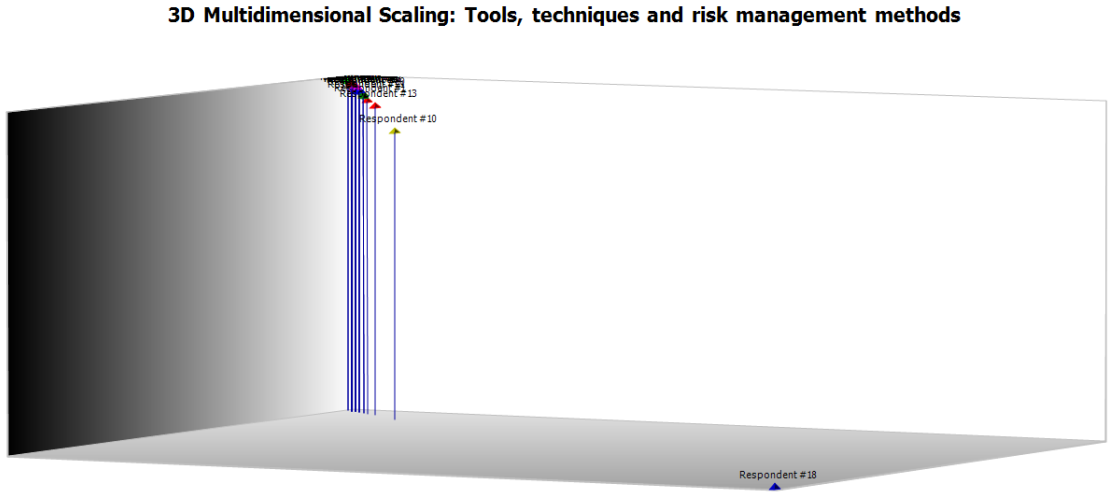


Figure 17: 3D multidimensional scaling – tools, techniques and risk management methods

5.4.2 Opportunity risks

The sentiments that emerged from the intelligent transcripts relate to the question: How are positive (opportunity) risks in the project identified, assessed, monitored in IT projects delivered in agile? The following sentiments were revealed:

- There should be a change in the risk manager's mindset and focus on tracking, monitoring and measuring the benefits, post the deployment of the IT project and that is still a gap that is missing.
- Risk managers should be managing the uncertainty because the uncertainty can be positive or negative.
- Risk management should adjust mindsets and practices to ensure that potential upside risk is identified and managed.
- The organisation should guide the risk managers on how to identify opportunities when part of the Scrum team.
- The nature of risk practitioners or the culture within risk practitioners is negative risk identification and assessment.
- Risk managers don't look at risk as opportunities so that presents a challenge, in terms of positive risks.
- Risk managers should not look at opportunities, is more the responsibility of the product owner to look at risks as an opportunity.

- When opportunity risks are identified, it will allow the organisation a faster time to market and enhance efficiencies in terms of reduction of risks, post-implementation, or even in the execution and implementation phase.
- The risk manager is not empowered to identify opportunities because it must go through four or five committees. A delegation of authority could solve most of these issues.
- There's huge change management required, because risk managers will not make the decision if there is a risk to them, so it's also understanding that fail-fast approach.
- Risk managers can identify opportunities to get efficiency to get the team to ease off where there are bottlenecks or blockers.

In IT projects, there is a perception that risks are harmful and less focus is placed on risk as an opportunity (Moran, 2014). This was confirmed by the responses, which suggested a lack of focus on opportunity risk by the risk managers.

Denney's (2020) exploratory qualitative study investigated how practitioners used positive risks as opportunities in project management to improve the likelihood of successfully meeting project objectives. The responses in the current study confirmed that there is a need to guide the risk managers on how to use opportunity risks in projects.

In the cultural theory, individualists fear that others will control their freedom and tend to see risk as an opportunity (Oltedal et al., 2004). The respondents mentioned that the risk managers did not see risk as an opportunity, and this

could be because risk managers are not aligned to the individualist way of thinking.

The opportunity risk interconnected responses as shown in Figure 18 point to respondents who are of the view that there should be a focus on opportunity risk.

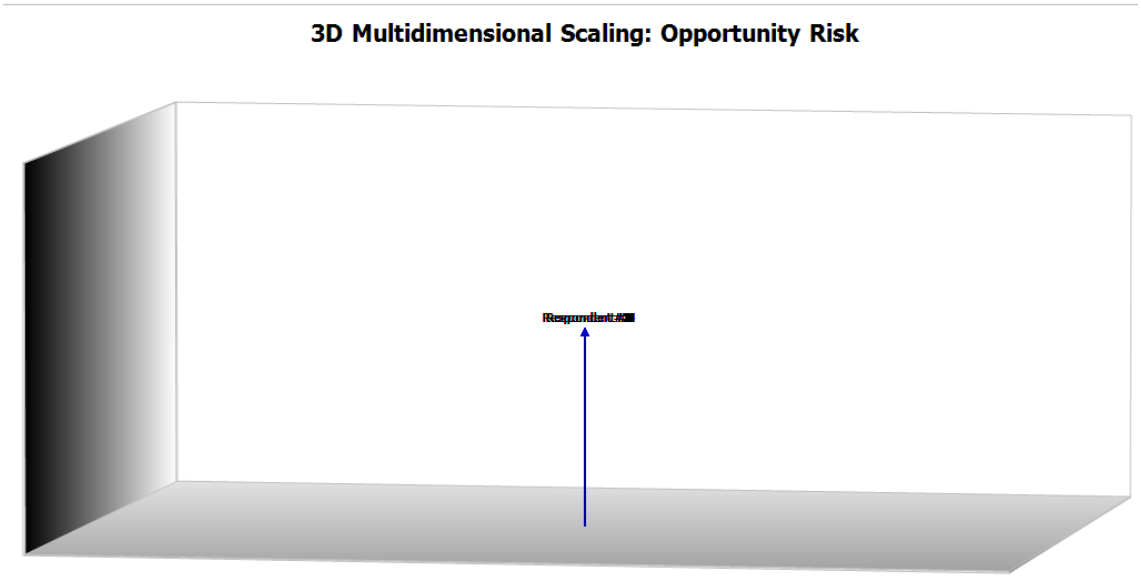


Figure 18: 3D multidimensional scaling – opportunity risk

5.5 Discussion of Proposition 3 – Benefits of adopting an agile risk management approach

The following sentiments on the benefits of adopting an agile risk management approach were extracted from the intelligent transcripts:

- Business, IT department and risk management function alignment.
- Early risk identification and embedding mitigating controls into IT projects.
- Project cost reduction, risk reduction and predictability.
- Visibility by risk management as well as a reduction in rework.

- Relevant data received on time will ensure a quicker time to market for the IT project.
- A better understanding of the customer or client.
- Ability to manage changing priorities.

The benefits of an agile risk management approach are risk awareness built into agile practice and evaluation of value add to the customer (Parente, 2014). These are benefits that were also identified by the respondents.

In the 14th annual State of the Agile survey, 37% of the respondents gave as their reason for adopting an agile methodology to reduce project risk, with 34% stating that technical risk identification and measurement before deployment were valuable (Digital.ai Software, 2020). Among the most mentioned benefits of implementing an agile methodology was reduced project risk at 51% (Digital.ai Software, 2020). It was clear in the current study that the majority of respondents identified the benefit of adopting an agile risk management as reducing project risks.

Figure 19: 3D multidimensional scaling – benefits link the responses in the analysis of the benefits of adopting an agile risk management process. It demonstrates the interconnected responses based on the code colours (blue, red and green). The colours suggest that the majority of respondents are aligned in terms of the benefits.

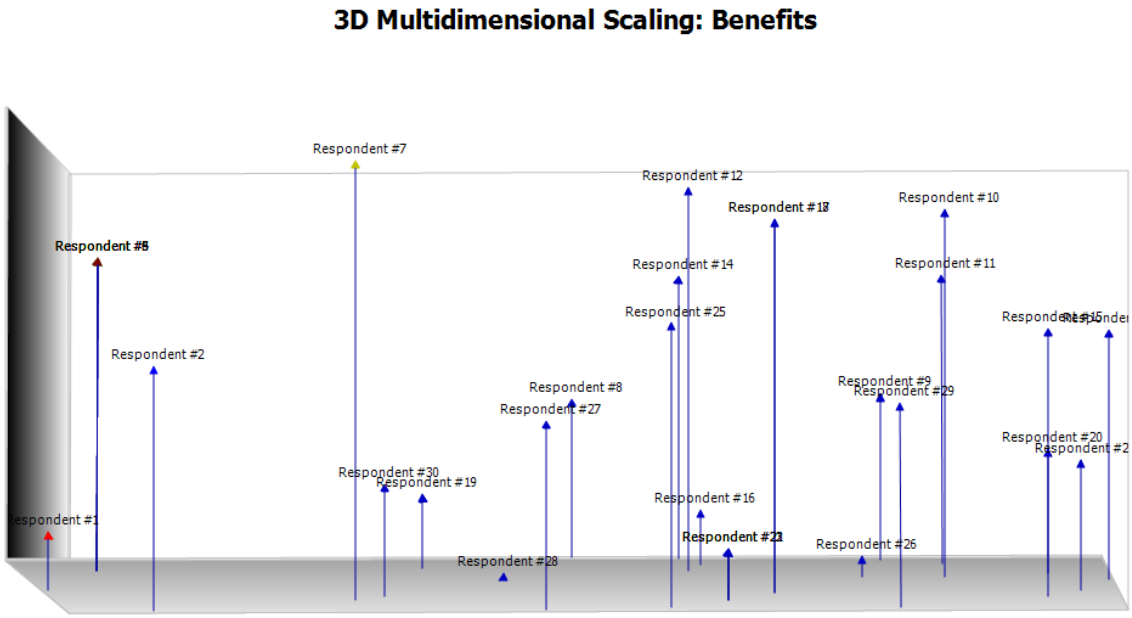


Figure 19: Link analysis of the benefits of adopting agile risk management

5.6 Conclusion

To summarise the sentiments discussed above the following themes were considered:

- Risk must not be in the team.
- Risk should form part of the team.
- Risk creates a risk log.
- Risk should enable.
- Joint accountability
- Risk core part of Scrum.
- Risk role to provide oversight.
- Traditional risk its rigid.

- Traditional risk tick box.
- Traditional risk is not risk adjusted.
- Risk management process is the responsibility of:
    - Partnership
    - Group accountability
    - Scrum team
- Current tools, techniques and methods are:
    - Work but not sufficient
    - Not relevant
    - Not adequate
- To ensure opportunity risks are identified:
    - Change in mindset and focus
    - Manage uncertainty

Table 5 aligns the research objectives, interview questions and propositions with the conclusions reached by the study.

Table 4: Traditional risk management versus agile risk management characteristics

RO #	Research Objective and Interview Questions	Proposition	Conclusion per Objective and Proposition
A	Objective – Identify the role and involvement of risk management in executing IT projects through an agile methodology.		
1.1	What is the role of risk management/managers when applying the agile methodology in IT Projects?		Tavares et al. (2017) note that project management neglects risk management. Risk management should form part

RO #	Research Objective and Interview Questions	Proposition	Conclusion per Objective and Proposition
		Risk management plays a role in IT projects executed through an agile methodology.	of the Scrum team and its role is to provide advice on, monitor and report on project risks and other sources of risk.
1.2	Is the traditional risk management process adequate to manage risks in agile methodology?		Buganová and Šimíčková (2019) state that each project is specific, which creates typical risks with unique reasons that must be managed and monitored for the project to succeed. Traditional risk management is not adequate in an agile environment; however, it has a role to play. There is a need to improve the speed and agility in decision making by risk management.
1.3	Who is responsible for identifying, assessing, and monitoring risks in the agile method i.e. (scrum master, product owner, dev or risk practitioners, or scrum team)?		The cultural theory provides four options to use when identifying risk and respondents were aligned with a group or collaboration option within the Scrum team to identify risks. Egalitarians, who are high group but low grid, prefer collective decision making and tend to be skeptical of experts (Tansey & O'Riordan, 1999).
B	Objective – Explore the tools, techniques and methods to enhance early risk identification to result in opportunities when delivering IT projects		

RO #	Research Objective and Interview Questions	Proposition	Conclusion per Objective and Proposition
1.1	Do you think the existing tools, methods, or techniques are appropriate to identify projects and other sources of risk in the agile method?	The tools, techniques and risk management methods can enhance early risk identification to identify opportunities in IT projects.	Most of the respondents agreed that the existing tools, methods and techniques are not adequate, although there are areas that have learnt to use them. But there is a need to automate to have continuous use of agile tools. Hijazi et al. (2012) argue that risks are unavoidable in most software development methodologies and require risk management processes to be improved.
1.2	How are positive (opportunity) risks in the project identified, assessed, monitored in IT projects delivered in agile?		In IT projects, there is a perception that risks are harmful, with less focus on risk as an opportunity (Moran, 2014).There is a gap and a need to provide guidance and focus on risk as an opportunity.
C	Objective – Investigate the benefits of an agile risk management process in IT projects delivered using an agile methodology		
1.1	What are the benefits of adopting an agile risk management methodology?	There are benefits in adopting an agile risk management process in IT projects delivered using an agile methodology.	There is a substantial difference in implementing the risk management process between the traditional delivery method, which follows an explicit risk management process, and the agile approach, which integrates the

RO #	Research Objective and Interview Questions	Proposition	Conclusion per Objective and Proposition
			risk management process into each project stage and relies on regular communication, sprints and testing (Buganová & Šimíčková, 2019). All respondents agreed that there will be benefits should risk management adopt new ways of working through the agile risk management approach.

CHAPTER 6. CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The research problem was that in terms of the traditional risk management process that is currently largely used, risk management functions are not mandatory before and during the execution of IT projects by the Scrum team. The purpose of this study was to investigate the role of risk management before and during the execution of IT projects and to establish whether the involvement of risk management will enhance early risk identification. The study also aimed to identify the benefits of using an agile risk management process, by answering the following three propositions:

- Proposition 1 - Risk management plays a role in IT projects executed through an agile methodology.
- Proposition 2 - The current tools, techniques and risk management methods can enhance early risk identification to identify opportunities in IT projects.
- Proposition 3 - There are benefits in adopting an agile risk management process in IT projects delivered using an agile method.

This chapter addresses the research objectives by incorporating all the findings from all the data collected about the propositions. Propositions 1, 2, and 3 are informed by research objectives 1, 2, and 3 respectively.

On the basis of the conclusions reached, recommendations are made and suggestions for future research are provided for all stakeholders interested in this field of study.

6.2 Conclusion regarding Research Objective 1 – To identify the role and involvement of risk management in executing IT projects through an agile methodology

The study's first objective was to identify the role and involvement of risk management in executing IT projects through an agile methodology. To achieve this objective three interview questions were discussed with the respondents:

- The role of risk management when involved in IT projects executed through an agile methodology
- This included ascertaining whether the traditional risk management process is adequate to manage risk in the agile environment.
- In addition, this objective aimed to establish who is responsible for the risk management process (identifying, assessing and monitoring risks) in the Scrum team according to constructs identified in the cultural theory.

The findings confirmed that risk management functions, have a role to play in IT projects executed through an agile methodology, however, risk management functions are not always involved before and during the execution of IT projects by the Scrum team. In addition, the traditional risk management process is not

adequate for agile risk management as it still relies on committees to make decisions. Furthermore, based on the cultural theory the risk management process is the Scrum team accountability.

As a result of these findings other sources of risks may not be identified early. Hence, risk management functions need to establish a clear role and responsibility for risk managers when they are involved in IT projects executed in agile approach. Respondents proposed that the risk managers who form part of the risk teams should be allowed to delegate authority for different risk management tasks. In addition, in the development and execution of IT projects, identifying risk is a collaborative and group responsibility, with each Scrum member further having a responsibility to identify risk in their respective areas of expertise.

6.3 Conclusion regarding Research Objective 2 – To explore the tools, techniques and methods to enhance early risk identification to result in opportunities when delivering IT projects

This objective aimed to explore the risk management tools, techniques and methods used to enhance the early identification of risk to result in opportunities when delivering IT projects.

To achieve this objective interview questions were discussed with the respondents:

- The existing tools, methods, or techniques are appropriate to identify projects and other sources of risk in the agile method.
- The identification of positive (opportunity) risks in the project identified, assessed, monitored in IT projects delivered in agile.

The findings confirmed that existing tools, methods and techniques are not adequate to manage risks in IT Projects. In addition, there is a gap on how to identify opportunity risks in IT projects. Respondents proposed there is a need to automate the tools, methods and techniques used by risk managers to ensure that risk is an enabler, as well as guidance to be provided to the risk management functions on how to identify opportunity risks in IT projects.

6.4 Conclusion regarding Research Objective 3 – To investigate the benefits of an agile risk management process in IT projects delivered using an agile methodology

The third research objective was to identify the benefits of using an agile risk management process in IT projects delivered using an agile methodology. The findings were clear that there are various benefits to be achieved when an organisation adopts an agile risk management process, such as:

- Skills transfer and cross-skilling will be enabled within the Scrum team.

- Early risk identification will result in no surprises at the end of the project.
- Embedding risk within the product will ensure a proactive common understanding of risk.
- Risk velocity and change will be better managed, and
- An agile risk management approach will bring structure and a healthy team as well as collaboration along all lines of defence.

6.5 Recommendations and/or practical and theoretical implications

The benefits of adopting new ways of working for the risk management function were identified and proposed by all the respondents. The practical implications for risk management are summarised in the following recommendations.

Firstly, all risk managers need to attend agile methodology training to gain a better understanding and knowledge of the new ways of working.

Secondly, the executives and senior management must set clear tone from the top that the organisation is adopting an agile risk management approach.

Thirdly, risk management responsibility should be documented using the risk responsibility assignment matrix RACI (Responsible, Accountable, Consulted and Informed) to ensure that risk management is implicit in the agile methodology used in the organisation.

Fourthly, a clear change management process should be followed to change the risk culture and mindset of risk managers to ensure that risk opportunities are identified.

Lastly, a schedule of delegation of authority should be documented to grant the authority and power to risk managers to make decisions before and during the execution of the IT projects they are involved with.

6.6 Suggestions for further research

The following suggestions are made for future research:

- The case study was performed in one organisation. Future research could be performed in other organisations, industries and countries to verify the findings of this study and establish the benefits of adopting an agile risk management approach in other contexts.
- Further research could concentrate on the development of an agile risk management framework that could be used for risk management processes within IT projects.
- Lastly, research could be undertaken to explore the impact of agile risk management when used in general risk management practices and not only the IT projects executed using an agile methodology.

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APPENDIX A – INTERVIEW GUIDE

1. **Preliminaries:**
    a. Introductions – Thank the respondents for their participation.
    b. Purpose of the interview – To investigate an agile risk management process to enhance early risk identification within IT software projects delivered using an agile methodology.
    c. Duration of the study – The interview will take 45 minutes.
    d. Recording of the interview - With respondent permission, I would also like to audio record the interview using Microsoft Teams.
    e. Confirmation before the interview starts – Request the respondents to ask any questions.
2. **Questions**

RO #	Research Objective and interview questions	Proposition
A	Identify the role and involvement of risk management in IT projects executed through agile methodology	
1.1	What is the role of risk management/managers when applying the agile methodology in IT Projects?	Risk management has a role when IT projects executed through agile methodology. (Everything surfaced from the literature review)
1.2	Is the traditional risk management process adequate to manage risks in agile methodology?	
1.3	Who is responsible for identifying, assessing, and monitoring risks in the agile method i.e. (scrum master, product owner, dev or risk practitioners, or scrum team)?	
B	Explore the tools, techniques, and methods to enhance early risk identification to result in opportunities when delivering IT Projects	

RO #	Research Objective and interview questions	Proposition
1.1	Do you think the existing tools, methods, or techniques are appropriate to identify projects and other sources of risk in the agile method?	The tools, techniques, and risk management, methods that can enhance early risk identification to identify opportunities in IT projects (Everything surfaced from the literature review)
1.2	How are positive (opportunity) risks in the project identified, assessed, monitored in IT projects delivered in agile?	
C	Investigate the benefits of an agile risk management process in IT projects delivered using an agile methodology	
1.1	What are the benefits of adopting an agile risk management methodology?	There are benefits when adopting agile risk management process in IT projects delivered using an agile method (Everything surfaced from the literature review)

APPENDIX B – THE PARTICIPANT INFORMATION SHEET

Participant Information Sheet

Dear Sir / Madam,

My name is Wandile Mazula, and I am a Master's student in Digital Business at the University of the Witwatersrand, Johannesburg. As part of my studies, I have to undertake a research project, and I am investigating an agile risk management process to enhance early risk identification within IT software projects delivered using an agile methodology under the supervision of Dr Manessah Alagbaoso. The aim of this research project is to adapt the traditional risk management process to an agile risk management process when delivering IT projects using the agile Scrum framework.

As part of this project, I would like to invite you to take part in an interview. This once of activity will involve answering questions and will take around 45 minutes. With your permission, I would also like to audio record the interview using a Microsoft Teams. This recording will be stored in Ms teams and only the researcher will have access to this recording. It will be deleted after three years.

There will be no personal costs to you if you participate in this project. You will not receive any direct benefits from participation but there are no disadvantages or penalties if you do not choose to participate or if you withdraw from the study. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, we will stop the interview or resume another time.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. If you wish to receive a summary of this report, I will be happy to send it to you. The data collected from this research project will be stored in one drive and will be kept for three years. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za

Yours sincerely,
Wandile Mazula

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Supervisor:
Dr Manessah Alagbaoso, 072 922 0206

APPENDIX C – PARTICIPANT AGREEMENT FORM

Agile Risk Management in IT Projects Delivered Through Agile Methodology

Wandile Mazula,

I, ..., agree to participate in this research project. The research has been explained to me and I understand what my participation will involve. I agree to the following:

(Please circle the relevant options below).

I agree that my participation will remain anonymous	YES	NO
I agree that the researcher may use anonymous quotes in his / her research report	YES	NO
I agree that the interview may be audio recorded	YES	NO
I agree that the information I provide may be used anonymously after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained.	YES	NO

Due to the interview conducted on-line acknowledge that the research can sign the form on my behalf.

.....(signature)

..... (Wandile Mazula)

..... (date)

APPENDIX D – ETHICS APPLICATION FORM

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School

Instructions

1 This workbook must be completed by all MM and MBA students.
2 Completed applications must be submitted to the relevant Programme Manager.
3 Applications may be submitted electronically; no hardcopies will be accepted.
4 Incomplete or handwritten applications will NOT be considered and will be returned.
5 Supporting documents must be provided electronically.
6 All fields MUST be completed; fields that are not applicable are greyed out.
7 Drop-down lists are used to indicate valid entries.
8 This sheet plus all **ten** numbered worksheets must be completed.

Complete this checklist to show what documents you have submitted.

		Filename:
X	Completed Ethics Application Form	*WBS HERC Ethics application form - W Mazula 1773*
X	Copy of the Research / Project Proposal	*Agile Risk Management in IT Projects Delivered Thr*
X	Copies of proposed research instruments	*Appendix A - Interview guide*
X	Participant Information Sheets	*Appendix B - Participation form*
X	Consent forms	*Appendix C - Particpant agreement form*
	Relevant permission letters	