

**The Influence of Agile Management Processes on Risk
Management and Performance: Case UAE Construction
Sector**

تأثير عمليات الإدارة الرشيقة على إدارة المخاطر والأداء: حالة قطاع
البناء في دولة الإمارات العربية المتحدة

by

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of the requirements for the degree of
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Abstract

With the rapid and dynamic nature of construction projects in recent years, risk management has become highly important to navigate through the uncertainties that come with construction projects. However, the traditional approach has not been keeping up with these changes, and that can be noticed from the performance of the construction projects in recent years since cost and time overrun have been recurring problems in the construction sector. Agile management has risen in the IT sector as a substitute for traditional management, to introduce flexibility to the project and enhance the delivery of the project. The purpose of this paper is to study the influence of agile management processes on risk management and project performance of construction projects in the UAE. To understand the implications of agile management on risk management and project performance in construction projects, a number of online interviews have been conducted to assess agile management principles' impact on risk management. The interview responses have all agreed to the positive influence of agile management on risk management and project performance. After analyzing the data, a framework has been proposed consisting of agile determinants to address and manage risks and enhance construction project performance.

Keywords: agile management, risk management, construction, UAE, framework

خلاصة

مع الطابع السريع والديناميكي لمشاريع البناء في السنوات الأخيرة، أصبحت إدارة المخاطر أمراً ذا أهمية كبيرة للتغلب على الشكوك التي تصاحب مشاريع البناء. ومع ذلك، النهج التقليدية لم تواكب هذه التغيرات، ويمكن ملاحظة ذلك من خلال أداء المشاريع الإنشائية في السنوات الأخيرة، منذ أن أصبح تجاوز التكلفة والوقت مشكلة متكررة في قطاع البناء. يهدف هذه البحث إلى دراسة تأثير عمليات الإدارة الرشيقة على إدارة المخاطر وأداء مشاريع البناء في دولة الإمارات العربية المتحدة. لقد برزت الإدارة الرشيقة في قطاع تكنولوجيا المعلومات كبديل للإدارة التقليدية، وذلك لإدخال المرونة للمشروع وتعزيز تسليم المشروع. لفهم آثار الإدارة الرشيقة على إدارة المخاطر وأداء المشروع في مشاريع البناء، تم إجراء عدد من المقابلات عبر الإنترنت لتقييم تأثير مبادئ الإدارة الرشيقة على إدارة المخاطر. وقد اتفقت جميع إجابات المقابلات على التأثير الإيجابي للإدارة الرشيقة على إدارة المخاطر وأداء المشروع. وبعد تحليل البيانات، تم اقتراح إطار يتكون من محددات سريعة لمعالجة وإدارة المخاطر، وتعزيز أداء مشاريع البناء.

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Chapter 1: Introduction

1.1 Research Background

Sharifi and Zhang (1999), and Katayama and Bennet (1999) state that responding to uncertainty efficiently is the meaning of agile (as cited in Han, 2013). There is no doubt that construction projects have grown to be more complex in the last decades, and the UAE with its rapid growth in the construction sector cannot be excluded. The complexity that is associated with construction projects implies that uncertainty and changes occur during the construction project. These uncertainties have to be managed effectively to avoid risks in construction, such as cost and time overrun. Faridi and El-Sayegh (2006), and Motaleb (2009) state that because of the rapid growth in the construction sector in UAE, delay is a persistent problem (as cited in Motaleb & Kishk, 2013).

The background of this research delves into the context of the UAE construction sector, where construction with its dynamic growth is investigated. The dynamic growth of the sector is starting to get attracted to the agile methodology to be able to navigate through the risks and uncertainties that come with this growth.

While the principles of agile management have proven their influence in various other sectors, when it comes to the construction sector, its application has not been researched thoroughly yet, especially in the UAE where this topic is yet to be explored.

The impact searched for in this research not only focuses on agile management applicability to help navigate through risks and uncertainties but also on its potential influence on enhancing project performance. As the complexity of construction projects has begun to rise, agile management's influence on risk management has become important to be explored.

This research seeks to explore and investigate the relationship between agile management, risk management, and construction project performance in the UAE. By engaging with construction professionals with insights on agile practices, the study aims to guide professionals in the construction industry to better performance and contribute to the ongoing evolution of project management methodologies in the UAE.

1.2 Industry Background

The construction sector in the UAE has shown remarkable growth in the last decades contributing to the country's economy, Emirates NBD (2014) stated that at the rise of 2014, the construction industry was one of the leading sectors contributing 8.3% of the total GDP in UAE (as cited in Johnson & Babu, 2018). Abu Dhabi Chamber of Commerce and Industry (2009) states that one of the reasons that has affected the construction industry to experience growth was the growth of population that was led by more people wanting to own or invest in properties in UAE (as cited in Motaleb & Kishk, 2010). Moreover, UAE has experienced a remarkable boost with UAE awarded to host the EXPO 2020, where the construction of major and large projects needed to be delivered. (Mehran, 2016). Also, with the construction of Mohamed bin Rashid City, and the mall of the world (Kerr et al., 2013), the UAE construction sector shows that it is continuing to develop more and become one of the leading sectors in UAE. However, even with this remarkable growth the UAE construction sector still faces challenges.

Cost and time overruns are the most occurring challenges in construction projects around the world, and the UAE is not excluded. Faridi and El-Sayegh (2006) have stated that time overrun occurs in around 50% of the construction projects in UAE (as cited in Motaleb & Kishk, 2010). According to Sweis et al. (2008) generally, multiple reasons can be attributed to

time overrun such as weak planning, approval delays, and client decision-making, which all can affect project success (as cited in Motaleb & Kishk, 2010).

For instance, The Chartered Institute of Building (n.d) stated that the Dubai metro project had a lot of disagreement about the design and scope alteration, which caused the project to face an 85% increase in cost and 5-year delay (as cited in Johnson & Babu, 2020). In the same way, Maceda (2016) states that 70% of Dubai projects face a time overrun, which is associated with resources, contractual disputes, as well as approval (as cited in Johnson & Babu, 2018).

1.3 Research Aim

The research aims to assess how agile management processes can be used to manage risks on construction projects and enhance the performance of construction projects. The research will propose an agile framework that will comprise of agile determinants that can be used to manage risks and enhance construction project performance.

1.4 Research Objectives

- Appraise the literature and establish the link between agile management processes, risk management, and construction project performance.
- Ascertain the role of agile management processes in managing construction project risks.
- Establish how agile management processes can be used to improve the performance of construction projects.
- Propose an agile framework that will comprise of agile determinants that can be used to manage risks and enhance construction project performance

1.5 Research Questions

- How do agile management processes influence risk management in construction projects and ultimately impact project performance?
- What is the role of agile management processes in effectively identifying, assessing, and mitigating construction project risks?
- What are the best practices for incorporating agile management processes into construction project management, and how do these practices lead to improved project performance in terms of cost, time, and quality?

1.6 Novelty of the Research Study

Agile management was first introduced in the software development sector. And not until recently that it started to facilitate its way into the other sector. And when it comes to the construction sector, it still falling even more behind, due to the nature of construction projects. there is a noticeable gap in the literature is noticeable when it comes to agile management and construction. Moreover, there is also a gap when it comes to the study of integrating risk management in agile management processes. Vieira et al. (2020) state in their research that research was scarce when it comes to studying risk management in agile management processes. Due to these two factors, and the UAE construction sector situation, the researcher decided to see if agile management can enhance risk management and construction project performance.

1.7 Research Process

The research objective and questions have been established after a small overview of the literature research regarding the topic of the research. Then, comprehensive literature research has been conducted to explore agile management processes and principles, risk

management, and project performance. The relationship between factors has been explored mainly regarding other industries, due to the lack of research in the construction industry. Then a research method has been used to address these relationships regarding the construction industry. The data have been analyzed with regard to its corresponding themes. In the end, a proposed agile risk management has been proposed, consisting of agile determinants and their influence on risk management and project performance.

1.8 Dissertation Structure

The dissertation consists of six chapters. The first chapter is an introduction to the research that starts with a brief research and construction industry background. And also identifies the research aim, objectives, and questions.

The second chapter is literature research. This section discussed agile management principles and processes, as well as the statutes of agile management in the UAE construction sector. Moreover, it goes on to discuss the risk management processes and the parameters of project performance. Moreover, this section goes to discover the view of previous research regarding the interaction between agile management and risk management in general with no specific to the construction sector, as well as the interaction between risk management and project performance. The section continues to establish a link between agile management, risk management, and project performance.

The third chapter is the research method chapter. In this chapter, the research process is described, research method, research strategy, pilot study, sampling, data analysis, and ethics.

The fourth chapter is the analysis chapter. In this chapter, the formation, and organization of the data in the forms of themes are discussed. The section continues to provide an interpretation of the data and the meaning behind them.

The fifth chapter is the discussion. This chapter delve into the significance of each theme, and its effects on the research objective and questions. After discussing the themes and establishing the links between the factors, an agile framework is proposed to manage risks in construction projects.

The sixth chapter is conclusion and recommendation. This chapter summarizes the findings of the research and provide a conclusion to the objectives of the research. Then a set of recommendation is presented to guide the implementation of the framework into construction projects.

Chapter 2: Literature Review

2.1 Introduction

The purpose of this paper is to investigate the influence of agile management processes on risk management and performance in construction projects. By its nature, agile management represents adaptability and flexibility, and to understand how agile management influences risk management, it is important to delve into its core principles. In the next sections, the values, cores, and principles of agile management, and risk management will be discussed. This will give the foundation this paper needs as it progresses to address the relationship and its influence in the construction sector.

While the importance of agile management has been established in various sectors, especially in the IT sector. It has been noticed by the researcher that there is a lack of research about its impact on the construction sector, and the UAE construction sector was not excluded. Moreover, Vieira et al. (2020, p. 2) in their papers investigating the integration of risk management in agile management state that “It was not possible to find in these related works a comprehensive secondary study that focuses on how risk management is being integrated into Agile software development methods in general”. This shows that there is a noticeable lack of research in this area. This paper aims to fill that gap by investigating the influence of agile management processes on risk management and performance in construction projects within the UAE. The existing information about agile management’s influence on risk management from different industries will be investigated, and then its applicability in UAE construction will be studied.

2.2 Conceptualization

2.2.1 *Agile Management*

Agile management was first introduced in software development as a way to replace the traditional way of project management. Ciric et al. (2019, p. 1408) state that “basically, agility is the optimal balance between needs for stability and adequate level of flexibility”. The traditional way of managing projects resembled the stability concept of agility, where projects are developed through a series of steps planned at the very beginning of the project life cycle. This method of implementation is usually known as the waterfall method, this method while planning the project assumes that all the parameters of the project are predictable, from requirements to risks (Ciric et al., 2019). Patzak et al explain that in the waterfall method, the project is planned holistically, which means that all aspects of the project are planned at the beginning of the project, from initiation to handing off, to implementation of the project per plan without any deviation (as cited in Thesing et al., 2021). The waterfall served the projects until recently when people started realizing that projects don’t normally follow the original plan set at the beginning of the project and that the projects are subjected to a lot of changes that might affect the original plan of the project, such as customer changes, improved requirements, which might lead to cost overrun and delays due to the nature of the waterfall method. This is where agile management came into play to provide some flexibility to the project plan in response to the limitations of the traditional method. According to Ciric et al. (2019, p. 1408), APM values and origins were aligned and taken from with agile manifesto document, they state that agile “focuses on the flexibility, acceptability of change, continuous advancement and strong interaction”. So, where the waterfall method provides a structured and stable plan for the projects, the agile method provides the flexibility needed to adhere to the changes and risks that will affect the course of the project.

To analyze how agile helps in managing construction risks more than the traditional way, it is important to understand the difference between traditional and agile management. This paper will focus on the processes of agile and its effect on risk management. One of the main differences between the two methods is that the traditional method works in a sequential manner. That means the plan for the whole project is set at the beginning and expected to be followed through, and then the execution for the whole project is undergone according to that plan. Typically, traditional management goes through five phases which are initiation, planning, execution, monitoring and control, and closure. The focus is on implementing the initial plan as precisely as possible. This provides stability and structure, predictable resources, and documented planning (Thesing et al., 2021). There are many limitations when applying traditional methods, one of which is that in the first stages which is the initiation, and planning, all the parameters of the project are defined, such as goals, objectives, deadlines, and responsibilities (Thesing et al., 2021). This approach implies that every aspect of the project is predictable, where some requirements of the project cannot be identified by the project client at the beginning of the project, which results in the project not following the original plan during the execution phase (Ciric et al., 2019). On the other hand, agile management does not assume predictability from the beginning of the project, rather it gives room for changes by using an iterative approach in its process. Brechner, Sutherland, and Sutherland state that the execution of a sequential holistic plan isn't the agile focus (as cited in Thesing et al., 2021). As mentioned before, agile focuses on flexibility, and adapting to change, and that can be seen from the principles of agile that were posted in the agile manifesto which can be summarized into, adaptability to change, continuous interaction between the team, and early delivery of value (Fowler & Highsmith, 2001). By taking a closer look at the methodologies of agile, those principles can be noticed throughout their process. For instance, one of the most used

methodologies is scrum. Scrum as a methodology contains within it four events, and these four events, when implemented fulfill the agile principles. Lei et al. (2017) mention that transparency, inspection, and adaption are the pillars of scrum success. These three pillars represent the agile principles. Scrum in its essence loops around the iterative approach, and this is fulfilled by the sprints. Each sprint represents one iteration, and each iteration has a plan and a product to be released at the end. Each iteration lasts at most four weeks. The short timebox of the sprint allows the project to be more flexible to change, since as mentioned each sprint has its plan, and this plan is formed at the beginning of the sprint. The other events of the scrum as mentioned by Lei et al. (2017) are daily scrum, review meetings, and retrospective meetings. In the daily scrum, the team meets every day to discuss the progress of the sprint and report any issues. The review and retrospective meeting are conducted at the end of the sprint. The end product of the sprint is presented to the client, and to discuss if there are any changes or obstacles the retrospective meeting is conducted. The iteration process of the scrum can cover the limitations mentioned above in traditional project management. Thesing et al. (2021) say that the upside of implementing agile is that at the outset of the project, the client might not be able to acknowledge some specific details. And with the short duration of each iteration, specifying those specific details at the outset of the project is not required.

The nature of agile management helps not only in delivering the value and the product more efficiently but also in the risk management of the project. Siddique and Hussein say “However, risks agile methods reduce risks through multiple iterations or Sprints” (as cited in Tavares et al., 2019, p. 2). Moreover, Conforto et al. (2014) state that “Feedback mechanisms, present in agile methods, help to respond to risks” (as cited in Tavares et al., 2019, p. 2).

2.2.2.1 Agile Management in UAE Construction Sector. Since the introduction of agile management, it has proved its effectiveness over the traditional method. As mentioned,

agile management was introduced to accommodate the rapid changing environments of software projects, these rapid changes are associated with cost overrun, schedule overrun, and other various risks. Many studies have investigated those concerns, for example, Ahmad et al. (2016) state that compared to the traditional approach, agile management has been shown to reduce the cost and time of projects. Another research by Han (2013) investigated the effect of agile management in reducing delays in construction projects. He states that the flexibility that is incorporated into the project by applying agile management to a project can be more stable and avoid swaying away from the project schedule.

The construction sector in general has always faced challenges in delivering projects, especially when it comes to cost and time. Cost and time overrun have been long-lasting problems in the construction sector, and the UAE construction sector is not excluded. Despite the rapid growth of construction in the UAE, this issue is still standing, Faridi and ElSayegh (2006) and Motaleb and Kishk (2010) have stated that due to weak planning and delays in approvals and client decision, cost and schedule overrun have been observed in approximately half of the UAE construction sector (as cited in Johnson & Babu, 2020). Moreover, Bajracharya and Halloum (2012) state that most of the construction projects in the UAE experience schedule and cost overruns. Agile management processes as explained before, are one of the solutions that can be applied to reduce cost and time overrun. The studies by Ahmad et al. (2016), and Han (2013), have proven that agile management can play a major role in helping construction projects to reduce cost and time in construction, and the same concept can be studied to be applied to UAE construction sector.

However, despite the rapid growing interest in agile management, there has not been a lot of research dedicated to studying the subject when it comes to the construction sector, and in the UAE construction sector, this might arise from the fact that the nature of construction

projects is not suitable for agile management. However, Owen and Codinhoto (2006) studied the applicability of applying agile management in construction projects, and they came to the conclusion that agile management is applicable in the pre-design, and design stages, whereas in the construction phase, they found it is not applicable due to nature of the construction. However, while this may have been accurate at that time, this knowledge might have been changed due to technological advancement in the construction sector. This research paper aims to raise awareness of the benefits that arise from incorporating agile management in construction projects by studying its effects on risk management and performance.

2.2.2 Risk Management

In this section, the principles of risk management will be discussed, and delve into its concepts. It is important to remember that the purpose of this paper is to investigate the effect of agile management on risk management and project performance. with the concept of agile management previously discussed, the interconnection between those two principles will be investigated in a later section.

Risk management plays a vital role in any project, by implementing the five processes of identifying, analyzing, evaluating, treating, monitoring, and reviewing risks (Hopkin, 2017), the probability of the project's success can be increased. Risk has been defined in many ways, the orange book defines it as “uncertainty of outcome” (as cited in Hopkin, 2017, p. 16), and the Institute of Internal Auditors defines it as the effect on the success of the objectives by the probability of an event occurring (as cited in Hopkin, 2017). So, the risk is an uncertainty that will impact the project whether it is positive or negative impact. Hence, it can be understood that there are different types of risk that should be managed. Hopkin (2017) in his book mentions four different types of risks, compliance, control, hazard, and opportunity risks.

Each one is dealt with differently depending on the strategy of the risk management applied in the project.

According to HM Treasury risk management is “all the processes involved in identifying, assessing and judging risks, assigning ownership, taking actions to mitigate or anticipate them, and monitoring and reviewing progress” (as cited in Hopkin 2017, p. 46). Whereas ISO Guide 73 BS 31100 defines it as “Co-ordinated activities to direct and control an organization with regard to risk” (as cited in Hopkin 2017, p. 46). It can be understood that risk management is mainly the process that helps the project deal with any risk that could impact the objective of the project, and from here the importance of it can be observed. The importance of risk management lies in the fact that it makes achieving the objective of the project easier and smoother. Risks can be destructive events that will lead the project to failure or missed opportunities restricting the project from enhancing its performance. Hopkin (2017) mentions in his book multiple reasons why risk management is an essential part of any project, he states that there are many issues that are needed for the application of risk management, such as non-stable marketplace, pandemics, resource availability, technology advancement, and many other issues that without risk management the performance of the project will decrease. One of the factors that influence the success of the project is well-executed risk management, Hopkin (2017) states that since the importance of risk management has increased, detailed reporting and information about the performance, and the risk information on the project are required by the stakeholders, which results in a higher efficiency of the project and making better decision.

Now that it has been established that risk management is essential to any project, it's time to see what constitutes well-executed risk management. There are many standards that have established a framework for risk management, and by following them an organization

can get the full potential of risk management. An example of the ISO 31000:2018 will be looked at in this paper. The ISO (2018) in their framework divided risk management into 5 processes which are, establishing the context, risk identification, risk analysis, risk evaluation, and risk treatment, with two processes that are done throughout the whole process, which are communication and consultation, and monitoring and review (as cited in Laine et al. 2021). The first process which is establishing the context deals with defining the objective of risk management, as well as which tool will be used to help with the decision-making (Laine et al., 2021; Parviainen et al., 2021). The second which is risk identification deals with recognizing all the risks that might occur and the sources of them and describing them (Laine et al., 2021; Parviainen et al., 2021). Moreover, Hosny et al. (2018, p. 2669) Say that “the objective of risk identification is to develop a comprehensive list of risks”. The third process is risk analysis, which aims to characterize the risks and their nature, by means of analyzing their likelihood and impact (Laine et al., 2021; Parviainen et al., 2021).

The next step is to evaluate the risks, which aims to compare between the risks with regard to the results of the previous step, the end result of this step is to prioritize the risks. The last step is risk treatment, in this step the decision on which strategy is used to mitigate the risks and assessing that treatment (Laine et al., 2021; Parviainen et al., 2021). The last two stages are communication and monitoring, communication refers to communicating the risks and the decision on them with the relevant stakeholders (Parviainen et al. 2021), and monitoring and review to assess the implication of the five processes as well as assessing the need for any interference regarding the decision making throughout the risk management (Laine et al., 2021; Parviainen et al., 2021). As is known, a waterfall project lifecycle consists of initiation, planning, execution, and closure. So, typically the risk management processes will be integrated into those stages. In order to understand how risk management in an agile

project will differ from a waterfall project in the case of a construction project, the way that risk management is currently integrated should be looked at. Beckers et al. (2013) in their report talked about the lifecycle approach of risk management in infrastructure projects. They divided the project into four stages which are initiation, planning and designing the project, procurement and contractual choices, construction delivery, and asset operation. The first two stages can be correlated with the first two stages of the waterfall projects. Construction delivery and asset operation are correlated with execution. They state that in the first stage, the most important step is to identify and assess the risks, “specifically in the earliest design and planning phases of a project, this may require a conscious effort to identify, assess, and, ideally, quantify the risks the project will be exposed to across its life cycle” (Beckers et al., 2013, p. 7). They move on to emphasize the need to allocate responsibilities for each risk, that is to say, allocate ownerships, “There should be an early focus on optimal risk-ownership allocation” (Beckers et al., 2013, p. 8). It can be understood from this that in the first two stages of the project, risks should be identified and assessed, by means of analysis, evaluation, and treatment of the identified risks. Beckers et al. (2013) move on to the construction delivery and mention that mitigating the risks is the focus of this stage. Moreover, they emphasized the ongoing monitoring of the progress and risks, by implementing daily meetings, and a clear image of the risk owners. Moreover, they emphasized the importance of reporting and monitoring, for the purpose of tracking the progress. In the last two stages of the construction project, the only process from the risk management framework stated by Beckers et al. (2013) was monitoring and reviewing, where they emphasized the importance of it. Schieg (2006) supports this process, in his paper he discussed the risk management process in detail and divided the project into 3 stages, start-up, manage, and close phase. He stated that the purpose of risk management in this stage is to identify possible risks in the project. In the

management phase, he mentions that monitoring the identified risks during the project execution is the main objective of risk management. In the close phase, the main objective of the risk management is to review the risks and their effect on the progress of the project.

Effective risk management is essential for the project's success, by identifying and treating those risks the project can avoid cost and time overruns, Hosny et al. (2018) state that ineffective risk management is the cause of the repeated cost and time overrun in the construction project. However, implementing effective risk management could be challenging, “the challenge of effective risk management is to turn as many of unknown risks into known risks through creative risk identification, assessment and control” (Hosny et al., 2018, p. 2667). Moreover, this challenge elevates in the construction projects with the implementation of the waterfall method for the project. “risk assessment is typically performed before construction commences and is a static, one-time effort with no capacity to incorporate real-time monitoring data or to update the risks as construction progresses” (Zhou et al. 2020, p. 1). As can be observed from the previous discussion, risk management processes that include identifying, and assessing, are all performed in the planning stage of the project. As the project commences, new risks might emerge that need to be taken into account.

2.2.2.1 Agile and Risk Management. Implementing agile management in projects can have a significant effect on the risk management processes, leading to reduced risks in projects. The most common risks in any project are cost and time overrun. That is not just true for the construction industry, but it is applicable for most of the other industries if not all. The foundation of this paper as mentioned before will be established by investigating the effect of agile management on risk management from other sectors, then assessing if it is also applicable to the construction sector.

There are many studies that have confirmed that agile management can in fact help in eliminating the risk of cost and schedule overrun. The methodology of agile management that includes iteration and increased focus on communication through meetings, as well as their adaptive abilities to the rapid changing condition of projects, has proved its effectiveness in improving risk management. A study has found that agile processes such as sprints and daily meetings, have shown remarkable results in reducing and mitigating risks (Elkhatib et al., 2022). Moreover, Vieira et al. (2020, p. 1) in their paper have concluded that “Agile methods are enablers of risk management practices”.

2.2.3 Project Performance

The ultimate point of any project is to deliver the end product to the client under the specified objective and goals. Anantatmula (2015, p. 4) emphasizes that “project performance is aimed to increase project success”. Therefore, Project performance is an essential factor to be managed and looked at in the project, since it affects the project’s success.

Regarding project management, Project success and performance have almost the same variables, meaning that the definition of project success is related mostly to three standards which are cost time quality. Anantatmula (2015) states that project success is defined around the iron triangle (cost, schedule, quality), and through time more definitions have appeared, that are fluctuating from the iron triangle. So, the project is deemed successful when it performs well in terms of completing it on time, time management, quality management, avoiding cost overrun, and adhering to standards.

However, with the evolution in the project management area, it was due that project success definition would evolve too. O’Brochta (2002) states that in the past project success parameters have been changed a lot and still changing. In 1960 technical performance was the number one parameter, then the parameter shifted towards schedule, cost, and quality in 1970.

Moreover, more parameters have been included such as customer satisfaction in 1980, and organizational impact in 1990 (as cited in Anantatmula, 2015). Moreover, De Wit (1988) explains that all stakeholders' objectives should be taken into consideration as a success parameter and not only the iron triangle, as the iron is not enough for clients who are interested in the long-term advantage (as cited in Eriksson & Westerberg, 2011). Also, De Wit (1986) defines project success as the "ability to meet the functionality and performance requirement of the project stakeholders" (as cited in Unegbu et al., 2022).

Therefore, from the above definition of project success, project performance can be defined as the measures of the success of the project in terms of its meeting its objectives. The objectives in this context vary, from its assigned time and cost to the product specifications. The project performance should be evaluated with regard to all the previous parameters that contribute to project success. Another name that is correlated with what the project performance is measuring, is key performance indicators (KPIs), "key performance indicator (KPI) is the measure of the performance of the process that is critical to its success" (Takim & Akintoye, 2002, p. 547). In the case of construction projects, the Construction Industry Board (1998) have identified 10 KPIs to be followed in order to have a good performance, and those are capital cost, construction time, time predictability, cost predictability, defects, safety, productivity, Turnover, profitability, and client satisfaction (as cited in Takim & Akintoye, 2002). It is observed that these 10 KPIs are mostly related to the iron triangle, Ward et al. (1991), Mohsini and Davidson (1992), and Ghalayini and Nobel (1996) in their papers emphasize that the iron triangle is not enough to measure the performance of construction project and that stakeholders' involvement have a great effect on the success (as cited in Haponava & Al-Jibouri, 2009).

Considering these KPIs, the next step is to understand what factors contribute to project performance. Unegbu et al. (2022) in their paper studied the relationship between project performance and project management practices. PMI (2017) have set a guideline for project management which consists of 10 knowledge area, some of which are scope management, quality management, risk management, and stakeholder management. Chou and Yang (2012) state that there are 76 practices in all 10 knowledge areas (as cited in Unegbu et al., 2022). As mentioned before project performance is defined in terms of achieving the project objectives. An effective Scope management in which the objective of the project is defined, can enhance the project's performance. Unegbu et al. (2022) found out that project performance can be enhanced by enhancing scope management.

Additionally, as mentioned before the second to last stage in the project life cycle is monitoring and control, regular checkups and continuous monitoring of the flow of the project can help the project managers to identify deviations in the project timeline, as well as cost overruns, and more. Pinto and Slevin (1987) in their paper identified 10 factors affecting the project's success: "project mission, top management support, schedule and plans, client consultation, personnel, technical tasks, client acceptance, monitoring and feedback, communication, trouble-shooting" (as cited in Beleiu et al., 2015, p. 62). Hence, monitoring and control can be considered essential factors to project performance, as they can help the project respond to deviations and take immediate action to correct them.

In conclusion, this section has provided the foundation for this paper, as it has explored project performance definition as well as established that project management processes and practices are a factor influencing project performance. And since agile management and risk management are from those practices, this paper can now explore the relationship between those variables. In the next section, those three variables will be linked.

2.3 Determinants of Safety Commitment: Theoretical Framework

2.3.1 *Theory of Dynamic Capability*

The theory of dynamic capability was first introduced by Teece et al. (1997), the theory was defined as “the ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments” (as cited in Zheng et al., 2011, p. 1036). This theory emphasizes the need for organizations to adapt to change and an uncertain world. In other words, organizations need to evolve and enhance their agility to respond more quickly to risks that might occur. Moreover et al. (2002) studied the theory and came up with a definition of dynamic capability “a learned and stable pattern of collective activity” (as cited in Zheng et al., 2011, p. 1037). In their framework, they underscore the importance of knowledge-related activities, to enhance the effectiveness of the processes.

Agile management principles as defined in the previous section are aligned with the concept of dynamic capability. As mentioned before, agile management “focuses on the flexibility, acceptability of change, continuous advancement and strong interaction” (Ciric et al., 2019, p. 1408). Hence, organizations that are equipped with agile principles will perform better in a dynamic environment and changing requirements. So, it can be said, that the dynamic capability theory suggests that agile management practices improve an organization’s ability to adapt to a rapidly changing environment, as well as respond more effectively to risks.

Risk management principles can be observed in the dynamic capability theory. As mentioned before, risk management processes that consist of establishing context, identifying, analyzing, evaluating, treating risks, and continuous control and review help to manage risks most effectively. Risk management helps organizations to adapt to changing environments by managing risks. The dynamic capability theory recognizes risk management principles and

practices. Zheng et al. (2011) in their paper expanded upon the base theory and created a framework called knowledge-based dynamic capabilities. They defined this framework as the organization's capacity to perceive, investigate, and address a changing environment, by acquiring, generating, and combining knowledge. This framework is divided into three sub-capabilities, knowledge acquisition capabilities (KAC), knowledge generation capabilities (KGC), and knowledge combination capabilities (KCC). They define the first capability which is KAC as “the firm’s ability to identify and acquire useful external knowledge” (Zheng et al., 2011, p. 1038). As well as the second capability KGC is defined as the ability of the organization to generate new knowledge with the support of new and improved procedures and methods (Zheng et al., 2011). Lastly, KCC is “the firm’s ability to integrate and apply internal and external knowledge” (Zheng et al., 2011, p. 1039). This framework supports the identification and assessment process of risk management practices and suggests that risk management in a rapidly changing environment is essential. Moreover, Teece later refined the definition of dynamic capability as the capability to support organization performance in the long term by developing, using, and protecting intangible assets (Zheng et al., 2011).

In conclusion, the theory of dynamic capability suggests that in order for organizations to perform well in a changing environment, they need to enhance their agility and flexibility. A rapidly changing environment brings risks to the organization. By embracing agile practices, the organization can adapt to change and respond to risk more effectively. Hence, from this theory, it can be established that the performance of an organization can be enhanced by implementing agile management practices and risk management.

2.3.2 Organizational Information Processing Theory

Srinivasan and Swink (2015, 2018) state that the theory of organizational information processing states that when organizations perform complex activities with a high possibility of

risks and interdependencies, they need to gather, assess, and use information properly and efficiently (as cited in Yu et al., 2021). Moreover, Fan et al. (2017) explain that according to organizational information processing theory, there are two strategies for an organization if they intend on keeping up with a changing environment, first is to gather a higher quality of information as much as possible. Second, is striving to enhance information processing capabilities (as cited in Xie et al., 2022). However, sharing information across the organization, vertically and horizontally, is an essential activity, regardless of the strategy chosen (Dubey et al., 2022).

Galbraith (1974) states that “The organizational information processing theory characterizes organizations as systems that possess both a need and ability to process information as a means to reduce uncertainty” (as cited in Cegielski et al., 2012, p. 187). This theory has three components which are, information processing requirements, information processing capabilities, and the fit between requirements and capabilities (Cegielski et al., 2012). Premkumar et al. (2005) define the information processing requirements as the gap between the information needed for decision-making and the information that is accessible to the organization (as cited in Cegielski et al., 2012). By implementing procedures to enhance the quality and quantity of information, managers try to mitigate the gap suggested by the information processing requirements. (Long et al., 2015). This lines up with the first strategy mentioned above. The second component is information processing capabilities, Tushman and Nadler (1978) define it as the capability of an organization to use and organize information meaningfully to support decision-making (as cited in Cegielski et al., 2012). As the risks elevate and the need for proper decision-making increases, effective communication, organization, and sharing of information is required (Cegielski et al., 2012). This institutes the capabilities of the organization to process information mentioned as the second strategy

previously. The third component is the fit between requirements and capabilities. Flynn and Flynn (1999) and Galbraith (1973) state that to manage risks and enhance performance in a rapidly changing environment, organizations must seek to fit between the first two components (as cited in Yu et al., 2021). In other words, the best strategy to implement is to combine both strategies, Tushman and Nadler (1978) state that organizational information processing theory suggests the implementation of both strategies, which are gathering higher quality information, as well as improving the processing capabilities, to enhance the performance of the organization (as cited in Cegielski et al., 2012). Therefore, this theory underscores the necessity and effect of decision-making and the flow of information on the performance of the project/organization.

The principles of organizational information processing theory are closely correlated with the approaches that agile management suggests. The processes of agile methodologies underscore the importance of communication, and sharing information as noticed from the daily scrum, review, and retrospective meeting. By implementing agile principles, organizations can enhance their information processing, leading them to effectively manage risks and enhance project performance. These activities emphasize that information should be shared between team members, stakeholders, and clients.

Moreover, as mentioned before, the first component of the organizational information processing theory is the gap of information needed to perform an activity. Gattiker and Goodhue (2004) and Galbraith (1973) state that uncertainty in an organization is related to the shortage of information, and the organization's main goal is to mitigate these uncertainties (as cited in Dubey et al., 2022). Christopher and Lee (2004) mention that for organizations to make decisions, they need to mitigate environmental risks by obtaining more information (as cited in Cegielski et al., 2012). These claims emphasize the importance of risk management.

The processes of risk management underscore the importance of the flow of information that is related to risks. The allocation of risk responsibilities, as well as the monitoring and control, requires the organization to implement a good atmosphere that allows for a smooth transition of information, to be able to manage risks effectively.

Lastly, the organizational information processing theory emphasizes the importance of the flow of information to enhance performance. Sanders et al. (2011) and Tokar et al. (2011) state that “Among organizations that participate in a supply chain, there is a requirement for information sharing, collaboration, and connectivity if firms are to perform at an optimal level” (as cited in Cegielski et al., 2012, p. 188). Moreover, Galbraith (1973) argues that the ability of organizations to enhance their performance is related to the ability to their information processing (as cited in Long et al., 2015). As can be seen, the performance of the project is highly correlated with the enhancement of the information processing and the flow of this information within the project. In conclusion, it can be suggested that, by implementing agile methodologies into the project, which emphasizes the importance of information sharing, the risk management of the project will be affected positively, since it also emphasizes the role of information sharing. This in turn will enhance the project performance.

2.4 Determinates of Project Performance: Empirical Review

Agile management approach when it was first introduced did not account for risk management in its methodology, Hijazi et al. (2012) state that “Risk management in Agile methods is performed implicitly” (as cited in Vieira et al., 2020, p. 2). That implies that risks are being treated due to the nature of the practices of agile management (International Electrotechnical Commission 2010) (as cited in Vieira et al., 2020). Siddique and Hussein (2014) also support this claim by saying that through sprints and repeated cycles, the risk is being mitigated (as cited in Tavares et al., 2019). However, that does not exclude risk

management completely from agile methodology. Since, the mitigation of risks that occurs due to the nature of the agile practices is not enough in certain condition (Vieira et al., 2020). Therefore, risk management is an essential part of any agile project. Many studies have looked upon how risk management is being implemented in agile management, defining the most important task of risk management, as well as how effective is risk management in the agile methodology.

First, it is important to compare the implementation of risk management in a traditional and agile way. In the traditional method the risk is managed more holistically, whereas due to the nature of agile practice as explained before, risk management is embedded in the various project stages (Buganová & Šimíčková, 2019). Elkhatab et al. (2022) explain that in the traditional method, there are multiple activities spread along the whole project duration, whereas in the agile methodology, the number of tasks is reduced significantly and is executed in a shorter duration, and the next tasks are executed upon the feedback received from the client. This supports what has been said in the previous section, that risk management is not included in the agile methodology. However, all risks can be assessed and managed thoroughly, and better mitigation action can be implemented if risk management is applied in agile methodology (Buganová & Šimíčková, 2019). As mentioned before, agile methodology alone is not enough to mitigate all risks.

To understand how agile management can affect risk management, the principles of agile management will be the main decider on the effect of agile management on risk management.

2.4.1 Adaptability to Change and Risk Management

One of the main principles that might be the main reason for introducing the concept of agile management is the adaptability to change. This principle can be noticed by the iteration

process that agile management revolves around. As known risks often contribute to sudden or unexpected changes that occur during the project, hence agile management comes to enhance risk management in the projects.

Elkhatib et al. (2022) in their paper studied the impact of implementing risk management in agile projects on the success of the project. they have conducted interviews, observations, and surveys to collect their data. They have found out that risk management in an agile project is more efficient than in a traditional project, and that is due to the fact that agile projects are divided into smaller durations to mitigate the risks and improve the quality. By taking a look at their analysis, it can be seen that agile methodologies enhance risk management practices. One of the respondents stated that risks are managed more effectively, due to the ability to manage risks in each sprint (as cited in Elkhatib et al., 2022). Other respondents also support this argument by saying that managers are able to focus and manage risks more effectively due to limited tasks in each sprint (as cited in Elkhatib et al., 2022). Moreover, another argument that was raised is the faster response and identification of risks by managers, due to one of the agile practices which is the daily meeting (as cited in Elkhatib et al., 2022).

2.4.2 Continuous Interaction and Risk Management

The second principle that will be looked at is the continuous interaction. The practices of agile management such as daily meetings and review meetings can be representative of this principle. The daily meeting focuses on the team members, and the review meeting happens after each sprint to make sure that the client is in the loop of the project.

A study by Tavares et al. (2019) where they have investigated risk management practices that are implemented in agile methodology. They have investigated 129 works that have suggested 127 risk management practices that could be applied in agile management

methodology. They suggest that projects that implement agile management, notice a significant improvement in risk management. They furthermore divided the risk management practices among the different components of agile methodology, and each component is divided into subcomponents. The five components were artifacts, events, features, roles, techniques, and methods. A questionnaire was distributed to analyze the most important components of applying effective risk management. They found out that the most important was artifacts. Moreover, Respondents also classified the most important subcomponents of agile management that have to be applied to ensure effective risk management, the top 5 subcomponents were daily meeting, increment, prototype, product backlog, and sprint planning. It has been justified as to why the daily meeting was ranked as the most important subcomponent, and that is due to the risk management practices that are applied to them, which can be summarized as communication and sharing risk information, identifying and assessing risks, monitoring those risks, as well as coordinating plans on what should be done during the day. And identifying, assessing, and making response plans could also be done during the sprint planning. Hence, during the sprint planning risks are being identified and analyzed, to ensure the success of the project, moreover, during the daily meeting those risks are being monitored, and also defining the response plans that have been developed during the sprint plan.

This all enhances risk management and encourages communication between team members, which was also identified as an important subcomponent. Continuous communication and collaboration were listed as the most important features of agile management. Beck et al. (2001) state that the interaction between team members is underscored in the values of the Agile manifesto (as cited in Tavares et al., 2019).

The result of this study shows how important is continuous interaction in risk management, and how agile management with its practices can enhance risk management by enhancing communication and interaction between team members.

2.4.3 Inspection and Risk Management

The third principle is inspection. Inspection is a very important principle for agile management due to the fact that agile management is all about flexibility and adapting to change, and that will not be possible without a good inspection and monitoring of the project to identify possible risks and changes that are mandatory to respond, to prevent problems in the project. These principles can be also observed from the daily meeting, as well as review and retrospective meetings.

The study by Tavares et al. (2019) investigated risk management practices that are implemented in agile methodology. As mentioned before, the daily meeting was ranked as the most recommended activity to be implemented to enhance risk management. This was justified by the following reasons:

- In the daily meeting, risks can be monitored as well as their response plan
- Risks can be identified and analyzed during those meetings

Moreover, in those meetings, the team members can communicate what have they faced during the day before and what will they achieve today. Conforto et al. (2014) say “Feedback mechanisms, present in agile methods, help to respond to risks” (as cited in Tavares et al., 2019, p. 2). The feedback mechanism makes the inspection of risks happen on a daily basis, which helps in identifying any new emerging risks and monitoring the risks identified.

Moreover, Vieira et al. (2020) in their paper, researched how agile management methodology integrates risk management into its methodology. They have found 18 papers that have studied the implementation of risk management into agile and found out that risk management is mostly being integrated into scrum methodology. It was reported that risk management have performed in a more efficient way, due to agile practices, in most of the paper that have been analyzed by them. Schmietendorf et al. (2002) state that agile management methodology improves risk management practices (as cited in Vieira et al., 2020).

2.4.4 Risk Management and Performance

Most of the research that will be presented in this section has been looking at the impact on performance by the risk management practices individually, and not as a whole. For instance, Roque and de Carvalho (2013) in their paper studied the impact on IT project performance by implementing risk assessment. They surveyed 415 projects in the IT sector in Brazil. They found that there was a huge effect on project performance when projects implement risk assessment strategies. That is due to the ability of the team members to identify and manage risks. They concluded that the project performance is positively impacted by the implementation of risk assessment and the use of risk management strategies (as cited in Kinyua et al., 2015).

Moreover, Jun et al. (2010) in their paper studied the impact on IT project performance by implementing risk planning. The data was collected by mail and email from 181 managers in China. Managers were providing the data considering recent projects. After analyzing the data, they found that between risk planning and project performance, exists a positive relationship. They concluded that risk planning helps the project to adhere to the timeline of

the project, and the cost of the project, as well as an increase in the profit of the organization, which means that the project performance has improved (as cited in Kinyua et al., 2015).

Another paper by Juliane and Alexander (2013) studied the influence of risk management on the success of IT projects. The influence on the project performance was the main objective of the research. A questionnaire was distributed to 176 organizations. After analyzing the responses, they concluded that project performance is affected positively by risk management (as cited in Kinyua et al., 2015).

Kinyua et al. (2015) studied the impact of risk management strategies on project performance. the impact of risk management strategies on small and medium organizations' performance was the objective of their study. Questionnaires were distributed to employees of 48 ICT organizations in Kenya. The data received confirmed that risk management strategies have a positive influence on project performance.

Rabechini Junior and De Carvalho (2013) in their paper investigated the influence of risk management on project performance in different sectors in Brazil. 415 survey was distributed to different Brazilian organizations from different sectors. Two conclusion was obtained after the result was analyzed. First, there was a positive impact on project success when implementing risk management. Second, project success is highly influenced when a risk manager is appointed to the project.

Lastly, Pimchangthong and Boonjing (2017) have also investigated the impact of risk management on the IT project's success. 200 questionnaires were distributed to managers in IT organizations, and the data collected were analyzed using multiple analysis tools. The risk management processes were analyzed separately, three processes were analyzed: risk identification, risk response, and risk analysis. The result of the analysis confirmed that risk identification and response affect positively the project performance, on the other hand, risk

analysis was reported to hurt performance. They further explained that overanalyzing is the issue in this case. They stated that to avoid negative influence on the cost and the timeline of the project, risk analysis should be done carefully and not overdo it. In the end they concluded that to improve the performance of the project, all risk management processes are significant.

As discussed before, construction projects in the UAE have been facing a lot of cost and time overrun due to the rapid changes and construction risks. This section implies that agile management can enhance risk management, which will make dealing and responding to the rapid changes more efficient, which in turn will lead to project performance.

2.4.5 Issues Identified from the Literature Reviewed

The link between agile management, risk management, and project performance has been well understood from the empirical review provided in the previous section. However, it is important to note some of the issues and restriction that was observed in the literature.

First, Nelson, Taran et al. (2008) (as cited in Vieira et al., 2020) draw attention to the issue of implementing risk management into agile management. They claim that agility which is the main property of agile projects might be reduced since implementing risk management might require extra time. This was also noticed by Pimchangthong and Boonjing (2017) who found that risk analysis affects project performance negatively since it affects the timeline and cost. However, this can be resolved, by the suggestion that was provided from both papers. They suggested that implementing risk assessment using a small assessment will mitigate the issue of extra time, whereas the other paper supports this argument by suggesting to not overdo risk analysis.

Another issue that has to be pointed out, is what Tavares et al. (2019, p. 3) mentioned in their paper, where they stated the difference between risk management and agile management. They state that “Risk management usually follows a heavy-handed approach,

while agile methods advocate a lightweight approach”. This might be explained by how Campanelli et al. (2018) described the difference between waterfall and agile methodology. They state that “waterfall approaches employ the use of extensive documentation which is not the case in agile methods” (as cited in Elkhatab et al., 2022, p. 1167). However, Tavares et al. (2017) suggest the principles of agile manifesto has to be taken into consideration when implementing risk management into agile projects (as cited in Tavares et al., 2019)

Moreover, it should be noted that in the paper presented by Roque and de Carvalho (2013), although they have found that risk management improves project performance, the parameters of project performance, such as schedule, cost, etc., were not identified in the study (as cited in Kinyua et al., 2015). The same issue can be found in the study by Juliane and Alexander (2013) (as cited in Kinyua et al., 2015).

2.4.6 Chapter Summary

The relationship between agile management, risk management, and project performance was explored in this section. First, it was established that risk management is not explicitly included in agile management principles due to agile nature, nevertheless, the importance of risk management in agile management to mitigate risks was established. Later, various study was examined to explore the impact of agile management practices on risk management. Through the examination, it was found that due to agile practices, risk management becomes more efficient. It was concluded that through iterative cycles and daily meetings, agile management improves the implementation of risk management.

Moving on, the influence of risk management on project performance was explored. A positive relationship between risk management and project performance was established consistently in all the studies examined. It was shown that implementing risk management strategies positively impacted the schedule, cost, and profit of the projects.

In conclusion, the impact of agile management on risk management practices was found to be positive, which concludes that risk management is enhanced when applied in an agile environment. The project performance is enhanced as well since it was established that risk management enhances project performance. So, it can be concluded that project performance is enhanced in an agile environment.

The literature research has laid the groundwork for this paper to start assessing the influence of agile management on risk management and construction project performance in the UAE.

Chapter 3: Research Method

This section will discuss the research methodology followed in this paper. First an overview of the qualitative and quantitative method will be given. then the philosophical view, strategy, pilot study, sampling strategy, data collection method, validation and verification, ethics protocols, and finish with a summary of the section.

3.1 Overview of Qualitative and Quantitative

The qualitative and quantitative methods describe the method of collecting data for the research. Williams (2007) state that the select of research method depends on the research question. Qualitative method deals with research question that need textural data, whereas quantitative method deals with questions that requires numerical data.

Williams (2007, p. 67) states that “What constitutes qualitative research involves purposeful use for describing, explaining, and interpreting collected data”. As mentioned before, qualitative research deal with textual data, which institutes the need to explain and interpreting the meaning behind it. He also mentions that that the qualitative method doesn’t have a specific framework, because its main purpose Is to construct new theories. Alharahsheh and Pius (2020, p. 40) state that “Qualitative research aims to provide specific understanding to a phenomenon based on the ones experiencing it with less generalization”

In the other hand, Leedy and Ormrod (2001) state that quantitative research uses existing theory as its base and construct experiment and survey to test them (as cited in Williams, 2007). Ormrod (2001) explains that the quantitative approach aims to generalize a theory, and validating or establishing a connection between variables (as cited in Williams, 2007). Moreover, as mentioned quantitative research uses numerical data, which explains the claim of the purpose of quantitative research of validating relationship. Williams (2007)

mentions that the data collected in quantitative research are numerical and they are analyzed with mathematical models.

This research paper implemented a qualitative approach due to the nature of the research and the objectives of it. The influence of agile management on risk management was investigated in the literature review, however in the context of construction projects, it was not investigated in the literature. For this reason, a qualitative method was used, to conduct interviews with the relevant participants to understand the depth of the influence as discussed in the literature section.

3.2 Philosophical View of the Research Study

There are typically two main philosophical view to research, and those are positivist and Interpretivist. According to (Chia, n.d.), the positivist view considers the reality to be independent from the researcher, where his beliefs, and point of view shouldn't interfere with the results. Scotland (2012) and Saunders et al. (2012) also say that positivists views are discarding the thoughts of the researcher by focusing on the pure data (ascited in Alharahsheh & Pius, 2020). Ryan (2006) mentions that the most used philosophy in research is the positivist approach. She also states that to keep the interpretation of the researcher away from research, scientific method is used to discover human experience, and that by using experiment and observation alone researcher can have a complete idea about the research. Chia (n.d.) also mentions that through investigation, data obtained from observations, are what make good research. However, Mishler (1990) and Kuhn (1962) say that real life practices is not represented efficiently in the positivist view (as cited in Ryan, 2006). Moreover, Alharahsheh and Pius (2020, p. 41) mention one of the issues of positivist view is "Therefore, this might be challenging for researchers to gain further insight of in-depth issues to be

considered part of their research”. Lastly, they also mention that generalization of the results Is the end goal of the positivist view.

On the other hand, Alharahsheh and Pius (2020) explain that the connection between variables with regard to the context is the main focus of the Interpretivist, and that the individual experience is important to the research. Tuohy et al. (2013, p. 5) also say that “The aim of interpretive phenomenology is to describe and interpret experiences”. Unlike the positivist view, Saunders et al. (2012) mention that due to the interpretation of the researchers, the result of the interpretivist research cannot be generalized (as cited in Alharahsheh & Pius, 2020). However, Myers (2008) and Saunders et al. (2012) argue that by gathering and explaining the qualitative data from the interpretivist view, might lead to better understanding of some context like improvement affected by some variables (as cited in Alharahsheh & Pius, 2020). Also, Moustakas (1994) and Remenyi et al. (1998) argue that “This paradigm would also support the research to be more focused on the specific topic and abstain the research from heading towards more generalisation as given in the positivist paradigm” ,(as cited in Alharahsheh & Pius 2020, p. 42)

This research followed the interpretivist philosophy, because as mentioned before that agile management does not explicitly include risk management in its practices. Hence, the experience of the participants is needed to understand the effect of agile management practices on risk management if it was to be applied in construction projects.

3.2.1 Research Strategy for this Study

The construction sector has been running on the waterfall project management method for a long time, and the concept of agile management is still an emerging idea in the construction sector. For this reason, this research study implemented a qualitative method for the data collection in order to explore the influence of agile management practices on risk

management and performance. There are many strategies to be used to collect data from the qualitative method such as participant observation, interviews, focus group, questionnaires and surveys (Bleiker et al., 2019). A semi-structured interview was conducted to allow participants to share their experience, and perspective about the relationship between the variables. Bleiker et al. (2019, p. 6) say that “semi-structured interviews Semi-structured interviews often consist of more open-ended questions such as ‘how did you feel about ...’”. this type of interviews is more suited for the purpose of this research to discover in-depth to what extent does agile practices influence risk management.

3.2.2 Pilot Study

Interview questions were formed by the researcher to be used in the interviews. However, Kvale (2007) state that there is need for the interview questions to be enhanced to determine if the questions are suitable, and to avoid any weaknesses in the format of the questions (as cited in Han, 2013). For this purpose, after the interview questions have been formed, a pilot study was conducted with four participants, three from the academic sector, and one from the practical sector. After conducting the pilot study, the interview questions were revised and enhanced.

3.2.3 Sampling Strategy

Two methods of sampling were used. First, a convenience sampling where the participants were selected based on the relations of the researcher with whom have experience and knowledge to provide valuable insights on the relationship between variables. Then a snowballing technique where the participants connected the researcher to other participants. All/most the participants selected were project managers who have experience in working, or knowledge with agile management.

Also, some of the participants were selected by looking up on LinkedIn for project managers from UAE construction sector, who appear to work with agile management, or have a recent PMP certificate.

3.2.4 Data Collection Method

As mentioned, a semi-structured interview is conducted by contacting professional project managers in the field of construction in the UAE. An online interview was deemed the most suitable approach, due its applicability and advantage over face-to-face interviews in terms of being faster. After getting the participant consent to the interview, a date and time have been set for each participant to their convenience the online interview was conducted through the Zoom platform.

The interviews were aiming to ask the participants with regard to their experience, how they agile management and risk management. Themes were associated with the interview, and they are:

- Risk management challenges in construction projects
- Agile management principles
- Risk management efficiency and agile
- Agile principles and Risk management
- Challenges of implementing agile in UAE
- Project performance parameters
- Risk management and project performance

3.2.5 Data Analysis

There are two choices of analysis for the qualitative method, content analysis and thematic analysis. Thematic analysis is performed to assess the factors and the connection

between them. Content analysis is performed to obtain a ranking of what is the most important factors. This research is not interested in analysing the and discovering the most important agile management practice that affect risk management, only to understand if those practices enhance risk management or not. Hence, thematic analysis was performed.

The participant view of the interrelation between agile management, risk management, and project performance in construction projects have investigated using the thematic analysis. The interviews were transcribed fully, and the researcher have gone through the transcription reputedly to discover the common themes emerging in the data. The data segments that were deemed insightful and relatable have been coded, and later on they have been added under their related theme.

3.2.6 Ethics

This research has been conducted with consideration of the research ethics. Dooly et al. (2017) in their paper have described the ethics of the research and they are as follows:

- Trying to avoid any harm that might strike the participants
- the aim and the objective of the research will be notified to all the participants
- before conducting the research, informed consent will be done from all the participants.
- The ability to withdraw from the research will be given to all the participants
- The data obtained from the participants will be confidential and only accessible by the researcher.

Prior the interview, the participants have been sent a consent letter, asking them for their participation and ensuring them that their participation will be confidential. During the

interview, the participants have been ensured again about the confidentiality, and that the data will not be shared, and their right to withdraw from the research study.

Chapter 4: Data Analysis

4.1 Introduction

The purpose of this chapter is to analyze the qualitative data that was obtained from the research participants regarding the influence of agile management on risk management and construction project performance. A thorough thematic analysis is conducted to delve into the data gathered. Braun and Clarke (2006) state that the thematic analysis is a flexible method to identify themes in the data.

The data gathered from the interviewees, obtained the knowledge and experience of the participants and their views of agile principles and its implication in the construction industry. A further investigation was required to understand and gather the various information that needed to be revealed from the participant's insights. The thematic analysis is used to categorize and familiarize the researcher with the different themes that emerged through the interviews. According to Braun and Clarke (2006), the thematic analysis process consists of six themes that can be summarized into four steps which are, data familiarization, generating codes, identifying themes, and categorizing and analyzing the themes for the purpose of the research. By implementing a thematic analysis, the researcher was able to delve deeper into the meaning of the participant's views and make sure that their perspectives were understood.

The following sections will move step by step of the analysis of the data from data organization to identifying the themes.

4.2 Data Analysis

4.2.1 Participant Experience and Job Position

The main aim of the research was to obtain data from professionals who had experience in the construction sector, as well as knowledge of agile management practices and

principles. In order to filter such participants, the researcher found participants who had obtained the PMP certificate in recent years. The PMP certificate in recent years has started to shift its knowledge towards the implementation of agile management into its core teachings. With the construction experience and agile management knowledge, the participants were able to provide insightful data for the aid of the research. **Table 1** shows the participant's job title and level of experience in the field.

Table 1

Participant Information

	Role	Experience (years)
Participant 1	Planning engineer	5
Participant 2	Project manager	20
Participant 3	Project manager	15
Participant 4	Senior director	15
Participant 5	Construction manager	10
Participant 6	Project manager	15
Participant 7	Project manager	15
Participant 8	Project manger	10
Participant 9	Construction director	10

4.2.2 Data Preparation, Coding, and Theme Development

This section will discuss the initial stage of the analysis process. Before starting to analyze the qualitative data that are essentially human experiences, it is important to organize the data to make it easier to interpret the data with the objective of the research and its questions, and this is done by data preparation, coding, and theme development. Qualitative data are raw data that are acquired from the interviews, and these data need to be prepared in order to extract the insights from them, and this is done by transforming the interviews into textual data. In the context of this research, the primary source of data was interviews with industry professionals, project managers, and construction managers that were transcribed.

4.2.2.1 Data Preparation. The data preparation phase included a transcription of the interviews conducted with the participants. All the interviews were recorded and transcribed completely. This was done to fully understand and capture the insights of the participants, though not only reading the words but listening to the pauses and emotions of the participants as well. After the transcription was completed, they were organized and stored in a digital format to ensure ease of access during the research process, as well as to ensure the confidentiality of the participants by giving the participants special codes to differentiate between the participants without compromising their identity. Moreover, to ensure the quality and precision of the transcription, the textual data have been revised repeatedly to fix any inaccuracy that has happened in the transcription process. Also, the researcher has gone through the transcription in depth to fully acknowledge the data and the insights given by the participants. The data preparation phase is an essential phase of the pre-analysis step, to make sure that the participant's insights are fully captured. The data preparation phase consisted of transforming the recorded interview into written words and organizing them to lay the ground for the coding and development phase.

4.2.2.2 Coding Process. The second step in the pre-analysis step is the coding. Data segments that seem interesting to the researcher are highlighted and identified by using codes (Braun & Clarke 2006). The importance of coding lies in dividing the data into categories that will help in the interpretation of the data. There are two ways of coding which are inductive and deductive approaches. According to Braun and Clarke (2006), the inductive approach looks at the data and tries to identify codes that emerge from it, without relying on previous coding framework, whereas the deductive approach is driven by a framework of codes that is produced by the researcher and focuses on a specific range of data.

The coding approach that was used for the context of this research, which is studying the influence of agile management on risk management and project performance, was both the inductive and deductive approach. The inductive approach uses codes that emerge from the data, which is suitable for the nature of this research since this research can be considered exploratory in its nature. As mentioned before, the concept of agile management in construction projects is still an emerging idea. However, the deductive approach was also used to code segments of the data according to the relevant themes that have already been defined by the researcher in the previous sections. The use of both approaches is justified by the nature of the interview questions, where the questions sought the insights of the participant without influence from the researcher at the beginning, but then the researcher introduced themes to the participants that were identified from the literature research, seeking insight from the participant regarding them.

The use of the two approaches at the same time, resulted in a more comprehensive exploration of participants' insights, which in result captured the complex relationship between agile management and risk management in construction projects.

4.2.2.3 Development of Themes. The last step of the pre-analysis step is theme development. Themes refer to the collection of codes that follow the same pattern. These codes are grouped under themes that should be interpreted later based on the point of view researcher. Development of themes requires a thorough investigation of the transcribed text, to get the major themes from the individual codes. After the initial coding phase, where segments of the transcribed texts have been highlighted, patterns began to emerge. Similarity and connection between codes that represented the same concept were grouped under the same themes. The advantage of using both inductive and deductive approaches lie in comparing the data from the interview with the literature, which eases the process of grouping the codes

under themes that were identified from the literature. Codes that don't represent any existing theme, refer to the emerging themes, that comes from insights and point of view of the participants, regarding the research subject. The researcher investigated the transcribed data multiple times, to further understand the emerging themes and patterns within the data, this involved looking at the codes and how they interrelate with each other.

Once the themes were generated, they were revised by the researcher, to look upon their interconnection. Some themes might overlap with each other, which emphasizes the depth of the participant's insights. This interconnection required further analysis to understand the themes and the complexity of the connection between agile management risk management and project performance.

4.2.2.4 Integration of Theoretical Framework. The coding and theme development process were mainly guided by the theoretical framework of this research. Investigating the qualitative data using the theoretical framework helped in generating the initial codes and forming the themes. The theoretical framework in this study was related to the agile management principle and their influence on risk management which are adaptability, continuous interaction, and inspection. The initial coding was closely related to these three principles, where by using the deductive approach, the researcher was searching for segments related to these three principles. These three principles served as the expected themes, providing a structured approach to the coding and theme development process.

4.2.3 Agile Management Influence on Risk Management and Project Performance

The main objective of the research was to investigate if agile management practices would influence the risk management and project performance of construction projects. When the participants were asked, all of them agreed that agile management influences risk management. One participant stated, "agile will be helpful in managing risk considering that

agile is mainly based on, on the, on the flexibility”. Another participant stated, “yes sure. Sure, because agile, agile it is, it is meant to manage uncertainty project”. One of the participants when asked if agility helps in managing risks, gave an example of the Covid-19 situation, and how being agile helped them in navigating through the changes. He states “during the COVID-19 time, it was a sudden change, and it affected all the projects ongoing. We, took from us a time to adapt to it, to prevent the spread of the disease”. His statement aligns with the theory of dynamic capability, which suggests that to be able to navigate through a changing environment, it is important to be agile and adaptable. One more participant gave an example of the benefits of using agile practices for risk management. He mentions “so, if any risk happens in a small scope or with any individual on the team, he can communicate it easier with the rest of the teams and the rest of the parties in charge of the project, which can make it easier for them to find a solution and to cover the risk to manage it easier”. His statement is in regard to the use of iteration cycles, which divides the project into small projects or sprints. He emphasizes the effect of agile management on the flow of information, especially regarding risks. This comes in aid with the theory of Organizational Information Processing, which as mentioned before, emphasizes the importance of information flow inside an organization to enhance performance.

4.2.4 Risk Management Challenges in Construction Projects

Before delving deeper into the agile management principle and its influence on risk management, it is important first to investigate the challenges in managing risk in construction projects. The participants were asked, “Could you please share your insights on the key challenges in managing risks specifically in the context of construction projects in the UAE?”. Each of the participants gave a unique and insightful intake regarding this matter. Multiple

challenges have been identified from the responses regarding risk management in construction projects:

4.2.4.1 Unpredictability. One of the main challenges of risk management in construction projects is the unpredictability. One participant stated, “the hardest thing to register the risk or to plan the risk is the unpredictability of the situation or on the site, because you can never predict what's happening or what's going to happen through the next one month, three months, something like that”. The nature of the construction projects is that it is uncertain, that is due to the fact the duration of the project can take up to a year or five years. The long duration of the project makes it harder to anticipate risk in the long run. This uncertainty is due to the long duration of the project coming from different areas. One participant mentioned “you know, also I mentioned the risk of the changes, changes many things changes in design, changes the material, changes in the decision that might be taken for such items or such activities on the projects. This will, may impact the project”. Change in construction projects is a big factor that causes risks related to cost or time. Niazi and Painting (2017) in their paper, have found multiple reports stating that one of the most common factors causing cost overrun is frequent changes in orders. One more risk that can be considered unpredictable is human error. Participant states that “so, man errors or human errors can never be predicted. this is the main obstacle we are facing to register risks in the construction project”.

4.2.4.2 Identification and Analysis. Another challenge that emerged from the participants' answers in the challenge of identifying risks. Three participants have shared the same concern regarding the challenges in identifying risks. The first participant stated that “identifying the risk is the most important and most challenging thing because risks are, for some projects, it is certain and for other, also for other there is certain risks which the

contractor or the consultant or the employer even can know these risks, but there is other type of risk which is not certain”. The main challenge here is closely related to the first challenge which is the uncertain risks, correctly identifying the uncertain risks is the first step to managing them. Another participant also agrees by emphasizing the challenge of uncertain risks, however, he underscores the challenge of managing those risks rather than identifying them. He states “the other part during the construction time itself. identification is easier but dealing with the risk itself is a challenge”. This can be justified by the response of the third respondent, he says “and the same time once you're correctly identified the potential risks that may, may be involved in your project you need also to correctly identify its impact and its likelihood”. Identification of the emerged risks might not be possible at the beginning of the project, since it is uncertain. One participant stated, “The main challenges comes from the unknown unknowns. So basically, the risks that haven't been identified, therefore, you can't really, you haven't really planned for”. So, managing those risk when it happens will be challenging, since it hasn't been analyzed.

4.2.4.3 Site-Specific Challenges. Another challenge is related to risk management during the progress of the construction, or to put it in risk management terms, in the monitoring and controlling phase of risk management. Two participants had pinpointed the challenges in this area. One participant stated, “the most critical thing I always facing is the material delivery and lack of information and coordination between construction and design team”. The participant raised the point that the lack of communication and information flow on the site brings challenges to risk management. And that can be understood, one of the main factors that can help in monitoring and controlling risks, is the communication between team members. Sharing the information, when the risk occurs to the risk manager or project manager, is the first step to start mitigating that risk. Another participant agreed with this point

when he mentioned “if the communication have not communicated properly between the project team, maybe a mess of some items of activity will happen”. Another participant touched base on the risk challenges regarding safety. She states “Part of these challenges is to ensure all calibre of engineers and labor are able to follow these protocols and, and ensuring you know, proper inductions and proper monitoring and follow ups to avoid an incident from occurring”. Safety risks can be considered as uncertain risks, which as mentioned before is one of the major challenges of risk management.

4.2.4.4 External Risks. External Risks might be one of the most challenging areas of risk management, due to the fact that their occurrence is out of hand of the project team. Two participants have highlighted this area in two different ways. One of the participants talked about the market dynamics and how it may affect the project. he mentions an example of how due to the market dynamics, and the change that happens in the sales, the predicted project start time has been moved earlier by three months. This change might have caused the project to increase its cost, as he mentioned that they were required to obtain extra resources due to the shift in the timeline. Another participant highlighted the issue of authority approvals. She highlighted that obtaining authority approval can be challenging, especially with how the regulation keeps evolving. According to the respondent, this type of risk requires careful planning, especially by putting buffer time as cautious, to be able to adapt when it happens.

4.2.5 Agile Management and Risk Management

After the participants have been asked to identify challenges regarding risk management. The researcher asked the participants' opinions regarding the influence of agile management on risk management, and how would it help in addressing the challenges they mentioned. As mentioned in the previous section, 100% of the participants agreed that agile management plays a significant role in effective risk management. However, when they were

asked to share their views regarding agile management principles and their influence on risk management, some of the answers provided different opinions regarding its influence in the construction industry. In the following sections, the principles of agile management that were identified in the literature research will be detailed as themes and will be discussed in depth.

4.2.5.1 Theme 1: Adaptability and Risk Management. The first principle of agile management that was investigated is the adaptability principle. The participants have been asked to elaborate on whether being adaptable can help with risk management challenges that have been mentioned. Most of the participants have agreed that being adaptable helps in making risk management more effective and helps in managing risks. One of the respondents stated, "as you said, which is the first agile concept, you always need to be adaptive, with the situation around you". The participant touched base with the unpredictability challenge of risk management, where being adaptive is essential to navigating changes and uncertainty in projects. Another respondent gave an example where being adaptive is very beneficial. He states "the first principle which that adaptability also is important in terms of the you know, in the construction projects, sometimes we require some adaptability in the process, so, that we can move faster in the in the construction, especially for the fast-track projects". Fast-track projects in their nature are usually short in time compared to other construction projects, which explains the need for being adaptive since there are higher risks. Khoueiry et al. (2013), Hossain and Chua (2014), and Dehghan et al. (2015) state that rework, design, and order change are major risks that come with fast-track projects (as cited in Rasul et al., 2021). Another respondent in her statement said, "agile methodologies help you adapt to the on-site situation without causing a lot of abortive works". Her response touched base with the risk management challenge mentioned in the previous section which is site-specific challenges, as well as supporting the case of fast-track project, where it emphasizes on the agile management

role in mitigating abortive works which is one of the major risks of fast-track projects.

Another respondent had a different take on adaptability, where he linked to the project manager. He mentions “see the capability of the project manager to adapt the change In a clever way, in a strong way, bravely do and apply a change in the middle of the project to adapt the change. This is, I call it, this is agility management”. He emphasized the role of the project manager to apply agile management, and apply changes, especially in the middle of the project where changes need to be made, “how the project manager level of adaptability, applicability to adapt the change, the level of agility of the project managers that’s playing role in applying the agile principle”. However, this doesn’t neglect the importance of agile management, rather it is a give and take relationship. One respondent says “on demand approach that will allow you to take quick action or not to stick to the original plans”. The on-demand approach of the agile manager, which is the adaptability principle as the respondent has confirmed, allows the project manager to respond to changes and apply changes during the project.

From the above, it can be seen that the participants view adaptability as a necessity for risk management.

4.2.5.2 Theme 2: Continuous Interaction and Risk Management. The second principle under investigation was the principle of continuous interaction. The participants were asked if this principle can help in addressing the challenges of risk management, mostly all the participants shared a positive point of view. One participant highlighted the importance of interaction and collaboration between stakeholders, and that is including customers, “Okay. Also, the collaboration, collaboration with the customers, due to the risk which is affecting the project, collaboration with the stakeholders and the customer is very important also”. His emphasis on the matter comes in regard to addressing risks that come from customers or

clients, which are translated into changes “like the interaction between the stakeholders and collaboration between all the stakeholders is very important to manage the risks and also if these risks is resulting in some changes in the project”. His statement highlights the importance of continuous interaction in one of risk management’s challenges which is unpredictability. Another participant also highlighted the importance of interaction for risk management, he mentioned” Yes, the interaction between the team is very important. when I mentioned in the project team, I mean, all the stakeholders involved in that project, you know, we have the client, the contractors, subcontractors, the project management team, the consultants, the contractor, the third parties, all these guys, the interaction should be in a good way”.

Three more participants highlighted the role of continuous interaction in resolving the identification and analysis challenge of risk management. One participant stated “of course, of course, these are like main factors of identifying risks and managing risks. effective communication or inspections will bring data that this data can be used in the process of risk management, which will be very effective in the process of risk management”. He claims that gathering data is crucial for risk management and that effective communication is required to gather data efficiently. Another participant shared the same point of view, highlighting the importance of all parties of the project to enhance their communication for better risk management, “So, if all the teams that we have is interacting together to identify and plan for this risk, it will be prevented. If some of the teams didn't involve will that would like make the challenge more difficult to identify and manage and manage this risk”. One more participant agreed, and mentioned some of the agile practices that emphasize the role of communication in addressing risk and managing them, “So, yeah, definitely, because, when you when you do interaction, daily interaction, when you do retrospective meetings and do daily inspection and

team interaction and increase the communication, this is essential, this is essential to make common understanding and start the daily planning and daily update of any planning in order to in order to address and mitigate the risk”.

One participant highlighted the role of communication in addressing on-site challenges. She says “another point, again, I’ll go back to the health and safety and that’s, it’s very important, and it’s crucial, really to adopt these methodologies, especially with the labor class, because it will ensure proper, you know, communication, proper monitoring”.

One participant emphasized the role of communication in managing risks, he states “So managing the risks depends on the communication of the whole team together as a whole structure”. Moreover, his emphasis was not merely on communication, but rather on a communication plan specifically designed for risk management, “all of them are essential and crucial, but the most important thing is the communication plan to manage the risks”.

In the end, continuous interaction or effective communication is viewed as a bridge between risks and risk management. Where communication serves to gather data, and enforce collaboration between stakeholders for the goal of managing and mitigating risks.

4.2.5.3 Theme 3: Inspection and Risk Management. The third principle which was investigated is inspection. When the participants were asked if inspection could help in addressing risk management challenges, their answers were a little bit vague. However, after careful analysis of the responses, it was clear that all the participants agreed that inspection helps in managing risks, especially when it comes to the challenge of identifying and analyzing the risks.

One respondent stated “yes, because part of the risks management is to ensure that the quality of the product or the deliverables meet the project requirements and the specification, so inspection, as a quality control system, it is minimizing the risk very much. So, inspections

yes, it is one of the important rules in the project, in the construction process”. The participant established a link between risk management and product quality, where he claims that risks are significantly reduced in the process of quality checks.

One participant stated that the data generated from inspection is crucial for risk management processes. Another participant agreed with this claim by saying “an inspection and as (Yanni) now, we identified look at the word for inspection, it's not like a physical inspection only. My understanding to the word inspection is a continuous review of the risks and continuous follow up on the identified risks during the project duration”. This statement addresses the challenge of identifying and analyzing of risks mentioned before. He emphasizes the importance of inspection to continually identify risks during the lifetime of the project, which would help in identifying and analyzing emerging risks. He also mentioned that inspection will help in keeping monitoring identified risks, and keep monitoring its response plan.

Another participant also acknowledged that inspection is a primary factor for risk management. He says “If we do not have a micro schedule for that plan, and we are not monitoring this plan on a daily basis, by having intensive interaction between the stakeholders, the site team, a daily inspection or like a frequent inspection planned in a certain sequence of different procedures, we won't be able to see where we are with this plan because definitely when you want to eliminate a risk”. Another participant adds on this point by giving an example of inspection element, he says “during each part of the design we have a checklist for the drawings to be checked from the from the scrum master”. One participant also adds “So with these weekly site inspections, it helps reduce the risk of any mistakes, any miscommunications, any problems in construction, or issues, and to try to capture it earlier on

rather than, then it's too late.....So I think having a proper reporting system, with inspections, making sure that all the inspections are being tracked”.

The underlying insights from this section are that having regular inspections by implementing site walks, monitoring the progress of the project, and the use of monitoring tools such as a checklist, helps in keeping track of the risks and its response plan.

4.2.5.4 Risk Management and Project Performance. The participants were asked to share their observations regarding the relationship between risk management and project performance. First, the construction project performance parameters had to be identified. The participants were asked, “what aspects/parameters are taken into consideration when trying to assess the performance of a construction project?”. The responses almost were identical from all the participants. All the responses were associated with three main parameters, which are cost, time, and quality. However, some of the participants also mentioned some other parameters, such as scope, client satisfaction, goals, and objectives. The literature research has confirmed that there are other parameters to measure the project performance, however, the participant seems to agree that in the case of a construction project, the main aspects are the time, cost, and quality. See

Figure 1.

Figure 1*Performance Parameters*

The participant then started giving their observation regarding the relationship between risk management and project performance. The common theme between the participants was that effective risk management helps drive the project toward success.

One participant underscored the importance of risk management and its effect on the timeline and cost of the project. he stated, “yes, risk management it is affecting the performance by not to go in time consuming or cost overrun, by avoiding reworks or also changes in the project”. This claim has been made by many other participants, for example, “affect the project performance? Yes, it is. It is preventing us from any delays, preventing us from many mistakes, challenges”.

Risk management processes have also been highlighted by the participants, one participant states that “if you are making site inspections, that means, you know where you are as a project and if there is a defect, or something you need to fix during the communication

you are fixing, then this will affect the production rate and also this is affecting the delivery, also at the end this will reduce the cost”. That participant emphasized the role of inspection in risk management to identify risks in the project, which will as a result reduce the time and cost of the project. another participant also highlighted the role of identifying and analyzing risks, she states “Identifying your major risks and following them up throughout the course of the project is very important. Being only reactive, will probably cause the most delays and the most cost impact to a project than being proactive”. The point made by the participant is that it is important to plan ahead for risks, which is being proactive, rather than just dealing with the risks when they happen, which is being reactive. However, it is still important to be reactive and proactive simultaneously, one participant highlighted the role of agile management, by talking about the three principles of agile. He states that adopting the agile principles will lead to effective risk management, which will as a result lead to a successful project. one more participant, when asked about the relationship between risk management and project performance, stated “so, when you have a dynamic project management, when you have a modern way of project management, adaptable manager, adaptable team, dynamic team that they can definitely do the change and address the risk. It's a direct relation. I mean, it's even famous relation”. He highlights the link between being more adaptable and reactive, to better risk management, and moves on to claim that effective risk management improves project performance.

It can be seen that the participants have established a positive relationship between effective risk management and project performance. They affirmed the need for inspection and adaptability for an enhanced construction project performance.

Chapter 5

Discussion

In this section, the role of each theme will be discussed in depth with regard to its influence on managing construction project risks, as well as its influence on construction project performance. The discussion will depend mainly on the findings from the analysis, by delving deeper into the implication of the agile management process in the construction sector, which will lead to a proposed agile framework for managing risks in construction projects.

5.1 Agile Management and Construction Project Risks

To further understand the dynamic of construction project management, the findings of the analysis section revealed and highlighted the role of agile management in mitigating risks. This section will delve into those findings to ascertain the role of agile management in managing risks.

5.1.1 *Adaptability as a Risk Mitigation Tool*

From the participant's responses, the adaptability principle of agile management has been highly recognized. The flexibility that comes with agile practices has been considered an efficient tool to deal with the uncertainty of construction projects. It is also important to note that some of the participants have highlighted the idea that construction projects, in their nature, do not allow for flexibility. One participant stated, “usually the influence or impact of agile as a total to the construction projects are limited”. He continues to elaborate that construction projects usually have a clear scope and objective from the beginning unlike other projects, and the changes that happen in the construction projects are not of high altitude that would require the implementation of agile management. His idea is that agile management is more beneficial in projects that don’t have a clear scope, or are its scope are expected to change drastically, which is not the case in construction projects. Another participant adds that

“flexibility, it might be not applicable in construction project, the flexibility. Because we are stuck in between specific period of time, we need to finish within the budget within the quality requirements within it time period”. This statement is similar to the first participant's claim, that the scope and objective of construction are set from the beginning of the project. However, both of them agreed that agile management is effective for risk management in construction projects. This indicates the applicability of applying agile management only for risk management while keeping the traditional method for original construction projects. This implies the application of a hybrid approach in construction projects.

One participant stated “for example, when we want to address a risk, we have a certain risk, potential risk, okay, and been highlighted as a high risk..... how the project manager be able to adapt a change, do some modification on the plan”? Another participant says “adaptability as I told you is to during the project as well, we required to adapt some of our processes”. Adaptability as described in that statement is the ability to apply change to the plan to navigate risks or changes. Emerging risks are unpredictable in any project, and for the project team to identify, analyze, and respond to the risk, adaptability is required to make decision quickly that is required to mitigate the risk without, or with minimum impact on the project.

5.1.2 Continuous Interaction and Collaboration

The emphasis of agile management on continuous interaction in the project has been acknowledged by all the participants for its influence on risk management. The importance of communication is inherited in all the project parties, and that includes stakeholders, clients, contractors, and the project management team. Communication is an essential factor for identifying and addressing risks. One participant stated “if you take a completed project and you want to transfer the risk, sorry, the lessons to the new project, you will find that most of

these activities, the delay activity, that impacted the project, due to changes not being addressed on time, due to risk not being, it was not able to be addressed due to the rigid and the classical way of implementing the construction”. Another participant agrees by stating “lack of communication is always the main reason behind any failure of any project other than construction, but mainly in construction”. Identifying risks and analyzing them might be the first step of risk management, however, without a proper communication plan and flow of information inside the project, identifying risks will be meaningless. Effective communication is an essential part of identification and management of risks.

5.1.3 Inspection as Quality Control Mechanism

Inspection emerged from the participant's responses as one of the major risk management processes within agile methodologies. It was acknowledged that inspection is not used in quality control only, but also as a way to identify and analyze risks. Regular site inspections when done with the aid of agile management methodologies, have been identified as a major tool for early identification of mistakes, miscommunication, and potential issues in construction. Agile management practices such as retrospective meeting, review meeting, and daily meeting has been identified as means of inspection that serves to identify risks and manage them.

Moreover, it has been acknowledged by some participants, that the integration of inspection and continuous interaction is essential for effective risk management. Daily meeting, one of the practices of agile management, is an example of the integration of those two principles where the project team meets to discuss the progress of the project and if there are any obstacles faced during the project. These daily meetings can help in keeping track of the risk management plan and responses.

In conclusion, the findings from the analysis clearly state the role of agile management in managing risks in construction projects. The adaptability emphasized in agile management, integrated with the focus on continuous interaction and inspection, contributes to effective risk management.

5.2 Agile Management and Construction Project Performance

The study has uncovered valuable insights regarding the influence of agile management and construction project performance. The insights from the participants will be discussed in this section.

5.2.1 Adapting to Uncertainty for Enhance Project Performance

First, it is important to remember that the construction project performance parameters in this paper consist of the three main parameters cost, time, and quality. Participants have acknowledged that agile management has emphasized the role of adaptability in its practices, which this a major factor that helps in guiding the project through uncertainties and changes. This has been confirmed by an example from one of the participants regarding the benefits of using agile management during COVID-19, where he demonstrated that being agile helped in navigating through the sudden change that happened due to COVID-19. However, the link between adaptability and project performance is indirect, because the concept of adapting to uncertainty and change, is one of the main ideas of risk management. So, it can be elaborated that agile management enhances risk management which in turn enhances project performance. Multiple participants have emphasized this fact, one participant stated “Now the effective risk management will lead to successful project because the more you, you you're successful in managing the risks or you're you are successful in identifying risks, the more you will be successful in achieving your project”. The relationship between agile management and risk management have been established to be a positive relationship in the previous sections.

One participant states this fact clearly “if we adapt the three concept that you have mentioned earlier, effectively, and everyone was adopting them in the project and the stakeholders were adopting them, of course, it will lead to a better risk management, which will lead to a successful construction project in the end”.

5.2.2 Enhancing Communication and Collaboration

Continuous interaction has been identified as a significant theme in the findings. Participants have highlighted the importance of interaction between project stakeholders. From the analysis, the impact of continuous interaction and project performance was found to be indirect. Continuous interaction was found to be an efficient tool for addressing challenges related to risk management as has been discussed in the previous section, which will in turn lead to better project performance. On the other hand, another indirect link was established that is related to the enhancement of team culture which will in turn lead to enhanced project performance. One participant mentioned, “it definitely helps with strengthening the relationship with the team, as well, and building the trust and the environment to be able to be more productive and deliver a successful project”.

However, one participant has acknowledged a direct link between communication and project performance. She claims that if communication is not done appropriately and efficiently, it might cause a waste of time. Another participant also stated that communication should not affect the cost and time of the project, since it is a natural activity in construction projects. This statement led to the conclusion that the direct link between communication and project performance is only a negative link.

5.2.3 Inspection for Quality and Performance

The role of inspection has been acknowledged by the participants as a crucial tool for quality control, as well as the identification and management of risks. The notion that

inspection works as a tool for both risk management and quality control, indicates that there is a direct link and indirect link between inspection and project performance. the indirect link as mentioned in the previous sections with regards to adaptability and continuous interaction, comes from its influence on risk management and its direct influence on risk management, as have already been established before.

On the other hand, the direct link comes from inspection being a tool for quality control. Regular inspection directly influences the quality aspect of project performance. One participant stated “inspection actually, it's the most important thing of all of them, because after each step after each progress needs to be inspected. So, you will make sure everything is going under the specifications”.

In conclusion, the findings strongly show how agile management impacts project performance. adaptability, continuous interaction, and inspection have been illustrated to impact project performance, whether it was direct or indirect. Integrating agile management into construction projects can be beneficial, not only to manage risks but to enhance project performance as well.

5.3 UAE Construction Projects

It has been established by the participants that agile management has a positive impact on risk management and construction project performance. In the context of UAE construction projects, the main challenges in risk management identified by the respondents are uncertainties, identifying and analyzing risks, site-specific, and external challenges. The issue of uncertainties is a fact in every construction project, however, agile management focuses on adaptability, and regular inspection addresses this issue. If risk management incorporates in its processes principle adaptability from the agile principle, there will be a better chance of identifying and mitigating uncertainties.

The second challenge of identifying and analyzing risks can be addressed by incorporating regular inspections and continuous interaction. This challenge includes the initial identification, as well as the continuous identification during the project. The emphasis of agile management on regular inspection and communication makes it easier to identify emerging risks and analyze them before they cause disruption in the project.

The third challenge which is site-specific refers to safety issues in the project. The focus on communication in the agile principle, addresses these issues, by building a culture that understands the importance of reporting issues on a fast basis, to address risks that might impact the safety and the progress of the project.

The last challenge which is external, refers mostly to change in regulation. External challenges might fall under the uncertainty category since it can't be anticipated or identified until it is in motion.

In the end, as mentioned in previous sections some of the causes of cost and time overrun in the UAE, are attributed to weak planning, and delays in client decision and approval. These factors influence project performance, and by implementing agile management, the project can navigate through this without impacting the project performance.

5.4 Proposing Agile Framework

This section will propose an agile framework that can be used to manage risks in construction projects. According to the findings from the insights given in the analysis, the agile framework aims to address the challenges identified in risk management and contribute significantly to the enhancement of project performance. The proposed agile framework is designed in response to the dynamics of construction project management.

5.4.1 *Determinates of Agile Framework*

5.4.1.1 Adaptability. The first determinant of the proposed agile framework is adaptability. Construction projects are not free from uncertainty, which is why this was the first determinant ensuring a flexible approach to risk management. Although some participants have shared concerns regarding the rigidity and predefined scope of construction projects, this proposed framework will be tailored for risk management, which will be integrated into the traditional waterfall approach, making the proposed framework a hybrid approach to project management.

5.4.1.2 Continuous Interaction. A major aspect of the proposed framework is continuous interaction. Findings from the analysis have established a shared view among the participants on the importance of communication for the identification and management of risks. This determinant will be interpreted by conducting regular meetings, focusing on the flow of information, and lessons learned from previous projects.

5.4.1.3 Inspection. Inspection is a key determinant in agile frameworks. Inspection as mentioned before serves as a tool for identifying and management of risks. Participants have agreed that regular inspection of the project helps in identifying issues in the progress of the project, as well as monitoring risk management response and mitigation.

5.4.2 *Proposed Approach for Agile Framework: Kanban*

Proposing an agile framework within the context of a hybrid approach, the researcher saw the choice of Kanban as more suitable than other approaches such as Scrum. This section justifies the rationale for selecting Kanban over Scrum for risk management.

5.4.2.1 Simplicity. The simplicity of the Kanban approach will make it easier for its integration into the traditional waterfall project structure. Unlike Scrum, in the Kanban approach, there is no need for identifying new positions in the project team, such as Scrum

Master, or introducing new practices such as sprints. The simplicity of the Kanban approach ensures a smoother transition requiring the team to take new knowledge.

5.4.2.2 Adaptability to Construction Project Dynamics. Some of the participants have shared their concerns regarding the rigidity of construction processes, in other words, the sequential and continuous pattern of the activity. Kanban shares this principle, where activity in Kanban operates in a continuous matter, as well as without restriction to time boxes introduced by sprints in the Scrum approach.

In the end, using the Kanban approach as a framework for risk management in construction projects works well as a hybrid approach. Its simplicity, adaptability to construction dynamics, and emphasis on continuous flow make it an efficient choice for integrating agile practices into the risk management processes.

5.4.3 Agile Risk Management Framework: Kanban

In this section, the framework will be explained. The discussion will go through each risk management process and describe its implementation in the context of agile management. The Kanban process for risk management would follow the traditional method for creating a risk management plan. This includes risk identification, risk analysis, risk response plan, risk monitoring and control. After creating the risk management plan the Kanban processes will start.

5.4.3.1 Risk Backlog. The risk backlog in definition is similar to the product backlog. Lei et al. (2017) all the features that need to be developed are contained in the backlog. Similarly, the risk backlog will contain all the risks identified in the risk management plan and need to be addressed. The risk backlog purpose is to prioritize the identified risks, and this list will be flexible for adjustment during the progress of the project.

5.4.3.2 Kanban Board. Kanban boards are a tool that is used in the Kanban approach, the purpose of the Kanban Boards is to help visualize the work in progress (Lei et al., 2017), See **Figure 2**. In the context of risk management, Kanban boards will be used to track risks that are identified and the ones that are being managed at the moment.

Figure 2

Kanban Board (Powell, 2018)

Backlog		To-do (2)	Doing (1)	Done
L M	Assembly	K J	I	A
N O	Test	H G	F	B
P	Calibration	E D	C	On-hold

5.4.3.3 Implementing WIP Limits for Risks. One of the principles of Kanban is the WIP limits, which is making sure that the team only focuses on a number of risks at a time, without overwhelming the capacity. The reason for this principle is that if too many risks are being managed simultaneously, is that it might mess up the priorities, and change focus on the risks that require immediate action.

5.4.3.4 Regular Risk Review Meeting. Regular risk review meeting is similar to the daily scrum. The team needs to meet up and discuss the situation of each risk, progress on the response strategies, and discuss if any risks have emerged. Review meeting doesn't have to be conducted daily, it is tailored to the need of the project, however, they still need to be a regular event. One participant stated, "so for construction point of view, the continuous interaction, having weekly meetings, having separate design meetings that on a weekly basis, or maybe twice a week, if needed, and the frequency will, will change, depending on how big the project

is, depending on how many the level of ambiguity the client might have”. The risk manager, project manager, and the risk team should attend these meetings since identifying and mitigating risk is their responsibility.

5.4.3.5 Adapt and Prioritize. The information from the review meetings regarding the new emerging risks should be addressed immediately, by identifying, analyzing, and implementing a response plan. The backlog needs to be reviewed and updated regularly, as well as updating the Kanban board with regard to the new information from the review meeting.

5.4.3.6 Communication and Collaboration. The team members and stakeholders should be informed of the risk statues and mitigation progress. Either by attending the review meeting or informing them by any means.

5.4.4 Implication of Agile Risk Management

Kanban's approach to agile risk management was deemed the best approach according to the researcher. The proposed framework encompassed the three agile determinants in its application. The adaptability determinant is encompassed in the Kanban approach through the principle of work-in-progress (WIP) Limits. The Kanban approach restricts the number of items in progress at a given time, the items in the case of the framework are risks. Restricting the number of risks that are managed, makes the risk management adaptable to any sudden changes or emerging risks that require immediate action. The reason behind this by limiting the amount of risks managed at a certain entail that there is capacity for the risk team to manage that risk without having to stop managing any other risk.

The other determinant is the inspection. Inspection as has been established is a major factor in risk management, and in the framework proposed inspection can be seen applied in many areas. The review meeting that is conducted, encompasses the inspection determinant.

Inspection entails checking the progress of the project work, where in the context of this framework, it entails the progress of the risk response plan, as well as identifying new risks. Kanban boards also serve as a tool inspection, where Kanban boards show the progress of risk mitigation.

The last determinant is continuous interaction. The framework ensures that the communication and the flow of information between the project team is as efficient as possible. And that is done through the regular review meeting, where stakeholders gather to share information regarding the status of risk management. Another aspect of the framework that ensures communication is the Kanban board. The Kanban board acts as a progress report for the situation in the project, where anyone can understand and get the information regarding the risk management statutes.

5.5 Summary

This chapter has discussed each theme and its implication on risk management and project performance. the finding identified that applying agile management in construction projects influences risk management and project performance positively. Then the themes were considered as determinants of agile management and an agile framework was proposed for managing risk and enhancing performance in construction projects. The proposed framework is based on the Kanban approach, since it was deemed the most appropriate for construction projects, due to its simplicity and similarity to the process of construction projects.

Chapter 6

Conclusion and Recommendation

The aim of the research was to assess how agile management processes can be used to manage risks in a construction project and enhance its performance and propose an agile framework that will comprise of agile determinants that can be used to manage risks and enhance construction project performance. The literature research conducted underscored three agile principles that influence risk management and project performance, which are adaptability, continuous interaction, and inspection. To assess those principles and their influence, interviews were conducted to gather data from construction project professionals where they have shared their insights regarding the topic. The data were gathered and analyzed to understand the relationship between the factors with regard to the objective of this research.

6.1 Agile Management, Risk Management, and Project Performance

The literature research was conducted to establish a link between agile management, risk management, and project performance. A direct link was established between agile management and risk management. Agile management, with its focus on adaptability and iteration, plays a vital role in influencing the processes of risk management.

On the other hand, an indirect link was identified between agile management and project performance. The enhancement of risk management, due to the application of agile management, was found to directly affect project performance, which implies the indirect link between the two.

The sequence of links is of importance, agile management influences risk management, and effective risk management influences project performance.

6.2 Agile Management and Construction Project Risks

The finding has affirmed the role of agile management in managing construction project risks. Participants have highlighted adaptability in agile management with its applicability to managing uncertainty. Also, some of the participants did not perceive the applicability of agile management in construction projects, due to the absence of flexibility in its process. However, they have still affirmed the applicability of agile management in risk management, which suggested a hybrid approach to project management.

Moreover, the principle of continuous interaction impact on risk management has also been established. Lack of communication was acknowledged to be a factor in delays, which led to the conclusion that agile management influences risk management since it emphasizes the role of communication within its processes.

Also, the principle of inspection has been highly acknowledged for its role in identifying risks and managing them. Regular site inspection, which is emphasized in agile practices, was seen as a crucial factor for the early identification of risks.

The findings from the study affirmed the findings from the literature research, where agile management processes directly influence risk management in construction projects. This consistency provided strength to the findings of this study, highlighting the applicability of implementing agile management to manage risks in construction projects.

6.3 Agile Management and Construction Project Performance

The findings indicated that there is an indirect link between the first agile management principle which is adaptability and project performance. Where adaptability might not directly affect performance parameters such as cost, time, and quality, its influence is delivered through its influence on risk management.

Moreover, continuous interaction has been established to have a direct and indirect link with project performance. The impact of interaction on risk management indicates an indirect impact of interaction on performance. On the other hand, a negative direct link between interaction and performance has been affirmed. The findings indicate that Ineffective communication might cause time wastage.

Also, the inspection was found to have two links, one indirect due to the inspection impact on risk management. And the direct link was due to the impact of inspection on quality.

The findings from the study were found consistence with the findings from the literature research, where agile management processes indirectly influence project performance in construction projects. This consistency strengthens the findings and emphasizes the role of agile management in contributing to a better project outcome.

6.4 Agile Risk Management Framework

The proposed agile framework, based on Kanban principles, addresses the challenges identified for risk management in construction projects. By emphasizing the role of adaptability, continuous interaction, and inspection, the framework presented a tailored approach to risk management in the context of construction projects.

The principle of adaptability lies as the cornerstone of this framework. Construction projects by their nature, are filled with uncertainties. The framework recognizes that, and place focus on adaptability. Moreover, continuous interaction plays a significant role in this framework, which aligns with the importance of communication for risk management, established from the literature research and empirical review. The framework emphasizes the application of regular meetings, to ensure an efficient information flow. Also, the role of

inspection was made vital in the Kanban framework to ensure the early identification and analysis of risks emerged in the construction project.

Due to Kanban simplicity, adaptability to construction, and efficient communication, a Kanban-based framework was the most efficient choice for hybrid management, integrating agile management into risk management processes.

6.5 Limitations

While this study was able to reach its final conclusion, there have been some limitations to the study that might have tempered the result. One limitation could come from the sample participants, although the study sought to understand the agile management influence on risk management from construction professionals, no risk manager participated in the study. Due to the snowballing method used to get the sample, no risk manager was found who has the knowledge of agile management.

6.6 Recommendation

Introducing any changes in the management methodology is not an easy task, especially when it comes to the construction sector, which has been applying the traditional method for decades. That accompanies the nature of the construction projects mentioned in the previous sections about their sequential processes, making it even harder to change from the traditional method to agile management. Many respondents have shared concerns and challenges when it comes to implementing agile management in construction. One challenge that many respondents shared is the old mindset, many senior project managers who have been working in the field for 20-plus years, might show resistance to change to the new way of management. Another challenge is team maturity. Some respondents shared concern that implementing agile management in construction projects will be meaningless if the team is not willing to accept the change and change their mentality.

The next set of recommendations will try to address the above concerns:

6.6.1 Adoption of Hybrid Approach

The hybrid approach proposed in this research can provide a footstep for the construction sector to start transforming its methodology into agile. As mentioned before, the construction sector has performing under the traditional method for decades. Implementing a hybrid approach can ease the integration of agile into the construction sector, as well as understanding its implications in construction processes.

The hybrid approach to agile risk management proposed can help in addressing the challenge of old school. By implementing agile risk management, the senior project managers can get a glimpse of its application and its benefits in the construction sector.

6.6.2 Regular Training and Awareness Program

To address the mentality of the project team, regular training, and seminars can be conducted to ensure that the team remains up to date with agile practices and principles.

6.6.3 PMP Certificate

The PMI in the latest years has been shifting its focus more towards an agile management approach, ensuring its principles are being implemented in its teaching. Encouraging project managers and risk managers to apply and get those certificates, can help in slowly changing the view of the old mindset from traditional to agile management.

6.7 Recommendation for Future Research

Although the study has found that agile management enhances risk management and project performance in construction projects, the proposed framework still needs to be tested for its applicability in construction projects. The framework needs to be tested and compared to the traditional waterfall, to understand its actual impact on project performance.

By conducting this assessment, our understanding of agile management and its application in construction projects will significantly be enhanced, as well as providing a framework specifically tailored for risk management in construction projects. The insights from these studies can provide a footstep to not only applying a hybrid approach for construction but completely integrating agile management in the construction project processes.

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Appendices

Appendix A

Interview Questions

Question 1/ Could you please share your insights on the key challenges in managing risks specifically in the context of construction projects in the UAE?

Question 2/ Can you please share your experiences with agile management principles? Which agile principles have you found most effective in your work?

Question 3/ Do you believe that agility plays a significant role in effective risk management in construction projects?

Question 4/ From your experience, what specific agile management principles do you believe are crucial for effective risk management in construction projects?

Question 5/ How do you think the principle of (adaptability, continuous interaction, inspection) in agile management could help address the challenges you mentioned in terms of risk management?

Question 6/ From your perspective, how have agile principles such as adaptability, continuous interaction, and inspection influenced determinants of risk like cost control and schedule adherence in construction projects? Please share specific examples or experiences.

Question 7/ In the UAE construction context, do you believe certain agile determinants are more relevant or effective due to unique industry dynamics or regulations?

Question 8/ Based on your knowledge of agile principles, do you see any potential challenges or limitations in implementing agile practices in the construction industry to address risk management?

Question 9/ what aspects/parameters is taken into consideration when trying to assess the performance of a construction project?

Question 10/ Can you share your observations regarding the relationship between risk management strategies and project performance in construction projects? How do these factors interact in your experience?