



**AN ASSESSMENT OF FACTORS INFLUENCING
INADEQUATE IMPLEMENTATION OF RISK CONTROL
AND MONITORING TECHNIQUES.**

BY

BOKANI NQOBA MLALAZI (1774640)

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Supervisor: Dr RIA VOSLOO

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LIST OF ACRONYMS

RM Risk Management

SACPCMP South African Council for Project and Construction Management Professions

Et al	And others
PM	Project Management
SA	South Africa
CPM	Construction Project Managers

DECLARATION

I Bokani Nqoba Mlalazi, 1774640, hereby declare that this thesis, submitted for the MSc in Construction Project Management at the University of Witwatersrand, Johannesburg has not been presented to any other university or institution for any degree. All references are appropriately acknowledged. The research presented in this dissertation has been done in accordance with the university of Witwatersrand. Ethics policy and the ethics clearance reference is in annexure A.

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(Signature of candidate)

ABSTRACT

There is inadequate implementation of risk management control and monitoring techniques within the South African construction industry. Previous studies revealed that the implementation of the risk control and monitoring techniques has not been done regularly, the industry has not been using suitable techniques, there has been low implementation of the techniques by the industry and that there has been poor documentation of the risk control and monitoring process. The factors that cause this inadequate implementation of the risk control and monitoring techniques in the South African construction industry are unknown and there is little literature documented on these factors. Therefore, the study set out to identify and assess the factors influencing the inadequate implementation of risk management control and monitoring techniques during the project execution phase.

To carry out the assessment of these factors influencing the inadequate implementation of risk control and monitoring techniques the research followed a positivist philosophy and a deductive approach. The data was collected using an online questionnaire from the construction project managers and construction manager who are members with SACPCMP and data collected was analysed qualitatively through content analysis and quantitatively using inferential and descriptive statistics.

The findings showed that meetings, technical performance, risk reassessment and risk audits are the four techniques that are most frequently used within the South African construction industry, whereas variance analysis, trend analysis and reserve analysis are less frequently used. The most influential factors causing inadequate implementation of risk control and monitoring techniques are knowledge of risk management, management support and cooperation of the team and experience of the company and personnel. Then the factors that are less influential towards the inadequate implementation of the control and monitoring techniques include legislation, size of company and availability of previous cases.

This research contributes to the body of knowledge and the industrial practices, by highlighting that there is an inadequate implementation of the control and monitoring, risk management techniques in the South African construction industry. Furthermore, it has outlined factors that have caused the inadequate implementation of the control and monitoring techniques chief being the lack of knowledge on how to implement the techniques. The study recommends that the industry needs to improve the knowledge it has on the implementation of risk management control and monitoring techniques and the

management and the team needs to be more cooperative so that there is an effective implementation of the techniques.

1 Introduction

Rwelamila and Shunmugan (2014) found that there is inadequate implementation of risk management control and monitoring techniques within the South African construction industry during the execution stage. Chihuri and Pretorius (2010) previously stated that in the South African civil engineering projects the implementation of risk control and monitoring is lower and poorly done during the execution stage. Studies conducted in Chile by Serpella et al (2014) revealed a similar trend in their construction industry the implementation of risk control and monitoring techniques was unsystematic and improperly done during the project execution stage. Furthermore, in Pakistan construction projects Choudhry and Iqbal, (2014) found out that during project execution there was poor documentation and a low implementation of the risk control and monitoring techniques.

1.1 Background

Construction risk management is defined as a “comprehensive and systematic way of identifying, analysing and responding to risks to achieve the project objectives” (PMBOK, 2013 :276). The risk management process is made up of risk identification, analysis, response and control and monitoring (Junior & Carvalho, 2013; Renault et al, 2016). It is an iterative process which has to be done continuously in each and every project phase (Choudhry, 2013).

The first stage in the process is the risk identification which involves the uncovering of various risks that may be encountered during the course of the project Mahendra et al (2013). Secondly is risk analysis which ascertains the quantitative and qualitative impact of the identified risks Mhetre et al (2016). Thirdly is risk response which according to Haseeb et al (2014) encompasses taking the relevant actions to deal the identified and analysed risks. Lastly, the control and monitoring according to Pandit and Yadav (2014:117) which is a “function of project management that uses skills, tools, techniques and knowledge to establish project baseline, followed by performance measurement to update project team with timely and accurate project information”.

According to Haseeb et al (2014), the implementation of risk management in the Pakistan construction industry is very important to the success of the project and also the projects that implemented it managed to complete their projects on schedule and budget. Similarly, Serpella et al (2015) found that risk management has been beneficial to the Chilean construction industry as the project performance had improved with some companies meeting the project objectives. In a few cases that were studied in South Africa by Chihuri and Pretorius (2010) it

was revealed that in cases where risk management was implemented the projects had a more favourable outcome as compared to those that did not implement it.

Despite the benefits of risk management, Serpella et al (2015) put forward that risk management techniques in the developing countries is being implemented insufficiently thus chaining poor results and henceforth limiting the success of the project. Whereas Haseeb et al (2014) found that risk management is very significant in the Pakistan construction industry and is done by the site managers with poor documentation of the processes and risks encountered. Furthermore these authors note that there is insufficient of knowledge on the effective implementation of risk management and the practical experience in dealing with the risks is not sufficiently (Haseeb et al, 2014). A similar trend was noticed by Choudhry and Iqbal (2016), who stated that in the Pakistan construction industry risk management techniques are being implemented unsystematically and there is no documentation.

In the Chinese construction industry it was found by Tang et al's (2007) that the Chinese were not implementing the techniques in some of the projects. On the other hand Kang et al (2015) findings in Malaysia revealed that the Malaysian companies were also not implementing the risk monitoring techniques to the required standards.

In the case of South Africa, according to Cook and Smallwood (2015), a risk management system is in place, but the construction project managers are inadequately implementing it. The authors pointed out that the construction project managers mostly used experience gained from previous projects to deal with risks that emerged and didn't use laid down guidelines which have been proven to improve project performance (Cook and Smallwood, 2015). Similarly, Shunmugam and Rwelamila (2014) agree that formal risk management is place and that it is not being implemented to the required standard citing that during the planning stage there was a vigorous implementation of risk management and as the project progressed most of the identified risks were not always mitigated. Research by Chihuri and Pretorius (2010) had previously echoed that the engineering projects where not applying the principles of risk management throughout the whole project lifecycle. The authors also pointed out that there is a poor implementation of risk control and monitoring techniques during the project execution stage (Chihuri and Pretorius, 2010).

Seku et al (2015) states if the poor, substandard and low implementation of the risk control and monitoring techniques continues within the construction industry that this would result in the failure of projects. According to a survey by Chihuru and Pretorius (2010) in South African

industry they found out the lack of implementation of risk management control and monitoring techniques within the construction projects resulted in the projects failing to meet the planned budgets, delivery date and client satisfaction. Whereas a research by Cook and Smallwood (2015) in South African construction industry and another one by Choudhry (2013) in Pakistan also revealed that the incomplete implementation of risk management techniques will result in the failure to meet the project deliverables namely time, cost and quality.

A report by the PWC (2015) stated that the inadequate implementation of risk management in construction projects would reduce the competitiveness of company and endanger its survival due to the downturn in the global economy and harsher operating conditions in South Africa.

1.2 Current knowledge on factors influencing inadequate implementation of risk control and monitoring techniques.

With the inadequate implementation of risk management techniques globally authors have identified the factors that influence the implementation of the techniques these included the size, of company knowledge of risk management, experience of the company and of the personnel in construction, history of having done a similar project, management support, availability of resources, legislation, lack of benefits of risk management, cooperation of the team, and complexity of the project.

In Tanzania it was found that the industry wasn't adequately implementing the risk management techniques because they were not aware of the techniques Chileshe and Kwikasi 2013. Similarly a study by Rostam et al (2014) revealed that companies in Scotland didn't implement some of the techniques because they were not aware of them and also there wasn't enough support from the management to implement the techniques properly. Zhao et al (2013) in Malaysia realized that the contractors had insufficient resources such as money and time that caused them to fail to implement the risk management techniques. On the other Hasseb et al (2014) conducted a study in the Pakistan construction industry and found out that the small sized projects which are less complicated did not warrant the use of risk management techniques. Similarly in the Singaporean construction industry Hwang et al. (2013) realised that there was a more attention to detail in risk management for the big and complex projects as compared to the small ones.

As for the South African construction industry, Shunmugam and Rwelamila (2014) found that the professionals and contractors didn't use some of the risk techniques as they were deemed to be too complicated and difficult to implement. Seku et al found out that the size of company, level of knowledge on risk management and experience of the employees had an effect in the way risk management was being implemented.

Although it has been found that above mentioned factors have influenced the implementation of risk management in general, the factors influencing the inadequate implementation of the risk control and monitoring techniques in the project execution phase has not been fully identified internationally or in South Africa. The South African construction industry is unlike the Pakistan, Chile and Indian industries that stated that risk management was a new phenomenon to them and that they did not have a formal risk management plan. As a result it would be useful to determine the factors influencing the inadequate implementation of the control and monitoring techniques despite the industry having a formalised risk management system.

1.3 Problem statement

The research problem has been identified as:

There is a lack of knowledge as to what are factors influencing the inadequate implementation of risk control and monitoring techniques.

1.4 Consequences of inadequate implementation of risk control and monitoring techniques

The failure to implement risk control and monitoring techniques to the required standards within the project execution stage would result in:

- Projects failing to meet their planned budgets and end up causing cost overruns;
- Schedule overruns where the projects fail to meet their planned schedules;
- Failure to achieve client satisfaction; and
- Substandard workmanship and quality.

1.5 Aim

The aim of this research is to identify and assess the factors influencing the inadequate implementation of risk management monitoring and control techniques during the project execution phase. Knowing this could lead to measures being taken to improve the implementation of the risk control and monitoring techniques within the South African construction industry.

1.6 Scope of the research

The study will focus on the inadequate implementation of the risk control and monitoring techniques within the project execution stage. The participants will be selected from the construction project managers and construction managers whom are members with the South African Council for Project and Construction Management Professions (SACPCMP). These professionals whom are members with the SACPCMP and have gone through a certain vetting which ensure that they possess a certain level of experience and expertise in the management of construction projects (South African Council for Project and Construction Management Professions 2015). As a result this ensures that the respondents will be knowledgeable on the risk management practices in the industry. The study will limit the scope to the projects that were done within the last five years from 2013- 2017 so as to provide recent data as to what is happening currently. Lastly, the study only consider the large civil engineering and building projects as according to Choudhry these projects face a lot of risks and there is a greater deal to ensure that the risk management of these projects is up to standard.

1.7 Primary question

The primary research question is:

What are the factors influencing the inadequate implementation of risk management control and monitoring techniques during project execution stage?

1.8 Objectives

The literature and empirical objectives for this study are given in table 1.1

Table 1.1 Literature and Empirical objectives

Literature Objectives	Empirical Objectives
• Describe current knowledge on inadequate implementation of risk management control and monitoring techniques. • Provide the definitions of terms • Discuss the risk management process and procedures • Identify the potential factors influencing the inadequate implementation of risk management control and monitoring techniques.	• Investigate into the extent of implementation of risk management control and monitoring techniques. • Evaluate and rank the factors affecting the implementation of risk management control and monitoring techniques

1.9 Assumptions

The research had a low response rate, as a result the findings of the research are not statistically generalizable. However, the findings can be theoretically generalizable.

1.10 Limitations

The findings of study will be limited to:

- Projects done in the past five years;
- Large civil engineering and building projects;
- In the South African construction industry; and
- To the responses from the construction managers and construction project managers registered with the SACPCMP.

1.11 Constraints

The constraints of the study are:

- The research had to be done within the time frames of the academic program hence there was a limited time to carry out the research.
- Questions about the exact implementation of the techniques by participants' companies could not be asked as they are more sensitive and could result in a low response rate.

1.12 Contribution of the research

Although, risk management is a well-researched area, the literature on the factors influencing the inadequate implementation of the risk control and monitoring techniques during the execution phase is very scant hence the research intends add this scant information to the existing body of knowledge. The contribution of undertaking this study besides adding to the existing body of knowledge is that it creates awareness in the South African built environment on the importance of controlling risks explicitly on the part of the construction project management.

A study by Chihuru and Pretorius (2010) in South African industry revealed that the lack of implementation of risk management control and monitoring techniques within the construction projects resulted in the projects failing to meet the planned budgets, delivery date and client satisfaction. To improve this inadequate implementation of risk control and monitoring techniques this study will enlighten the industry about factors influencing the inadequate implementation of risk management. The knowledge of the factors will also assist the industry to come up with the necessary measures to help improve the implementation of the risk control and monitoring techniques and subsequently improve the delivery of civil and building projects in the South African construction industry.

1.13 Summary

The chapter set out to introduce the study by revealing the background knowledge of the factors influencing the inadequate implementation of risk management techniques, which was followed by outlining the consequences of the inadequate implementation of the risk control and monitoring techniques. There after the chapter stated the aims, scope of research, the primary question and objectives of the research. Lastly the chapter dealt with the limitations and contributions of the study which basically was speaking to the influences that the researcher could not control and the significance of the study to the body of knowledge and construction industry.

The next chapter which is literature review sets out to determine the current knowledge on inadequate implementation of risk management control and monitoring techniques, followed by describing the risk management process and techniques implementation in the construction world over. And ultimately to identify the potential factors influencing the inadequate implementation of risk management control and monitoring techniques.

2 Literature Review

Shunmugam and Rwelamila (2014), state that the implementation of risk management control and monitoring during project execution has been inadequate. As a result the research will endeavour to determine the factors that give rise to inadequate implementation of the risk management control and monitoring techniques in South Africa. In order to identify the factors the literature review will look at:

- Current knowledge on inadequate implementation of risk management control and monitoring techniques;
- Provide the definitions of terms;
- Discuss the risk management process and procedures; and
- Identify the potential factors influencing the inadequate implementation of risk management control and monitoring techniques.

The process of reviewing the literature comprised of reviewing electronic sources of information focused on eBooks and journals centred on the research objectives. For the initial searches the keywords used were “Risk Management techniques”, “implementation of risk management” and “Control and monitoring techniques”. There after specific searches were conducted for literature identified in earlier research papers that would add value to the current research and had topics that were aligned to the objective of the research.

Literature review focused on the following databases: Science direct, Francis and Taylor, Research gate and Google Scholar

This approach will allow the researcher to gather relevant literature as to assess the factors that cause inadequate implementation of risk management control and monitoring techniques in the South African construction industry.

2.1 Definition and Assumptions

The following are the definitions used for the terms used in the research:

- Risk management- It is a positive and proactive process that aims to reduce the likelihood of unfavourable occurrences and increases the chances of favourable occurrences in the stages of the project life cycle, (Rohaninejad & Bagherpour, 2013).
- Control and monitoring- The PMBOK (2013) identifies risk control and monitoring as

a “process of implementing risk response plans, tracking identified risks, monitoring residual risks”.

2.1.1 Assumption

For the purpose of this research it is assumed that there is inadequate implementation of control and monitoring techniques. This assumption is based on a study by Shunmugam and Rwelamila (2014) who found that during project execution there was poor monitoring of risks that emerged and the documentation of the process was not properly done.

2.2 Current knowledge on the inadequate implementation of control and monitoring techniques.

In the risk management process, control and monitoring of risks is the last stage of the process which when implemented well would result in a successful management of risks in construction projects Serpella et al. (2015). Similarly the PMBOK (2013) postulates that if this stage is implemented well during project execution it will ensure that risk management is done effectively. Furthermore Slincu et al (2014) describes that risk control and monitoring involves tracking identified risks, monitoring residual risks, identifying new risks, executing risk response plans, and evaluating their effectiveness and documenting all these. Slincu et al (2014) views are reinforced by Newby (2016) who states that all the processes and outcomes from control and monitoring should be well documented so that they may accessible to the risk management team at any time.

Despite the outcry for proper documentation of the risk, Haseeb et al (2014) states that there is poor documentation of the risk management control process in the Pakistan construction industry. The authors explain that much of the risk management is left out to the site managers who tend to document the risk encountered poorly and sometimes do not document the strategies taken to deal with the risks (Haseeb et al, 2014). To reinforce the findings a study was conducted within the same country two years later by Choudhry and Iqbal (2016). The authors went on to discover that not only was there poor documentation of the control and monitoring processes, it was unsystematically done. Shunmugam and Rwelamila (2014) revealed that the way the risk management process was communicated and documentation was imprecise, incomplete, and inconsistent throughout the value chain of construction projects in South Africa.

In as much as risk control must be documented it needs to be conducted regularly (Renault and Agumba, 2016). In spite of this assertion, Chihuri and Pretorius (2010) realised that the South African industry doesn't monitor the risks as regularly as required. The authors further stated that in some projects some risks were left unattended till it was too late and costly to minimise the effect of the risk. Furthermore in Pakistan their risk controls were done irregularly to such an extent that unfavourable events would end up occurring and most of the time the industry would rely on remedial actions instead of proactive actions to manage the risks Iqbal et al (2015).

Whereas in the Chinese construction industry, Tang et al (2007) used mean ranking to check the level of application of risk monitoring and they found that periodic document reviews were not always used including the progress reports that were seldom used during project. Just alike, in Malaysia Kang et al (2015) found that there were low levels in the implementation of the risk control and monitoring techniques. The authors postulated that not all companies perform the acceptable operations of reporting, reviewing, and monitoring the ongoing risk management activity in Malaysia. Both authors' findings are speaking to low implementation of the monitoring techniques. They suggest that the Chinese are not implementing the techniques in some of the projects and some of the Malaysians companies were not implementing the risk monitoring techniques to the required standards.

Alike to the situation in Malaysia, Seku et al (2015), made an assertion that risk control and monitoring wasn't up to standard in the South African industry. The authors further stated that that project managers used personal judgement to make decision on controlling risk and this resulted in control strategies that were not as efficient as the ones that would be conceived from the laid down techniques Seku et al (2015). The PMBOK (2013), lays out a number of techniques that need to implemented for an efficient risk control but unlike South Africa, India hasn't adopted the techniques (Pandit and Yadav, 2014). The authors found out that the contractors control measures are only limited to making and maintaining work execution schedules and progress reports leaving out most crucial techniques such as value and trend analysis (Pandit and Yadav, 2014). Kalkhoran et al (2014) is in agreement with the authors and postulates the adoption of value and trend analysis would improve the Indian risk control and allow the projects to be delivered on schedule and budget. On the same note Yusuwan et al (2008) studied the private sector clients in the Malaysia found that even on the client's side there was selective and limited adoption of the risk control and monitoring techniques. The authors explained that the clients' means of controlling the project were only on imposing

liquidated damages which are usually not effective because the contractors always crafted reasons for the delays.

Shifting the attention from the private to the public sector, it was discovered that controls in the Indian government projects were done mostly during the implementation stage only and not enough attention to project control was given during the planning stage (Pandit and Yadav, 2014). Unlike in the Indian industry, it is interesting to note that the South African construction projects the control measures are well defined at the planning stage but as the project progresses these measures are not adhered to fully (Shunmugam and Rwelamila, 2014). The authors pointed out that as the project progressed some risks went unmanaged because of poor monitoring during the implementation stage.

Studies conducted in South African industry (Shunmugam and Rwelamila, 2014; Chihuri and Pretorius 2010) and abroad (Serpella et al, 2014; Choudhry and Iqbal, 2014) have outlined how the risk control and monitoring techniques and procedures have been inadequately implemented. The studies revealed that the implementation of the techniques has not been done regularly, the industry hasn't been using the suitable techniques, there has been low implementation of the techniques by the industry and there has been poor documentation of the risk control and monitoring process. But then the factors that influence the inadequate implementation of risk management in the South African construction industry are not known.

2.3 Risk management in construction

2.3.1 Risk

Risk is an event that may occur in a project consequently leading to a negative but sometimes to a positive impact to project's objectives Serpella et al (2014). Cagliano et.al (2015) concurs with the definition by adding that risk as an "uncertain event" may result in a positive or negative effect on the projects objectives. Subramaniyan and Veerakuma (2017) on the other hand views risk is an action or occurrence that has a negative effect on the delivery of project objectives. From the authors' definitions one may establish a risk as an unplanned event whose occurrence may result in a positive or negative effect on the delivery of project objectives.

2.3.2 Risk management

Risk management is a positive and proactive process that aims to reduce the likelihood of unfavourable occurrences and increases the chances of favourable occurrences in the stages of

the project life cycle, (Rohaninejad & Bagherpour, 2013). On the other hand according to Seku et al (2015) who cite Hubbard (2009), risk management is the “identification, assessment and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events”. The set of the above definitions point out that risk management is a proactive economical process that reduces the probability of unfavourable events and increases the occurrence of favourable events.

Sathishkumar et al (2015) postulates that risk management is a systematic process of identifying, analysing and responding to project risk, in such a manner that one reduces or eliminates the risks with a negative impact on the project and maximise the occurrence of risks with a positive impact on the project. Furthermore the PMBOK (2013) states that risk management in the construction project management context is a comprehensive and systematic way of identifying, analysing and responding to risks to achieve the project objectives. In a nutshell one may see risk management as a systematic process of identifying, analysing and responding to risks economically.

The risk management (RM) process has six steps which include planning, identification, qualitative analysis, quantitative analysis, response, monitoring and control (Dey 2012). On the other hand Serpella et al (2015), cites ISO 31.000, (2009), which stipulates that the research process has 7 steps that include planning, identification, qualitative and quantitative assessment, analysis, response, monitoring, and recording the risk management process. The latter steps have a greater insight into the management process with the inclusion of the analysis after the risk has been assessed and the RM process is recorded giving a reference for future risk management processes.

2.4 Background of risk management

Construction risk management started to be implemented around the mid 1970's in large engineering projects in the energy sector, there after it was adopted by other business sectors Campman and Ward (2003). Taroun (2014) theorise that by the 1980's risk management had been well established in construction in the developed countries. Seku et al (2015) goes further by noting that from the mid 1980's till the early 2000's project management shifted towards establishing the structure to be adopted for each different kind of project. The authors make an assertion that the current focus of construction risk management has been to broaden the scope of uncertainty management to include individual, social and cultural risks, (Seku et al, 2015).

In the 21st century there has been an increased adoption of risk management by several industries (Choudhry 2013). Also there are now a number of construction risk management guidelines that are being utilised worldwide, some of which emanate from the Australia and New Zealand Standard (AS/NZS ISO 31000), the Project Management Body of Knowledge (PMBOK), the British Standard (BS 31100), and Risk Analysis and Management for Projects (RAMP) (Pretorius and Chihuri, 2010). Seku et al (2015) unearthed that the Project Management Body of Knowledge (PMBOK) is the most frequently used guideline for the implementation of risk management by the South African construction industry. A study by Pretorius and Chihuri (2010), revealed that forty percent of the project managers in South Africa are making use of PMBOK, followed by the Australian and New Zealand standard at twenty- six percent which was deemed be used frequently because of its simplicity and relative ease to adhere to. With these findings the PMBOK guidelines will be used for the purposes of this research as it is being conducted in South Africa.

2.5 Implementation of risk management in construction

Cook and Smallwood (2015) put up the idea that the implementation of risk management has to be conducted from the inception and failure to do risk management at this stage would result in the use of inadequate contingences that won't be able to control risks that arise during the later stages of the project. Similarly Zhao et al (2013) postulated that well-planned risk management from the initial stages of a project would allow a more credible estimate of the final project costs.

Whereas Banaitiene and Banaitis (2012) had previously stated that beyond the inception and feasibility stages mentioned by Cook and Smallwood (2015), risk management needs to be repeated in each stage of the project life cycle. Haseeb et al (2014) are in consensus with the idea and suppose that risk management is an iterative process that needs to be done in each every stage of the construction process time and again.

On the other hand Serpella et al (2015), put forward that risk management in the developing countries is being implemented insufficiently thus chaining poor results and henceforth limiting the success of the project. Risk management as seen by some authors such as Rohaninejad & Bagherpour (2013) is a proactive process, but from Serpella et al (2015) findings they revealed that the practice of risk management is reactive, semi-permanent, casual and unstructured within the developing countries' construction industries, resulting in a lack of capacity to manage risks appropriately. Chihuri and Pretorius (2010) findings suggest that in South Africa

there is also a form of reactive implementation of risk management as they cited some cases where the risk that would be left unmanaged till it was too late resulting in the addressing of the risks becoming costly and time consuming.

Following the idea by Serpell et al (2015) that the risk management implementation is unstructured, Subramaniam and Veerakumar (2017), administered a large scale survey in the Indian contractors, clients and professionals. The authors discovered that the construction professionals in India are implementing the construction risk management daily although it is not in a structured format. Whereas a study by Choudhry (2013) using a similar methodology revealed that in Pakistan there wasn't a formal risk management process stating that risk management was fairly a new phenomenon in the industry. Unlike in India, Pakistan and other developing countries, a study conducted by Seku et al (2015) on the Gauteng construction projects revealed that 62.6% of the contractors undertook a structured risk management, which includes risk identification, assessment and avoidance, whereas 37.4% of the contractors surveyed implement the risk avoidance techniques.

Following the thread that there is a structured risk management in South Africa, Cook and Smallwood (2015) discovered that indeed a risk management system was in place, although the construction project managers were inadequately implementing it. The authors pointed out that the construction project managers mostly used experience gained from previous projects to deal with risks that emerged and didn't use laid down guidelines. Similarly Shunmugam and Rwelamila (2014) agree that formal risk management is in place and that it is not being implemented to the required standard citing that at times the construction personnel used personal judgement instead of the sophisticated risk management methods. From the above it may be deducted that the South African construction industry unlike Pakistan and Indian industries has a formal risk management process. Despite this all the countries' risk management practices are reactive and insufficiently done.

2.6 Risk management impact on project performance

The construction industry has a poor reputation of managing risks which has resulted in many projects failing to meet their deadlines and cost targets (Zhao et al 2013). Banaitiene and Banaitis (2012) suggest that the implementation of risk management will improve the capability of the construction industry to manage risk. The authors go further to state that risk management allows the identification and analysis of risks that may impact a project thereby improving construction processes and an effective use of resources.

Furthermore Hwang et al (2013) theorise that the implementation of risk management in construction projects assures that project deliverables (e.g. cost, time and quality etc.) are attained despite the size of the project. The authors went on and revealed that the more than 50% of the consultants and contractors that were interviewed in Singapore stated that the implementation of the risk management techniques can reduce schedule of a project by 10%. Whereas Dey (2012) asserts that risk management aims to increase the chances of satisfactory outcome in an event to occur and at the same time reducing the adversarial ones. Seku et al (2015), agrees with Dey (2012) and points out that this process can be more beneficial if it is undertaken in systematic format throughout the whole project from inception to completion. Haseeb et al (2014) postulates that the overall aim for conducting risk management is to reduce the negative events in projects and increase the positive events that could have a beneficial impact to a project. Choudhry and Iqbal (2016) agree with this notion and state that risk management's main objective is to increase the likelihood of a positive impact and decrease the chances of negative event in projects.

According to Haseeb et al (2014) the implementation of risk management in the Pakistan construction industry is very important to the success of the project and projects that implemented it managed to complete their projects on schedule and budget. Similarly Serpella et al (2015) found that risk management has been beneficial to the Chilean construction industry as the project performance had improved with some companies meeting the project objectives. Whereas a few case were studied in South Africa by Chihuri and Pretorius (2010) and the authors unveiled that projects where risk management was implemented had a more favourable outcome as compared to those that didn't.

From the authors' findings there seems to be a resounding idea that risk management does improve the performance of the project and this is further solidified by the poor project performance that was experienced when the risk management wasn't implemented. In as much as risk management improves the performance, some authors such as Cook and Smallwood (2015) point out that if risk management is not implemented in accordance with the guideline it will result in the failure of the project.

2.7 Risk management process and techniques

The risk management techniques are categorised according to the risk management process which consists of risk identification, analysis, response and review or monitoring (Choudhry, 2013). The risk management techniques are supposed to follow the order of the risk

management process and their implementation is cyclic, when you get to the monitoring stage the identification techniques are reused triggering a new cycle and this carries on till the end of the project, as shown in figure 2.1.



1.1.1 Figure 2. 1 The Risk Management

Process Source: Choudhry, 2013

2.7.1 Risk identification

Risk identification according to Banaitiene and Banaitis (2012) is the most important step of risk management which entails the identification of risks. According to Mahendra et al (2013) the risk identification techniques are implemented so as to uncover the various risks that will emerge in the construction project, the techniques include; Interviews, Expert system, Questionnaire, Delphi technique and checklist. Furthermore (Goh et. al., 2013), adds to the identification techniques the brainstorming, checklist; sensitivity analysis and risk register techniques.

From a study carried out by Choudhry and Iqbal (2016) in Pakistan the authors interviewed consultants, contractors and clients, and the respondents revealed that they frequently use expert system, followed by industry information, then checklist, risk review meetings and lastly brainstorming. The authors also highlighted that the opinions of the different respondents did not differ significantly other than the consultants who preferred using industry information because they already possessed in house expertise. The findings gathered by Chihuri and

Pretorius (2010) and Renault et al (2016) revealed that the South African industry's implementation of the risk identification techniques was an opposite of what was found in Pakistan. The brainstorming technique that was used least in Pakistan industry was found to be the most used in South Africa and as for the checklists technique which was most used in Pakistan was least used in South Africa (Chihuri and Pretorius, 2010 and Renault et al, 2016). It is worth noting that in the South African study, only the views of the construction managers were considered and it is unknown what the rest of the construction industry prefers to use.

Serpella et al (2015) postulates that risk identification techniques are being implemented only at the beginning of the project during the planning phase only. The authors further states that risk identification techniques are not conducted during project implementation, any discovered risks are not documented to revise the risk register which is an improper implementation of the technique. Just like in Chile, risk identification in South Africa wasn't done throughout the project Chihuri and Pretorius (2010).

2.7.2 Risk analysis

Risk analysis is conducted to ascertain the quantitative and qualitative impact of the identified risks Mhetre et al (2016). According to Mahendra et al (2013) qualitative analysis techniques include, Probability or impact risk rating matrix, and risk probability impact assessment, whereas the quantitative techniques include scenario analysis, Monte Carlo simulation, decision trees and sensitivity analysis.

Qualitative risk analysis takes into account the criteria of an event to make a judgement what the possible outcome is going to be, Haseeb et al (2014) and Mhetre et al (2016) states that it is based on descriptive scales to describe the likelihood and impact of risks . The qualitative risks are seldom practised in the Pakistan construction industry (Choudhry and Iqbal, 2016), and the contractor seems to implement the technique more than the client and the consultant. But overall the parties seemed not to be aware as to how to effectively implement the qualitative risk management techniques, and the implementation was more informal as none of the parties documented any of the analysis that was done.

Similar findings were gathered in South Africa that project manager seemed to implement qualitative risk assessment techniques more than the quantitative risk assessment techniques and they viewed these techniques were much simpler and easier to comprehend compared to the quantitative ones Chihuri and Pretorius (2010). Whereas in Malaysia on the clients' side and Singapore on small sized projects authors discovered similar trends, this may point out to

the view that the construction industry in general favours the qualitative analysis techniques.

Coming to the unpopular technique, according to Seku et al (2015), the quantitative risk analysis relies on statistics to calculate the probability of occurrence of a risk event and the impact of the event to the project's deliverables. The authors further state that the common method used in Chile construction industry is decision tree analysis which can be used in situations with two more probability outcomes, followed by the Monte Carlo simulation which comes up with a value from a probability distribution and other various factors.

A study in the Pakistan construction industry by Choudry and Iqbal (2016) revealed that there was little use of sensitivity analysis, expected monetary values, and risk-adjusted discount rate. Chihuri and Pretorius (2010) states that in large civil engineering projects in South Africa quantitative risk assessment have given a more accurate and detailed description of risks events but despite this they are less applied as compared to the qualitative techniques. Furthermore the authors uncovered that the reasons for the curtailment in the implementation of the techniques was that it is a time consuming and tedious exercise.

2.7.3 Risk response

According to Haseeb et al (2014) the four different ways to encounter risks are risk reduction, risk retention, risk elimination and risk transfer. A study by Choudhry and Iqbal (2016), states that the Pakistan construction industry frequently used risk elimination, followed by risk transfer, then risk reduction and lastly risk retention. The authors found out that insurances where the only risk transfer means that were used in the public sector and that it is a contractual obligation. Whereas in the Zambian construction industry Tembo and Khatleli (2016) stated that the most used response methods were insurance, contingency sums and percentages added to rates. When the risks have been responded to the next step which followed is risk review and monitoring Renault et al (2016).

2.7.4 Risk review and monitoring

The PMBOK (2013) identifies risk control and monitoring as a “process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project”. Whereas Pandit and Yadav (2014) views this as a “function of project management that uses skills, tools, techniques and knowledge to establish project baseline, followed by performance measurement to update project team with timely and accurate project information”. For this research control and monitoring will be taken as a process that makes uses of certain skills and techniques to

establish a project baseline, and then followed by tracking of identified and residual risk and overallly measuring performance to evaluate the effectiveness of the risk management process and the project itself.

The process of risk control and monitoring allows an efficient risk approach throughout the project lifecycle, according to Renault (2016). On the other hand Newby (2016) states that the role of project control is to provide a system to monitor and control the execution and delivery of the project as planned. Whereas the PMI suggests that risk control and monitoring is conducted to determine if the assumptions that were made during planning stage are still valid, the RM policies and procedures are still being followed and the contingency reserves for cost or schedule should be modified in alignment with the current risk assessment PMBOK (2013).

Newby (2016) puts forward that monitoring of events needs to be constant in a construction project as this allows the identification of the trigger events for each event as soon as possible, and this allows the implementation of risk response before the risk goes out of hand. Renault et al, (2016) agrees and states that the monitoring has to be done continuously and documented. Choudhry and Iqbal (2016) further stipulates that it is required that control planning be done at the beginning of the construction phase to improve the efficiency of the risk management process.

Choudhry (2013) made an observation that as the operations in the project happened, additional information arises, new risks arise and sometimes the risks that were identified will not be relevant any more. The author puts forward that due to these reasons, it is therefore essential to reassess risks to make sure to identify these emerging risks and to keep the risk plan up to date with the risks, strategy of response and actions carried out towards risks. After the risk response stage the monitoring of the response decision made commences. The monitoring will be continuously done and documented, including documenting new risks which will trigger the whole process time (Renault et al, 2016).

According to the PMBOK (2013) risk management control and monitoring techniques comprise of the following:

- Risk reassessment involves the repetitive assessment of the risks in a project and results in the identification of new risks and the closing of out-dated risks.
- Risk audit is a tool to evaluate the efficiency of the risk management process and to examine and document the efficiency of the risk response to identified risks. The project manager is responsible for the implementation of the risk audits.

- Variance analysis compares the planned results to the actual results whereas trend analysis reviews the project's execution using the performance information. The outcome from the analysis depicts the potential deviation from the planned cost and schedule targets, which may mean potential threats or benefits.
- Technical performance measurement is a tool to compare the technical accomplishment to the schedule of technical achievements. Technical achievements may be measured through the number of defects produced and available storage capacity. Any deviation technical accomplishment and the scheduled achievement will allow a forecast of the degree of success in achieving project deliverables.
- Reserve analysis compares the remaining reserve to the remaining risks, so as to certify if the remaining reserve is enough for the risks to be encountered.
- Meetings are the last of the techniques and the PMI states that project risk management should be an agenda item at periodic status meetings. The amount of time required for that item will vary, depending upon the risks that have been identified, their priority, and difficulty of response. The more often risk management is practiced, the easier it becomes. Frequent discussions about risk make it more likely that people will identify risks and opportunities

According Choudhry and Iqbal (2016) risk reassessment is the most used risk monitoring technique in Pakistan followed by the risk audit. The implementation of risk assessment was not done from a risk management point of view but was more of allocating responsibility and a mechanism of protection. Whereas the results from the survey showed that there was little knowledge on risk audits pertaining to its existence as a risk monitoring tool. Whereas Pandit and Yadav (2014) found out that in India there was poor definition of project control parameters during the planning phases of the project which lead to poor project brief to the other team members and the personnel dealing with the monitoring and controlling of the risks

2.8 Factors causing inadequate the implementation of risk control and monitoring techniques

Very little is known in this phase in the South African body of knowledge. The factors gathered will be used as a basis for determining the specific factors that are influencing the inadequate implementation of the control and monitoring techniques and are shown in Table 2.1.

Table 2. 1 Factors influencing the implementation of risk management.

Authors	Knowledge of RM	Experience of the company and personnel	Availability of previous cases	Management support and team cooperation	Size of company	Availability of resources	Legislation	Lack of awareness of benefits of DM	Complexity of the techniques	Complexity of the project
Seku et al (2015) South African construction industry	X	X			X	X				
Rafiq M. Choudhry and Khurram Iqbal (2016) Pakistan construction industry	X		X	X	X	X		X		X
Norazian Mohd Yusuwan, Hamimah Adnan & Ahmad Faris Omar 2008 Malaysian construction industry from client's perspective of RM	X	X	X	X					X	
Hwang, Zhao and Toh (2013) Singapore			X		X	X	X	X	X	X
Nicholas Chileshe, M. Reza Hosseini and Jacqueline Jepson 2016 Iran construction industry	X		X	X		X				
Nicholas Chileshe and Geraldine John Kikwasi 2013 Tanzanian construction industry	X			X		X			X	
Riaan Fischer 2015 South African small construction companies	X					X	X		X	X
S. Chihuri and L. Pretorius 2010 South African large civil engineering projects	X		X	X		X		X	X	X
Sharon Shunmugam and Prof. P.D. Rwelamila 2014 South African construction industry	X		X	X	X	X		X	X	X

2.8.1 Awareness of benefits of risk management

The Singaporean construction industry perceived that risk management process didn't have much benefit and impact on meeting the project objectives. Because of the time constrained project it seemed ineffective to be conducting the risk management at the expense of the project operations, Hwang et al (2013). Whereas Rostam et al (2014) believes that the SME contractors in Scotland are not implementing risk because they are not fully aware of the benefits of risk management.

2.8.2 Complexity of the project

Hasseb et al (2014) stated that the small sized projects which are less complicated do not warrant the use of risk management techniques. Similarly in the Singaporean construction industry Hwang et al. (2013) realised that there was a more concise way of dealing with risks for the big and complex projects as compared to the small ones. Just alike to the other two countries, in the case in Pakistan it was observed that in projects that were complex there was little use of personal judgments and as the management perceived that any risks that would impact the project would be detrimental to the success of the project (Choudry and Iqbal, 2016). Whereas Cook and Smallwood (2015) postulated that for complex projects one needs to make use of the risk management techniques according to the set guidelines, failure to do so will result in the failure of the projects.

2.8.3 Complexity of the techniques.

Shunmugam and Rwelamila (2014) found that the South African construction industry the project managers and contractors didn't use some of the risk techniques as they were deemed to be too complicated and difficult to implement. Whereas Chileshe et al. (2013) postulated that most of the risk management techniques were too sophisticated and as a result stuck to the basic quantitative probability analysis.

2.8.4 Size of company

A study conducted by Seku et al in South African construction industry identified that companies that were bigger than others based on the revenue each company was making, found that small companies did not implement risk management techniques as much as the bigger companies.

2.8.5 Knowledge of risk management techniques

Chileshe and Kwikasi 2013 postulated that some of the contractors in Tanzania are not

implementing certain risk management techniques because they were not aware of the techniques. Similarly a study by Rostam et al (2014) revealed that companies in Scotland didn't implement some of the techniques because they were not aware of them. In Pakistan as well, Choudhry (2013) claims that construction risk management is a new phenomenon and as a result there is little knowledge thus as a result most of the industry companies are not aware of the techniques that are supposed to be implemented.

2.8.6 Experience of the company

Companies in Malaysia that had more than 5 years of experience had already set out risk management plans that they were implementing whereas the newer companies were still figuring which techniques to use and which not to use, according to Yusuwa et al. (2008). Alike to Malaysia the South African companies with more than 10 years of experience have developed a risk management system for each particular type of construction project Smallwood and cook (2015). Seku et al (2015) unearthed that the experience of the company had a bearing on the way risk management was being implemented and there was a notable difference between companies that had 0-5 years of experience and the ones with above 10 years of experience.

2.8.7 Experience of the personnel

Seku et al (2015) established that individuals that had less than five years in the construction industry had a different way of dealing with risks as compared to an individual who had between five and ten and the one that above ten years of experience.

2.8.8 Use of similar cases

Smallwood and Cook (2015) postulated that project managers in the South African industry base their management of risks by using experience gained from previous projects and did not utilize the sophisticated techniques to identify and manage the risks. On the other side Serpel et al (2015) postulated that organization in Chile would have documentation of previous risks strategies that were used and they would make use of these strategies for similar cases with an in-depth analysis of the project at hand.

2.8.9 Availability of resources

Zhao et al (2013) in Malaysia realized that the contractors had insufficient resources such as money and time that caused them to fail to implement the risk management techniques. Whereas Hwang et al (2013) discovered that in Singaporean construction industry most of their

projects were time and budget constrained such that there was not enough time and money to conduct extensive risk management in their projects.

2.8.10 Legislation

Choudhry and Iqbal (2016) postulated that if the government were to impose the implementation of risk management on the Pakistan industry it would greatly improve the adoption of the techniques.

2.9 Conclusion to literature review

Literature review had set out to determine the current knowledge on inadequate implementation of risk management control and monitoring techniques, followed by describing the risk management process and techniques implementation in the construction world over. And ultimately to identify the potential factors influencing the inadequate implementation of risk management control and monitoring techniques. It was discovered that

- The implementation of the risk monitoring and control techniques has not been done regularly, the industry hasn't been using the suitable techniques, there has been low implementation of the techniques by the industry and there has been poor documentation of the risk control and monitoring process.
- That the South African construction industry unlike Pakistan, Indian and other developing countries' industries has a formal risk management process but all of these countries' risk management practices are reactive and insufficiently done.
- The risk management if implemented according to the set guidelines is able to improve the performance of the project, allowing the construction projects to meet their projects objectives as planned.
- The factors influencing the inadequate implementation of risk management monitoring and control techniques include the knowledge of risk management, the experience of the company and personnel, availability of previous cases, management support and cooperation of the team, size of company, availability of resources, legislation, lack of awareness of Benefits of risk management, complexity of the techniques and complexity of the project.

3 Research methodology

Research according to Khothari (2004:18) is “a scientific and systematic search for pertinent information on a specific topic”. Kumar (2011) suggests that research is a way of thinking that allows us to critically examine the various aspects of the day-to-day professional work including testing of new theories that contribute to the advancement of the practice and profession. This chapter presents the research philosophy, research design, sampling method, data collection procedures, then data analysis and its presentation. It also describes the method for ensuring reliability and validity as well as the ethical considerations that were adhered to.

3.1 Research philosophy and approach

The study makes use of the positivist philosophy which according to Saunders et al (2016), can be used when the data to be collected can be measured and quantified. The Saunders et al (2016), further state that positivism is a philosophy that entails working with an observable social reality to produce law like generalisations. Al-Habil (2011:949), states that positivism is “premised on the desire to draw a distinction between discovery and validation, the belief in neutral observations, value free ideal of unity of scientific knowledge, and belief in the methodological unity of sciences”. In order to achieve objectivity, neutrality and rationality, the researcher’s values, ideologies, perceptions and ideas should not influence the explanation and prediction of certain phenomena (Al-Habil, 2011).

The research follows a deductive approach which aligns with the positivist approach (Saunders et al, 2016). A deductive approach is followed if the research starts with a theory which was developed from the literature and research is intends to test this theory. As a result a deductive approach is be suitable in this research as it starts with a theoretical framework that will be tested through the research findings.

3.2 Research methodology

The research is an exploratory study and uses a survey methodology. An exploratory study is a valuable means to ask open questions to discover what is happening and gain insights about a topic of interest. Kumar (2011) states that an exploratory study is undertaken with the objective of either exploring an area where little is known or to investigate the possibilities of undertaking a particular research study. The study’s objectives are aligned with the objective to explore an area as it aims to reveal the factors that influence the inadequate implementation of risk management control and monitoring techniques.

A survey methodology is appropriate for this study as Saunders et al (2016), states that the survey strategy is associated with a deductive approach. Similar studies to this one that were done by Choudhry (2013) in Pakistan construction industry and by Seku et al (2015) in the South African industry made use of a survey strategy.

A mono quantitative method is be used for this research. Quantitative research examines the relationships between the variables that are measured numerically and analysed through a range of statistical and graphical techniques (Saunders et al, 2016). This method is suitable for this research as the method is associated with positivism which is the philosophy of this research. Taking into account that this is a quantitative research that is using a deductive approach a survey strategy would be most appropriate plan of action to achieve the goals of this research as suggested by Saunders et al (2016).

3.3 Data collection technique

There are a number of instruments that a researcher can use to gather information Kumar (2011). These instruments include but are not limited interviews, questionnaires, focus group discussions, observations and experiments (Saunders et al, 2016). For the purposes of this study, questionnaires are used to gather data. Kumar (2011) states that a questionnaire is a written list of questions which have to be self-completed by the respondents. Saunders et al (2016), states that the use of questionnaires could be used provide important background and contextual information needed to interpret the research findings.

The research is financially and time constrained, Kumar (2011) stated that the use of questionnaires is economical hence will be most suitable for the research. When administering the questionnaires by travelling to the respondents would be time consuming since they are found over a wide geographical area as a result the electronic questionnaires will allow the quickest way to reach all the intended respondents Fisher (2014). Similar study conducted by Chileshe et al (2015) in Iran and Choudhry and Iqbal (2016) in Pakistan made use of questionnaires.

3.4 Population and Sampling

The targeted population for the research are the construction managers and construction project managers whom are members with South African Council for Project and Construction Management Professions (SACPCMP). These professionals whom are members with the SACPCMP and have gone through a process which has ensured that they possess a certain

level of experience and expertise in the management of construction projects (SACPCMP, 2015). As a result this ensures that the respondents are capable give more valid data on a topic of management as they are registered.

One of the concerns in this research is that the respondents might be unwilling to state certain information that might be confidential to their companies. To counter this, the research follows an approach that was used by Fisher (2015) where he used SACPCMP as a vehicle to gain access than to use the participant's organisation.

Census sampling is used to select the respondents from the target population, where a list of the project managers is acquired from the council, then the researcher electronically sends the questionnaires to all the project managers. This sampling method was because a research of a similar nature used this sampling method and according to R. Fisher (2016) this sampling method can assist in improving the amount of responses that one receives.

3.5 Data Instrument

The data instrument that is used for this research is a questionnaire as attached in appendix C that is administered online. It includes four sections that are mentioned below.

3.5.1 Demographic items

It has close ended questions. It describes the respondents, verify the representivity of respondent and assess the moderating effect of the following variables:

- the sector the participants originate from public or private;
- the type of construction (Building, civil, electrical that the participants are mainly involved with);
- years of experience of each participant;
- what stakeholders (client, contractor or professionals); and
- whom the participants represent in the construction industry.

The responses will also be used to determine representation of the population.

3.5.2 Implementation of risk control and monitoring techniques.

This section of the questionnaire has close ended questions used to explore the implementation

of the risk control and monitoring techniques in South African building and civil projects during the project execution stage. The questions will include:

- At which stages are the risk control and monitoring techniques implemented;
- The size, type and nature of projects where they implement the techniques; and
- The extent to which each of the techniques have been implemented;

3.5.3 Factors that influence the inadequate implementation of Risk Management (RM) control and monitoring techniques.

Questions in this section are close ended. The respondents will be asked to rank how much they agree or disagree that a certain technique has an influence on the inadequate implementation of risk control and monitoring techniques. The ranking is done on a 5 point likert scale to allow the respondents to have a neutral point of view. Also the five point likert scale allows a level of discrimination to the extent that someone agrees or disagrees.

3.5.4 General paragraph questions.

This section comprises of the opened ended question that captures the explanations of the respondents and an in-depth reasoning to the implementation of the risk control and monitoring techniques and the factors causing inadequate implementation.

3.6 Data collection protocol

The instrument is to be tested for reliability and consistency. After the acceptance of the proposal an application for ethical clearance. If the ethics committee approves the ethical clearance application then commence the data collection process.

The first step in data collection is to contact the SACPCMP to obtain the most recent list of the construction managers and construction project managers that are members with the council. Then the questionnaires is uploaded into an internet platform. Then emails are sent to be respondents the link with the questionnaire and invite them to fill out the questionnaires. The invitations will make use of Qualtrics which is going to customize the email invitation with a personal greeting, explanation that the research is being done for academic purposes for the fulfilment of a masters degree and a request for consent of the participant to partake in the survey.

The link will be set to expire within three weeks, this timeline is used for this research as a

similar study that was carried out by Fisher (2015) in the South African construction industry with a similar research design used it. Data checking and verification will be performed immediately while the respondent is taking the survey. All the data is captured electronically and stored in a server and will be downloaded to the computer at once.

3.7 Data analysis and presentation

The research instrument included both open ended and closed ended questions which have been analysed quantitatively using a various analysis methods. The open ended questions were analysed using content analysis and the closed ended questions have been analysed using descriptive and inferential statistics.

3.7.1 Content Analysis

This is an analytical technique that allows qualitative data to be categorised or coded, so that it may be analysed quantitatively (Saunders et al, 2016). The authors state that this analysis tool can provide means to analyse large amount of qualitative data and code it so that one can be able to count frequencies and examine relationships between variables in the data. This technique was used for the open ended questions, where the responses will be grouped into suitable categories in reference with similar categories that were used in similar studies.

3.7.2 Z to percentile ranking

The Z to percentile ranking technique can be used for ranking a range of data including the one that is not normally distributed. This technique was used for ranking the extent of implementation of the risk control and monitoring techniques, as well as ranking the factors influence the inadequate implementation of the risk control and monitoring techniques.

3.7.3 Descriptive statistics

According to Saunders et al (2016), descriptive statistics provides the calculations to measure the central tendency and the measure of dispersion. The numerical measure for central tendency is the calculation of a mean, median, mode and trimmed mean. The measures for dispersion include the inter-quartile range and standard deviation. For the purposes of this research the measure for central tendency that will be used is the mode which represents the value that occurs most frequently in the distribution Saunders et al (2016), this would allow the researcher to identify what is the majority view on the respective topics.

3.7.4 Inferential statistics

Saunders *et al.* (2012) demonstrated that inferential statistics entailed the process of drawing conclusions about the population on the basis of data describing the sample. The methods of inferential stats that were used for this research include the analysis of variance (ANOVA) and the t – test. The One-Way ANOVA procedure produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable. Analysis of variance is used to test the hypothesis that several means are equal. This technique is an extension of the two-sample test (Taroun, 2014).

The second inferential statistic used is the t- test which will help find whether one group differs from another set or not. We calculate the mean of each group and then out whether the means of the two groups differ or not. To find out the difference between two means we use a t- test. For both these tests they entail calculating the p value which we compare with the alpha value, so as to determine if we are failing to reject or we are rejecting the null hypothesis. If we get a p value that is less than the alpha value, we would reject the null hypothesis as there will be a statistically significant difference.

The study therefore stated the null hypothesis (H_0) as being, that the mean for the population is no different than the mean of the sample, and the rejection of the hypothesis indicating that the likely mean for the population will be greater than the sample mean. The alpha value that used was 0.1 which is derived from the confidence interval of 90% which was been attained in this research.

H_0 = Acceptance. Sample mean equal to the population mean

H_1 = Rejection. Mean for the population likely to exceed the mean of the sample

*alpha-value for acceptance/rejection is 0.1

For the purposes of data presentation bar chart will be used to show difference in the extent of implementation of various techniques and to show the frequency of the factors that influence the inadequate implementation of the risk management control and monitoring techniques. Cross tabulation will be used to consider the moderating effect of the demographic variables.

3.8 Validity and reliability

Saunders et al (2016) points out that reliability and validity are essential to the determination about the quality of research. According to Kumar (2011) reliability refers to the quality of a measurement procedure that provides repeatability and accuracy. While Saunders et al (2016) views reliability as the ability of a research to give the same results if it was repeated time and again using the same design. The authors on the other hand validity points out the appropriateness of the measures used and accuracy in the analysis of the results.

To ensure reliability of the research will be made sure to adhere to the procedures of undertaking the research and to minimise participant error which according to Saunders et al (2016) are any factors that may adversely change the way a participant would respond. It will be minimised by ensuring that the participants' private space is not encroached, and they are at liberty to respond to the emailed questionnaires anytime within the two weeks given. There is need to avoid participant bias which would be achieved through making sure that their organisations and personal details stay anonymous. Also, there is a need to make sure that there is no researcher bias or error by being impartial and truthful to the responses.

To content ensure validity the research will be based on true premises this will be achieved through the use of recent and published texts, that are five years old and below to make sure that the information gathered is still relevant to the current research. The literature has to be from peer reviewed journals, published books and conference. The development of the conceptual framework will ensure construct validity.

As for the primary data collected will be ensured of its validity and reliability by the use of respondents that are members with the SACPCMP with experience and knowledge on the subject at hand. There will also be triangulation of primary data and literature to improve validity and reliability of the research data. External validity will be ensured by using a census sampling method and by confirming representation.

3.9 Ethical considerations

The research will be carried in such a manner that no personal or company details where attached to the data gather so as to provide the respondents with anonymity and confidentiality. According to Burns and Grove (1993) anonymity is a condition where the respondents cannot be traced back to their responses whereas according to Polit and Hungler (1995) confidentiality is a where the responses of the participants cannot be traced back to them.

The administration of the questionnaires will be respectful so as to make sure that the respondents' dignities are not compromised. To ensure that there is no intrusion of privacy the questionnaire is web based, which allows the respondents to complete the questionnaires at the time that is most convenient to them. No sensitive detail was required from the respondents and according to Fischer (2015) sensitive detail encompasses project name and location, client and company names, project value and specific dates.

When identifying items mindful of cultural and individual differences of respondents and should make sure that the questions do discriminate against any of these differences. The researcher will make sure to get the necessary informed consent from the respondents. Reporting will be done in an aggregated format to ensure anonymity of the research participants.

3.10 Conclusion

This research followed the positivist philosophy and the deductive approach as it starts with a theory which was developed from the literature and intends to test this theory. It is a mono quantitative research where the data is collected using an online questionnaire from the Construction project managers and construction manager registered with SACPCMP. The data collected is analysed quantitatively, figure 3.1 showing the summary of the research methodology. And the chapter also explains how the validity and reliability is achieved including the ethical concerns that the research will adhere to.

Table 3.1 Summary of the research methodology

Description	Method
Research Question	• What are the factors influencing the inadequate implementation of risk management control and monitoring techniques during project execution stage?
Literature objectives	• Describe current knowledge on inadequate implementation of risk management control and monitoring techniques. • Provide the definitions of terms • Discuss the risk management process and procedures • Identify the potential factors influencing the inadequate implementation of risk management control and monitoring techniques.
Empirical Objectives	• Investigate into the extent of implementation of risk management control and monitoring techniques. • Evaluate and rank the factors affecting the implementation of risk management control and monitoring techniques
Research Philosophy	• Positivist
Research Methodology	• Exploratory • Deductive • Survey methodology (Questionnaire)
Sampling	• Census
Data Analysis and Presentation	• Quantitative analysis by use of descriptive statistics and Inferential statistics • Bar Charts

4 Data Presentation and Analysis

This chapter endeavours to provide a detailed analysis of the data that was gathered on the implementation of the risk control and monitoring strategies, secondly, on how the risk management control and monitoring techniques are being implemented and thirdly, on the factors that influence the inadequate implementation of control and monitoring techniques. To carry out this analysis, the chapter will first outline the respondents' profiles, then an in-depth analysis into how the South African construction industry is handling the process of controlling and monitoring risks. This will then be followed by an assessment into the extent of implementation of the risk control and monitoring techniques. The assessment will then be followed by an evaluation and ranking of the factors that affect the implementation of the risk control and monitoring techniques.

1.2 4.1 Response

The survey was administered using an online survey system (Qualtrics), where a census sampling was done for the members of the SACPCPM amounting to 1300 individuals. Ninety eight of the professionals responded making a response rate of 7.5% which is lower than the 17.5 % received by Fischer (2015) on a similar study and demographic. According to Hwang et al (2014) they noted that most of the time a low a response rate may be caused by the level of confidentiality that is being requested. Although confidentiality was provided for in the research, some of the respondents may have seen some aspects of the data required being sensitive thus explaining the low response rate. At a confidence level of 90% the margin of error is 8 and the results cannot therefore be statistically generalizable (Hayes and Krippendorff, 2007).

4.1.1 Respondents' profile

The results from the first section of the questionnaire indicates that 39.78% of the respondents are contractors, with 34.41% being project managers. 20.43% of the respondents are from clients' organisations and a further 5.38% came from the other entities as shown in the figure 4.1. This will allow us to understand how the different parties in the construction industry implements risk management control and monitoring techniques and how they also determine what each group perceives to be factors that inhibit the adequate implementation of these techniques. The response therefore represents all the profiles adequately.

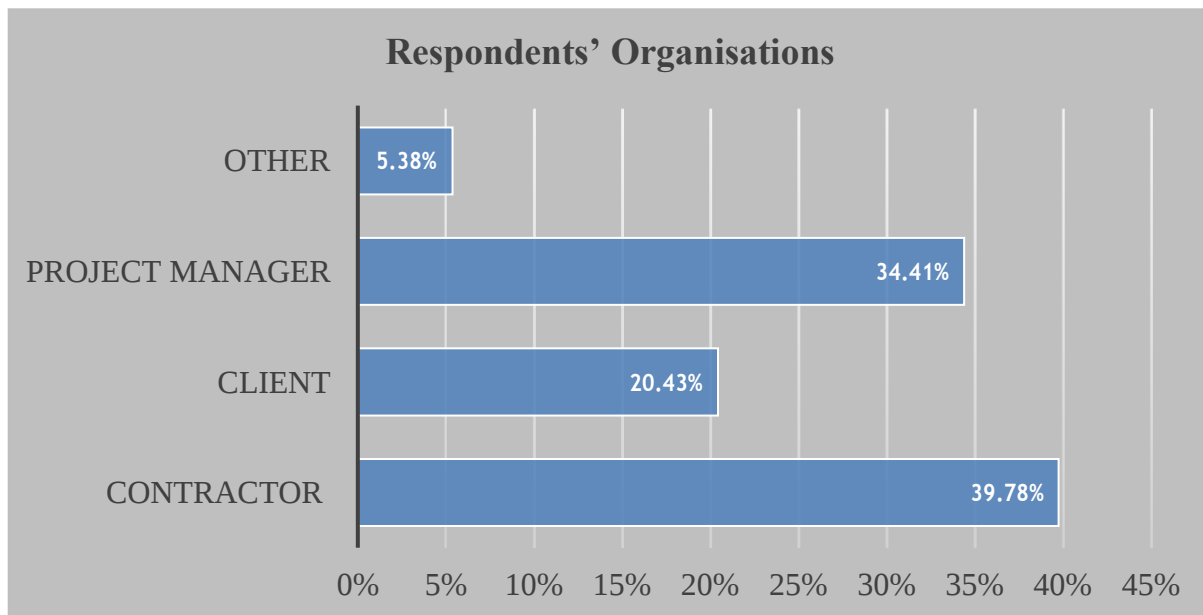


Figure 4. 1 Respondents' Organisations

The respondents' profiles showed that the majority of the participants are executives followed by 21.74% being construction managers then 19.57% being quantity surveyors and 16.30% holding other roles in their organisations as shown in figure 4.2. This information will allow us to determine how each professional implement risk management control and monitoring techniques.

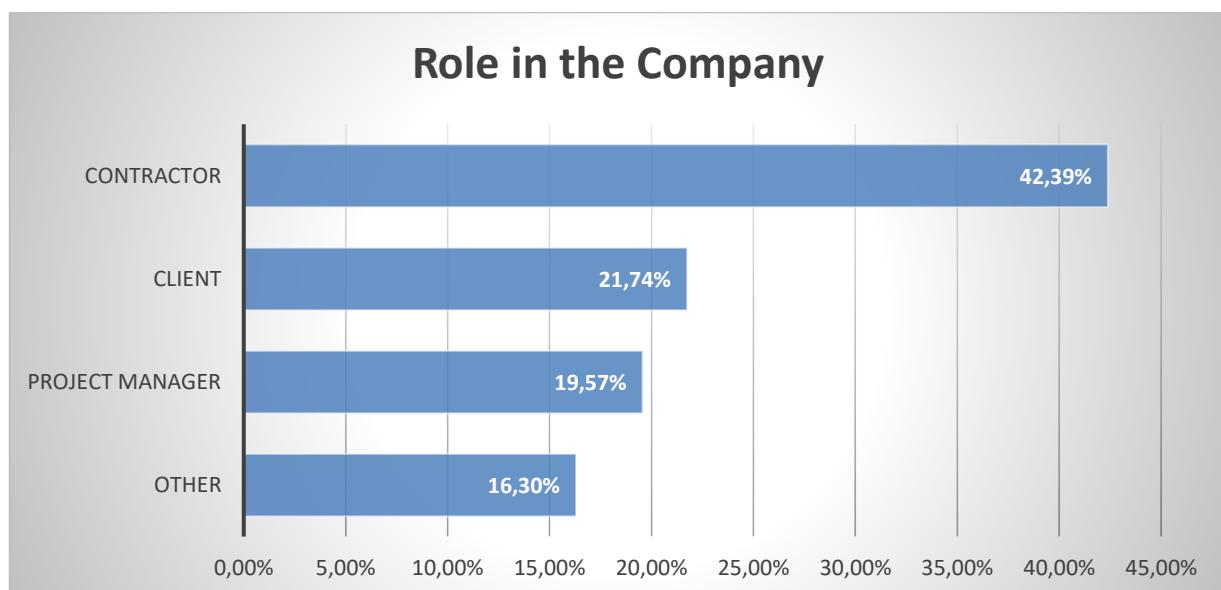


Figure 4. 2 Role in company

The participants were asked to state their number of years that they have spent in their current position. The majority of the participants had 10-20 years of experience. 29.67% of the respondents had more than 20 years of experience, as illustrated by figure 4.3. The majority of the workers with 10 years of experience showed that the data was acquired from reliable sources as the participants are well vexed with the matters in construction industry. This will allow the researcher to evaluate whether if the level of experience has a bearing on the implementation of the risk management monitoring techniques. In addition to all of this, it will work in comparing and validating the results received on the level of experience as a factor that causes inadequate implementation of the techniques.

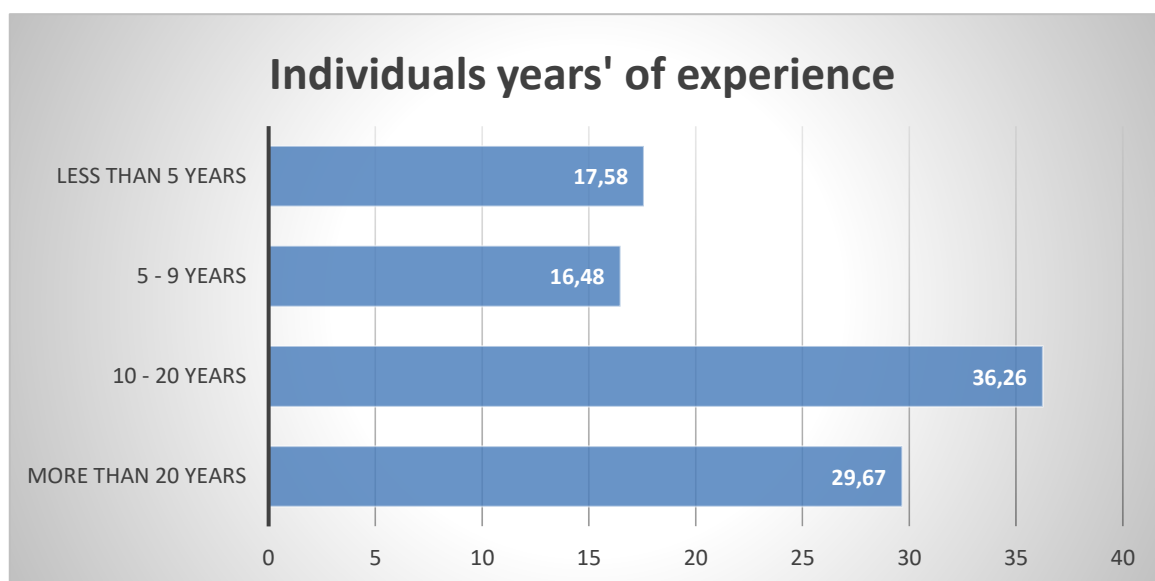


Figure 4. 3 Individual's years' of experience

The next aspect that was explored in the respondents' profile was the number of the employees employed by each company. 41.3% of the respondents come from a company with more than 251 workers. Companies with less than 20 employees produced 22.83% of the respondents surveyed. This will allow us to determine if there is a variance in the level of implementation of the risk control and monitoring techniques in-between organisations that have different number of staff.

The last representation of the respondents' profile is the sector in which the respondents are employed. This is shown in figure 4.4. Of the respondents surveyed, 60.87% work in the private sector, whereas 26.09% come from the public sector and lastly, 13.04% work in both sectors. This will allow us to analyse the extent to which each sector implements the control and

monitoring techniques. This allow us to see if there are any variances in the factors they deem to inhibit the adequate implementation of the techniques. On average the respondents have ten to twenty years of experience and the responses should therefore be valid

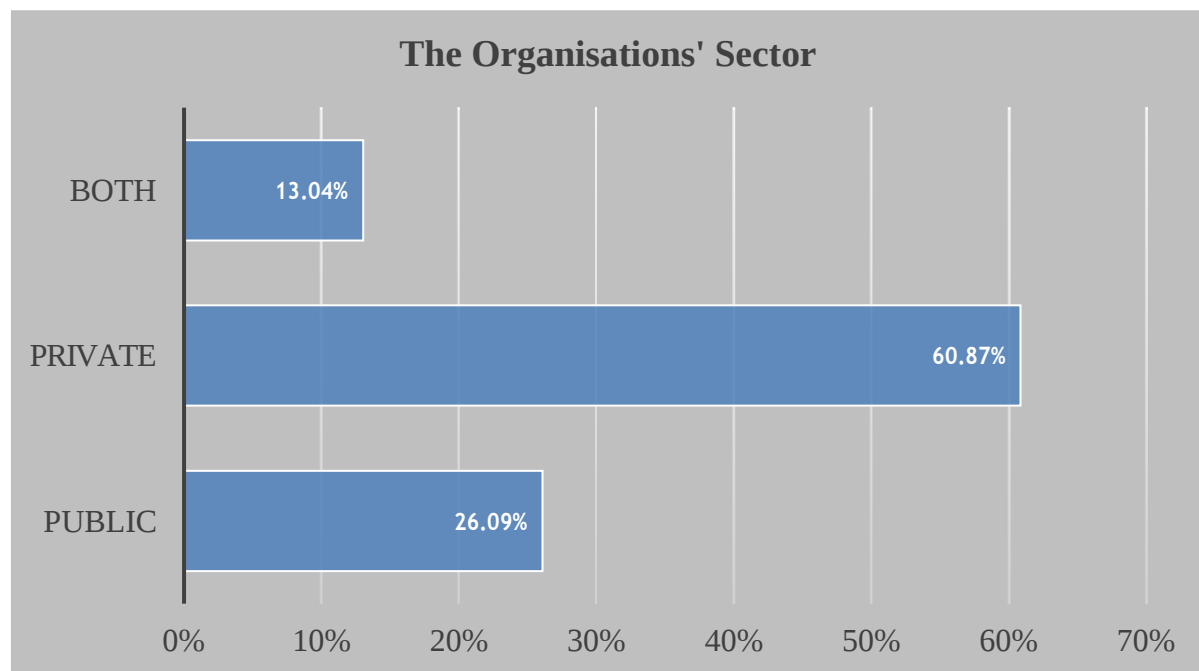


Figure 4. 4 Respondents' sector

4.1.2 Summary of the respondents profile

The research managed to get a response rate of 7.5% and at a confidence level of 90% with a margin of error 8. The findings cannot be statistically generalised to the South African construction industry. However, from the profiles of the participants' one may construe the data to be a reflection of the industry as the profiles that there is an adequate representation in all categories. The respondents' profiles have shown that the majority of the participants have more than 10 years of experience in all the three major parties of contract thus offering reliability and certainty of their response to be valid of the South African construction industry. The results of the survey is therefore indicative and can be theoretically generalised to the South African construction industry.

4.2 The need to implementation of Risk management control and monitoring

The respondents were asked to state whether it was necessary to implement risk management control and monitoring in small construction companies, the results of this question are tabulated in table 4.1. The responses were analysed using content analysis and the results were tabulated in table 4.1 which illustrates that 96 % of the respondents believe that it is necessary to carry out risk management control and monitoring in small construction projects.

Table 4. 1: The necessity of Risk management control and monitoring

Word or Phrase	Frequency of Occurrence
Yes it is essential every project	41%
Yes because you get to maximize profits and growth of the company	18%
Definitely, No project is too big or small. All projects have risk associated with and have to be treated equally at all times.	15%
Yes, all construction projects involve resources and time. Thus R.M. controlling is important	8%
yes - optimise the design solution, simplify construction avoid delays and accidents	7%
Very important because it ensures informed planning to avoid project delivery problems of time, cost quality and scope	5%
Yes, but it tends to be informal based on the compiler's experience	2%
No. Risk management is time consuming. Its implementation requires additional resources hence the lack of desire to utilize risk management.	2%
It is necessary only for projects bigger than R10.0m	1%
It is not that important because short duration projects usually have limited risks as compared to a project which would run for about 4-5 years.	1%

59% of the participants have pronounced that the implementation of risk management control and monitoring is essential for the project and maximising profits. Some of the reasons that the respondents stated was that:

- It is easier and less costly to implement it in smaller projects than with relatively large ones;
- Even though the risks may be small, they need to be controlled as they may cause the company to suffer loss of profits; and

- Yes because they are short duration and an activity gone wrong can be the difference between loss or profit.

The South African construction industry seems to have a different perception on the implementation of the risk management as compared to the Singaporean industry. According to Hwang et al (2014) the Singaporean industry believed that controlling and monitoring risks in small projects would reduce the profits. Consequently, the industry reduced the levels of effort in controlling the risks.

15% of the participants believe that controlling and monitoring risks in small projects will help improve the time, scope and quality of the project whereas some stated it will improve the aforementioned aspects as well as safety. This views put forth by the South African construction managers seem to disapprove the views of the Pakistan construction industry who believed that the process of controlling and monitoring is time consuming and requires more manpower Hasaad et al (2014).

On the other hand, 4% if the participants believed that risk management control and monitoring for small projects was not necessary. One of the participants stated that it is not that important because short duration projects usually have limited risks as compared to a project which would run for about 4-5 years. Whereas the other two stated that risk management is time consuming and its implementation requires additional resources hence the lack of desire to utilize risk management. These responses concur with the ones mentioned above from Singapore and Pakistan but then there are very few participants in South African construction industry that share this line of thought.

4.2.1 Documentation of risk control and monitoring

An effective monitoring and controlling of risks encompasses a formal documentation of all the practices that are carried out during the whole process of monitoring and controlling risks. To determine how the documentation is being carried out in the industry, the participants were asked to state who undertakes the documentation of risk control and monitoring and when do they do it. The findings from content analysis of the opened ended questionnaire have been tabulated in table 4.5 to illustrate the individuals who are in charge of documenting the risk control and monitoring in projects.

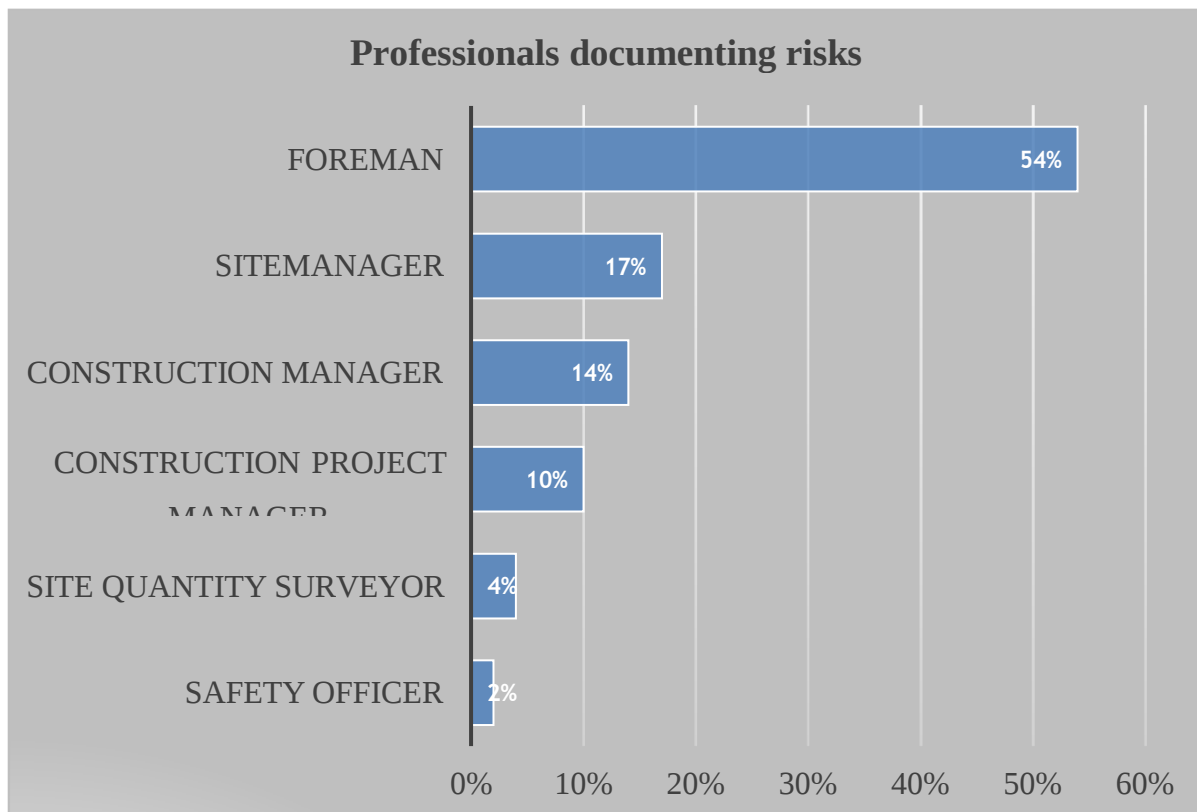


Figure 4. 5 Professionals documentation of the risk control and monitoring

54% of the participants stated that the role of documenting is delegated to the foreman and he was the one to be responsible for documenting the monitoring and controlling of the risks in construction projects. These results are similar to the ones that were found by Choudhry and Iqbal (2016) in Pakistan where the authors stated that the documentation of the control and monitoring was left in the ill equipped hands of the foreman. The authors stated that most of the foremen tend to do improper documentation of the risk management.

Choudhry and Iqbal (2016) stated that the documentation ought to be done by management. In the South African construction industry, less than half of the participants have their documentation done by the managers. Whereas 17% of the participant have their documentation done by the site managers, followed by construction managers and the construction project managers with 14% and 10% respectively. With the site quantity surveyor and the health and Safety officer with 4 % and 2% respectively. The results show that top management delegates the role of the documentation of the control and monitoring to the foreman and the middle management, i.e. the site mangers.

The questionnaire was an open ended, which allowed the respondents to pass on their views as to how the control and monitoring documentation was done. Some of the respondents pointed out that “the documentation of how the risks were being controlled during the implementation wasn’t

done”, and they saw it as “an endless paperwork which no one ever reads”. Whereas as some respondents who shared the same notion stated that, it is only essential to carry out the documentation process during the identification and assessment. And some of the respondents aired out that “the documentation of the control and monitoring process needed extra resources that are not available”. This statement thus goes to state that a part of South African construction industry believes the documenting of control and monitoring during project execution is hindered by the unavailability of time and funds to carry out such exercises.

It is worth noting that of the respondents that commented, few of them had positive perceptions about the documentation of the control and monitoring process. These participants stated that the documentation of the control and monitoring process can act as a reference for future projects.

4.2.2 Construction phases when controlling and monitoring is documented

The respondents were given an open ended question, requesting them to state when the documentation is done during the construction project phases. Each of the responses according to the construction phases in which the documenting of the risk control and monitoring had been done. The data was then recalculated in a percentage format and ranked in figure 4.6 from the most frequent construction phase that was used.

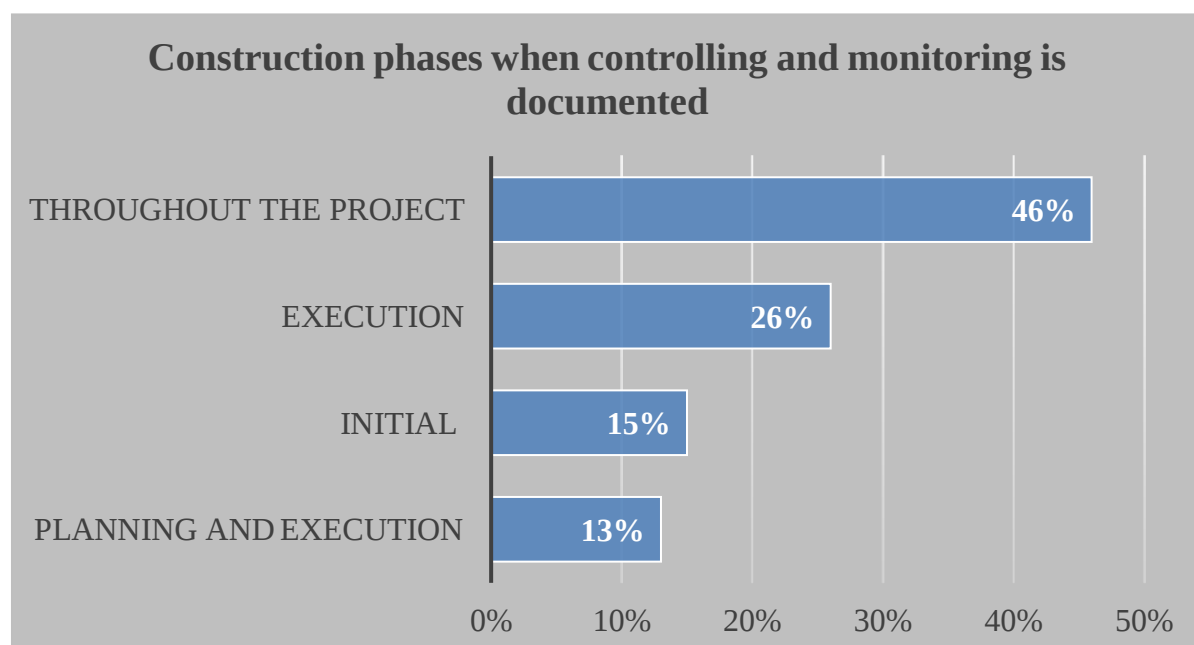


Figure 4. 6: Construction phases when controlling and monitoring is documented

Figure 4.6 revealed that the 46% of the respondents document the risk control and monitoring

process throughout the entire project from the initial phase up to close up. These results seem concur with the ones that are found on the previous section where the majority of the respondents stated that the documentation of risk management was not necessary and also that it depletes the funds of the project. But then one may also highlight that as much as the documentation is said to be done all the time it is not being done by top management as prescribed and that leaves room for the foreman to do a shoddy job as he is not being supervised sternly, (Choudhry and Iqbal, 2013).

The next commonly adopted phase for documenting risk management is execution phase where 26 % of the participants vouched that they document the control and monitoring during this stage. 15% of the participants stated that they document the information on control and monitoring of risks just in the initial stage and only 13% of the respondents document the information controlling and monitoring of risks during the planning and execution stage.

Overall it is seen that the majority of the participants do not document the control and monitoring of risks throughout the stages of the construction life cycle as prescribed.

4.3 Implementation of a formalised risk control and monitoring strategy

It was found that the majority of the respondents which constitutes of 45.24% stated that most of the time they implement a formalised risk control and monitoring strategy and only 30% implement a formalised risk control and monitoring all the time. These figures suggest that less than a third of the South African construction industry is implementing a formalised risk management control and monitoring strategy. And as a result the majority which is above two thirds is practising informal ways to control and monitor risks. These findings were similar to the ones that were found by Shunmugam and Rwelamila (2014) and Chihuri and Pretorius (2010), where they revealed that the South African construction industry is not implementing the risk control and monitoring techniques all of the time.

Also the findings that are being realised in this section seem to concur with those found above where it was found that the documentation was not done at every stage of the construction life cycle.

A further analysis was undertaken to determine if there was a difference in the implementation of a risk techniques by the different organisations. The results from an ANOVA showed that the contractors, clients and project managers, implemented the risk control and monitoring techniques most of the time and not all the time as prescribed. This meant that all these three

entities undertook informal risk control and monitoring. The results differ from the ones that were found by Hasseb et al (2014) in Pakistan where they discovered that the clients in the Pakistan construction industry most of the time left the control of risks to the contractor. This may go on to show that the South African industry seems to work as a team as compared to the Pakistan construction industry.

A t-test analysis was conducted to determine any variation in the implementation of risk control and monitoring strategy between the private and the public sector. The results obtained showed a p value of 0.04889 which was smaller than the alpha value of 0.1. These results mean that there is a statistically significant difference between these two sectors and therefore we reject the null hypothesis and accept the alternative that there is a difference in the extent to which these two sectors implemented a formalised risk control and monitoring strategy. A further look at the levels of how each sector implemented the techniques revealed that the mode for the private sector was a two meaning the majority used a formalised risk management most of the time. Then for the public sector the mode was a three meaning most of the participants they use a formalised risk control and monitoring strategy about half of the time. The private sector therefore tends to use a formalised risk control and monitoring strategy better than the public sector.

These results are similar to the ones that were found by Hwang et al (2014) in Singapore. The authors stated that the lack of a formalised risk management in the public sector caused most of the projects that were undertaken by the government to incur cost and time overruns. The deduction made by the authors suggests that the implementation of a formalised control and monitoring is paramount to the success of a project and therefore the public private sector has to adopt such a strategy, as both sectors are practising informal control and monitoring of risks.

In a nutshell these findings point out that the South African construction industry , particularly the private sector, applies a better formal risk management control and monitoring strategy, but unfortunately they are still not applying it adequately as they are not doing it at all times.

4.4 The implementation of risk management techniques

The participants were requested to score on a five point Likert scale, so as to indicate the extent to which they implement each of the risk control and monitoring techniques. Afterwards the researcher conducted a Z score to percentile ranking to identify the techniques that are being used frequently in the South African construction industry. Control and monitoring techniques

that have a score above 50% are assumed to be used frequently and those below 50% are used less frequently. Figure 4.7 illustrates that meetings, technical performance, risk reassessment and risk audits are the four techniques that are most frequently used within the South African construction industry, whereas variance analysis, trend analysis and reserve analysis are less frequently used.

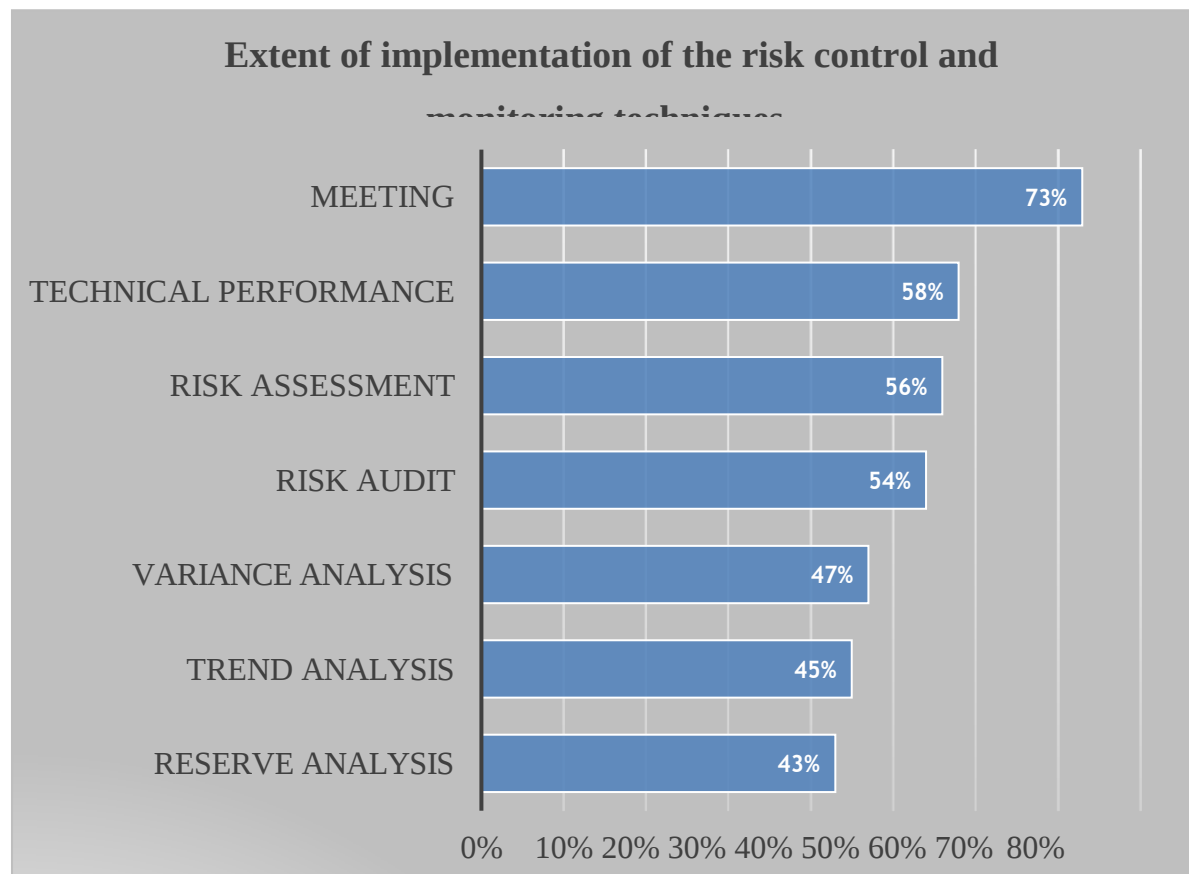


Figure 4. 7 Extent of implementation of the risk control and monitoring techniques.

The meetings are ranked first as the most frequent used risk control and monitoring technique, where 66% of the participants acknowledge that they use meetings as a technique to control and monitor risks all the time. In addition, 26 % of the participants stated that they sometimes use the meeting as a technique of controlling and monitoring risks. This gave a total of 92% of the respondents using the technique at some point in time in their risk control. The ANOVA test carried out showed that there was no difference in the implementation of the control and monitoring techniques by the different construction companies as the p value of 0.98 is greater the alpha value of 0.1 as shown in table 4.2. Also the information from the open ended questionnaires on the documentation of the control and monitoring process indicated that the

documentation is done during meetings. Thus the technique is extensively used in the South African construction industry.

An analysis of variance (ANOVA) was conducted to determine if there is a difference in the way the meetings are used by the client, contractor or the project manager. The results showed a p value of 0.51 which is higher than the alpha value of 0.1, this therefore translates these three groups frequently use meetings to control and monitor risks in projects. These results are similar to the ones that were found by Choudhry (2013), where the authors stated that clients always use meetings to control and monitor risks.

Table 4. 2 ANOVA for the implementation of the risk control and monitoring techniques between the different companies

Techniques	Source of Variation	SS	df	MS	F	P-value
Meeting	Between Groups	0.158475	3	0.052825	0.047483	0.986177
Technical performance	Between Groups	1.35023	2	0.675115	0.688018	0.505845
Risk reassessment	Between Groups	0.158475	3	0.052825	0.047483	0.986177
Risk audit	Between Groups	5.865975	3	1.955325	1.130516	0.342645

Technical performance and risk assessment are ranked the second and third most frequently used techniques to control and monitor risks. Similar to the meetings, the ANOVA test for these two techniques showed that the groups applied the techniques frequently. Although these findings are different as compared to the one found in Pakistan and Singapore by Hassad et al (2014) and Hwang et al (2014) respectively, where they found that the client only preferred using meetings. This difference may go on to show that the South African clients' organisation do partake in the managing of the risks better than those in the Pakistan and Indian construction industry.

The fourth ranked technique are the risk audits which had 43.21% of the respondents indicating that they implement this techniques all the time and 40.74% stating that they use it some of the time. These figures illustrate that almost half of the respondents utilise this technique all the

time. The ANOVA that was conducted to check the difference in the use of the technique by the different organisations revealed that there was no difference in the way the three types of organisations implemented the risk audits.

The Variance analysis, trend analysis and reserve analysis are the risk control and monitoring techniques that are implemented less frequently. A cross tabulation of the results of an analysis of the overall ranking and the different companies' ranking was done and it was tabulated in table 4.3.

Table 4. 3 Companies' ranking of the risk control and monitoring

	Reserve analysis	Trend analysis	Variance analysis
Overall	42.98%	45.20%	47.00%
Client	43.49%	57.11%	51.86%
Contractor	50.00%	48.84%	54.72%
Project Manager	36.99%	34.97%	35.58%

The contractors seem to implement variance analysis more than the other group. On the other hand the client seems to be implementing the trend analysis and the variance analysis more than the other groups. These results differ from the ones that were found by Choudhry (2013) in Pakistan where the author postulated that the clients are less involved in the implementation of risk management.

From the table one may realise that the project managers are the ones that less frequently implement these three risk control and monitoring techniques compared to the client and the contractor. These results are similar to a study done by Seku et al (2015) where the study revealed that the construction industry in South African project managers tends to prefer using techniques that are qualitative to the quantitative ones.

4.5 Factors that influence the inadequate implementation of risk control and monitoring techniques

Literature provided a list of factors that were found to influence the inadequate implementation of the whole risk management process. These factors were then used in this research to determine if these factors have influenced the South African construction industry to inadequately implement the risk management control and monitoring techniques. To make this determination the respondents were asked to rank the factors on a five point likert scale from

not influential to most influential. Where a rating of one meant the factor wasn't influential in the inadequate implementation of control and a rating of five meant the factor was influential towards the implementation of the inadequate implementation of risk management control and monitoring techniques.

The data collected from the likert scale scores was ranked using Z to percentile ranking so as illustrate the most influential to the least influential factors in causing the inadequate implementation of the control and monitoring techniques. The ranking that was done using the Z to percentile ranking is shown on figure 4.8.

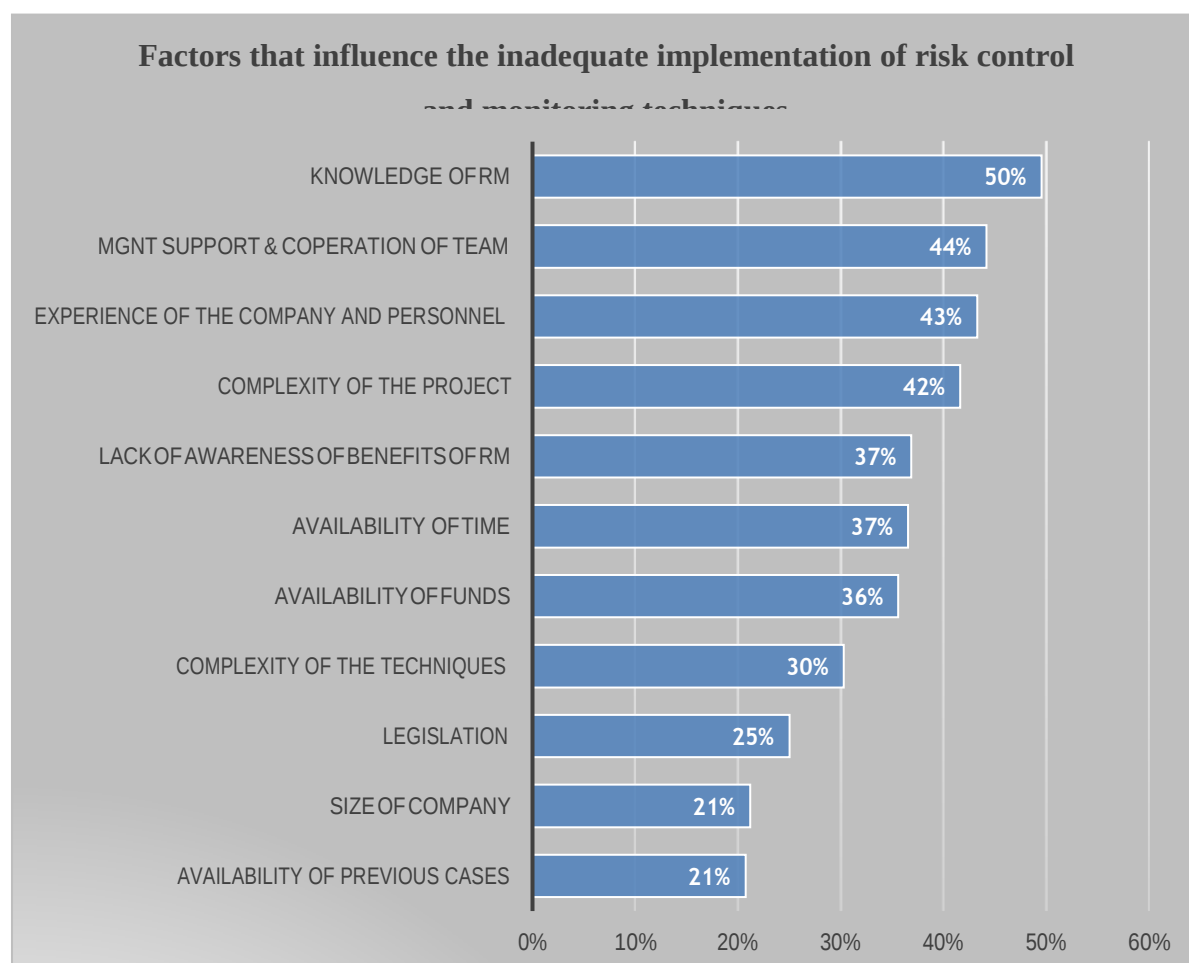


Figure 4. 8 Factors that influence the inadequate implementation of risk control and monitoring techniques

From the ranking it was determined that all the factors that had a percentile rank of 30% were less influential towards the inadequate implementation of the risk management control and monitoring techniques. A value of 30% was used because these factors had a mode of less than 3 meaning the majority of the respondents ranked the factors as not influential or less

influential. The results on figure 4.8 reveal that the factors that were influencing inadequate implementation of risk control and monitoring techniques are the knowledge of risk management, experience of the company and personnel, the management support and cooperation of the team, the availability of time, the availability of funds, the lack of awareness of benefits of risk management, the complexity of the techniques, the complexity of the project. Then the factors that are less influential towards the inadequate implementation of the control and monitoring techniques include the legislation, the size of company and the availability of previous cases in the South African construction industry.

4.5.1 Lack of knowledge of the risk management techniques

The lack of knowledge on the risk management techniques is ranked the highest and most influential factor causing the inadequate implementation of the risk control and monitoring techniques. The factor on the likert scale had an average and a mode of four which shows that the majority of the respondents believed that the scarcity of knowledge about the techniques was very influencing the inadequate implementation of the risk control and monitoring techniques.

An ANOVA test was done to determine if there was a difference in the way in which the client, contractor or the project manager viewed the influence that the lack of knowledge about the techniques had in causing inadequate implementation of risk control and monitoring techniques. The test showed a p value of 0.456 which is greater than the alpha value of 0.1 therefore we fail to reject the null hypothesis. Therefore one can conclude that all the respondents from the three types of companies perceive the lack of knowledge on the techniques as influential in the inadequate implementation of risk control and monitoring techniques. In a nutshell, the major factor according to the majority of the South African construction industry perceive the lack of knowledge on risk control and monitoring techniques is the most influential factor that causes the inadequate implementation of the risk techniques.

4.5.2 Lack of Management support and cooperation of the team

The lack of management support and the cooperation of the team is the second highest ranked factor to influence the inadequate implementation of risk control and monitoring techniques. It also had a mean and mode of four suggesting that the majority of the participants believe that the lack of management support and the lack of cooperation of the team is influencing the inadequate implementation of control and monitoring techniques. It is worth pointing out that the majority of the personnel that is documenting the control and monitoring process are the

foreman and the executive doesn't seem to partake in the documentation of the risks. Also the management is has not drafted a system were the control and monitoring process can be done throughout the whole project cycle.

Also in one of the open ended questionnaires some of the respondents stated that the management and other team members don't want to spend resources on a formal control and monitoring process. This also reinforces the view that the lack of the cooperation of the team has indeed has an influence in the inadequate implementation of the risk control and monitoring techniques.

4.5.3 Experience of the company and personnel

Experience of the company and personnel third most influential factor to negatively affect the implementation of the control and monitoring techniques. On the likert scale it had a mode of four thus the majority of the responded that the experience of personnel and company and personnel was viewed by the respondents as very influential towards the inadequate implementation of risk control and monitoring techniques.

An ANOVA test was conducted to verify if the client, contractor and the project manager had similar views on the influence that the experience of the company and the personnel had on the implementation of the techniques. The test that was done came up with a p value of 0.0529 which is below the alpha value of 0.1 therefore we fail to accept the null hypothesis, and accept the alternative hypothesis. By accepting the alternative hypothesis this means there is a difference in the way the contractor, client and project manager perceive the factor's influence in causing inadequate implementation of risk control and monitoring techniques.

A further analysis revealed that the clients had a mode score of three showing that they viewed the experience of the company and personnel as moderately influential towards the inadequate implementation of the control and monitoring techniques. Whereas the project manager and the contractors had a mode score of four showing that the majority of these respondents perceived the experience of the company and personnel as being very influential in negatively affecting the implementation of the control and monitoring techniques. Study undertaken by Hwang et al (2014) in Singapore revealed that the clients are more in the supervision just to ensure that their product comes as prescribed and the project managers and contractors are on the ground conducting the risk management techniques. Taking the supposition made by Hwang et al (2014) about the Singapore, the difference in the views may be there because the project manager and contractor are most probably the parties that

are solely responsible for delivering the project and lack of experience does seem to have more impact on them as the parties on the forefront.

4.5.4 Complexity of the project

The fourth ranked factor in the list of factors influencing the inadequate implementation of risk management control and monitoring technique is the complexity of the project. The technique had a mode of 4 which means that the majority of the South African construction industry believes that the complexity of the project has an influence in the inadequate implementation of the techniques.

The ANOVA test conducted revealed that there was a difference in the way the clients perceived the factor's influence in the implementation of the control and monitoring techniques. The results showed that the clients had a mode of 3 translating to a majority of the clients perceiving that the complexity of the project has a moderate influence on the inadequate implementation of the control and monitoring techniques. The results from the scoring of the project manager and the contractor showed a mode of four thus the two groups perceive the factor as very influential towards the implementation of the control and monitoring techniques.

This result is similar to the ones attained on the previous factor. This may go on to reinforce the statement that was posited by Hwang et al (2014), where the authors stated that the clients are not actively responsible in the implementation of the techniques. This would suggest why the clients perceive the complexity of the project as having a moderate influence on the inadequate implementation of the techniques as compared to the contractor and project manager who enforce the techniques.

4.5.5 Lack of awareness of benefits of risk management

Lack of awareness of benefits of risk management is the fifth most influential factor towards the implementation of the control and monitoring techniques. The ANOVA analysis carried out for this factor had a p value of 0.0897 which is less than our alpha value of 0.1, meaning that there is a difference in the way the groups perceived its influence on the implementation of the techniques.

Descriptive analysis carried out showed that the majority of the project managers and contractors had a score of four meaning they perceived the lack of awareness of the benefits as a factor is very influential towards the inadequate implementation of the risk control and monitoring techniques. Whereas the results from the clients and the contractors had a mode of

3, thus translating to the majority stating that the lack of awareness of the benefits of risk management is moderately influential in the inadequate implementation of the control and monitoring techniques. Then the project managers are the ones that perceive the lack of awareness of the benefits of risk management as a factor that is very influential towards the inadequate implementation of the control and monitoring techniques.

In the open ended questionnaires some of the respondents from the contractors pointed out that most of their colleagues are not interested in adopting some of the control and monitoring techniques because they are not aware of the benefits that the techniques had in improving the operations. The results seem to tally from the open ended questions and the ranking of the factors, which indicate that the contractors and clients inadequately implement the techniques because they are unaware of the control and monitoring techniques.

4.5.6 The lack available time

The lack of time is the sixth most influential factor to negatively affect the implementation of the control and monitoring techniques. On the likert scale it had a mean value of 3.67 and a mode of 3, which translates to a majority of the respondents stating that the availability of time has a moderate influence in the implementation of the risk control and monitoring. An ANOVA was conducted to check if there was a difference in the way the client, contractor and project manager ranked the factors' influence on the inadequate implementation of the control and monitoring techniques. The test conducted showed a P value of 0.708 thus we fail to reject the null hypothesis. By failing to reject the null hypothesis this meant that the client, contractor and the project managers all hold the view that the availability of time has an influence in the inadequate implementation of the control and monitoring techniques.

4.5.7 The lack availability of funds

The lack of availability of funds is the second of last ranked factor to influence the implementation the control and monitoring techniques. The majority of the respondents had a score of 3 meaning they think the lack of funds has a moderate influence in the implementation of the techniques. The ANOVA test that was conducted had a P value of 0.048 which is below the alpha value of 0.05, this therefore means we need to reject the null hypothesis and accept the alternative hypothesis. By accepting the alternative hypothesis that means there is a variation in the way the client, contractor and project manager rank the factor's influence on the inadequate implementation of the control and monitoring techniques.

A further analysis was carried out to determine how each of the groups ranked the factor's influence. It was discovered that the contractor had a mode of four on the likert scale whereas the project manager and the client had a mode of three. This therefore translates to the majority of the contractors believing the factor is very influential towards the inadequate implementation of the techniques. Whereas the majority of the clients and project managers view the factor as being moderately influential towards the inadequate implementation of the risk control and monitoring techniques.

4.5.8 The complexity of the techniques

The least ranked factor influencing the inadequate implementation of control and monitoring techniques is the complexity of techniques. The factor had a mode score of three showing that the majority of the respondents view the technique as moderately influential towards the inadequate implementation of the techniques. The ANOVA test conducted revealed that there was no difference in the way the contractor, client and project manager ranked the factor's influence in causing inadequate implementation of the control and monitoring techniques.

Also when checking the ranking on the extent of implementation of the control and monitoring techniques that required computations such as the reserve analysis there is 7% of the respondents stating that they are not sure if they use the techniques. This goes to reinforce and show that indeed the complexity of techniques is a factor that causes inadequate implementation of risk control and monitoring techniques.

4.6 Conclusion

In this chapter the research findings from the online survey were presented and analysed. The chapter began by stating the outcome of the response from the online survey this was followed by presenting and analysing the respondents' profile. Afterwards the chapter outlined the analysis methods which have been adopted in this research. Thereafter the chapter discussed the need to implement risk control and monitoring techniques and how the documentation is being practised as well as a discussion on how formal risk control and monitoring is being undertaken in the South African construction industry.

The chapter then went to discuss the implementation of the risk control and monitoring techniques and show the extent to which the techniques are being implemented in the South African construction industry. Lastly it ranked and discussed the factors that are influencing the inadequate implementation of the control and monitoring techniques.

5 Conclusion and recommendations

The chapter intends to outline the conclusion for the research and recommendations. It will first state how the research aim was achieved followed by concluding on the literature and empirical objectives of the research. This will be followed by detailing the assumptions that the research findings is encompassed in and the limitations that the research had. Then the chapter will outline the recommendations for practice and the recommendations for future research and lastly state the contribution that the research is going to make to the body of knowledge and practice of construction management.

5.1 Research aim

The aim of the research was to identify and assess the factors influencing the inadequate implementation of risk management control and monitoring techniques during the project execution phase. The identification of the factors that influence the inadequate implementation of the risk control and monitoring was done by reviewing the literature. The literature found provided the factors affecting the implementation of risk management in South Africa and abroad. These factors from literature were then sent to the members of the SACPCMP to investigate whether if these factors had an influence towards the inadequate implementation of the control and monitoring techniques.

5.2 Research objectives

The objectives for the research were made up of literature objectives and empirical objectives. The outcome of the literature objectives where documented in the second chapter of the research report and the empirical objectives findings where documented in the fourth chapter of the research.

5.2.1 Literature Objectives

The research has three literature objectives which were fulfilled by reviewing literature from journals, conference papers and textbooks from abroad and in South Africa and the findings where documented in the literature review chapter.

Describing the current knowledge on the implementation of the techniques.

The first objective entailed describing the current knowledge on inadequate implementation of

risk management control and monitoring techniques. For this objective the literature that was reviewed revealed that indeed the risk control and monitoring techniques were being inadequately implemented (Shunmugan and Rwelamila, 2014). Where the implementation of the control and monitoring techniques was not done regularly as prescribed by the PMBOK (2013), secondly, the studies showed that the industry hasn't been using the suitable techniques to control and monitor risks (Chihuri and Pretorius, 2010). Thirdly, that there was a low implementation of the techniques by the industry and fourthly, there was poor documentation of the risk control and monitoring process (Seku et al, 2015).

Definition of terms and discussing the control and monitoring process and techniques.

The second objective was to provide the specific definitions of the terms that are used in this research. After defining the terms the next objective was to discuss the risk management process and the control and monitoring techniques. In carry out the objective the researcher started with reviewing the implementation of whole risk management process and zeroed down to the control and monitoring of the risks.

The studies revealed that forty percent being the construction project managers make use of the PMBOK guidelines to manage risks (Seku et al, 2015). Also, the South African construction industry unlike Pakistan and Indian industries was found to have a formal risk management process. However, Chihuri and Pretorius (2010) and Rwelamila and Shunmugan (2014) stated that despite a formal risk management process being in place, it was not being adopted as the risk management reactive and done insufficiently.

The literature further revealed risk management does improve the performance of the project and this was further solidified by the poor project performance that was experienced when the risk management wasn't implemented. Authors such as Cook and Smallwood (2015) pointed out that if risk management is not implemented in accordance with the guidelines it will result in the failure of the project.

The risk management process used for the research consisted of risk identification, analysis, response and review or monitoring (Choudhry, 2013). The risk management process was found to be cyclical such that after control and monitoring the risks one has to restart identifying the risks again.

The research went on to discuss the control and monitoring techniques as outlined in the PMBOK (2013). The techniques that were discussed in literature included:

- Risk reassessment involves the repetitive assessment of the risks in a project and results in the identification of new risks and the closing of out-dated risks;
- Risk audit a tool to evaluate the efficiency of the risk management process and to examine and document the efficiency of the risk response to identified risks;
- Variance analysis which compares the planned results to the actual results
- Trend analysis that reviews the project's execution using the performance information.
- Technical performance measurement which compares the technical accomplishment to the schedule of technical achievements;
- Reserve analysis compares the remaining reserve to the remaining risks, so as to certify if the remaining reserve is enough for the risks to be encountered; and
- Meetings were PMI states that project risk management should be an agenda item at periodic status meetings.

Factors influencing inadequate implementation of control and monitoring techniques.

The last literature objective was on identifying the potential factors influencing the inadequate implementation of risk management control and monitoring techniques. Previous studies revealed the factors that affect the implementation of risk management. These factors included the lack of knowledge of risk management, the experience of the company and personnel, the unavailability of previous cases, lack of management support and cooperation of the team, size of company, the unavailability of resources, the lack of awareness of benefits of risk management, the complexity of the techniques and project.

5.2.2 Empirical Objectives

The study has of two empirical objectives which include the investigation into the extent of implementation of risk management control and monitoring techniques and to evaluate and rank the factors affecting the implementation of risk management control and monitoring techniques.

The extent of implementation of risk management control and monitoring techniques.

The findings and revealed that meetings, technical performance, risk reassessment and risk audits are the four techniques that are most frequently used within the South African construction industry, whereas variance analysis, trend analysis and reserve analysis are less frequently used.

Meetings are the most utilised technique in implementing risk control and monitoring techniques where 66% of the South African construction industry uses the technique all the time to control and monitor risks. Also the information from the open ended questionnaires on the documentation of the control and monitoring process indicated that the documentation is done during meetings. The results also confirmed that the majority of the contractors, project managers and clients all make use meetings most of the time to control and monitor risks. Thus the technique is extensively used in the South African construction industry.

The second and third most utilised techniques are technical performance and risk assessment. These two risk control and monitoring techniques were found to be frequently implemented by all the three groups. These findings were different from the ones found in Pakistan and Singapore by Hassad et al (2014) and Hwang et al (2014) respectively, where they found that the client only preferred using meetings. This difference may go on to show that the South African clients' organisation do partake in the managing of the risks better than those in the Pakistan and Indian construction industry.

The fourth ranked technique are the risk audits which had 43.21% of the respondents indicating that they implement this technique all the time and 40.74% stating that they use it some of the time. These figures illustrate that almost half of the respondents utilise this technique all the time and there is no difference in the way the three types of organisations implement the risk audits.

Findings revealed that reserve analysis, trend analysis and variance analysis are the least implemented control and monitoring techniques. The project managers are the ones that less frequently implement these three risk control and monitoring techniques compared to the client and the contractor. These results are similar to a study done by Seku et al (2015) where the study revealed that the construction industry in South African project managers tends to prefer using techniques that are qualitative to the quantitative ones.

Evaluate and rank the factors affecting the implementation of risk management control and monitoring techniques

The results from the data presentation and analysis revealed that the factors that were influencing inadequate implementation of risk control and monitoring techniques include

- the lack of knowledge on risk management;

- experience of the company and personnel;
- the lack of management support and cooperation of the team;
- the lack of time and funds;
- the lack of awareness of benefits of risk management; and
- the complexity of the techniques and the project.

Then the factors that are less influential towards the inadequate implementation of the control and monitoring techniques include the legislation, the size of company and the availability of previous cases in the South African construction industry.

The lack of knowledge on risk management control and monitoring techniques is perceived by the contractor, project manager and client as very influential in causing the inadequate implementation of the control and monitoring techniques. It is ranked the most influential factor in the South African construction industry.

The second most influential factor in the inadequate implementation of the control and monitoring techniques is the lack of management support and lack of team support. The ranking made by the respondents coincides with the information on the open-ended questions where it was pointed out that the majority of the personnel that is documenting the control and monitoring process are the foreman and the executive doesn't seem to partake in the documentation of the risks. The management has not drafted a system where the control and monitoring process can be done throughout the whole project cycle. Some of the respondents stated that the management and other team members don't want to spend resources on a formal control and monitoring process. This goes to show that lack of the cooperation of the team has indeed has an influence in the inadequate implementation of the risk control and monitoring techniques.

The experience of the company and personnel was ranked the third most influential factor in causing inadequate implementation of risk control and monitoring techniques. The clients perceived factor to be moderately influential towards the inadequate implementation of the control and monitoring techniques. On the other hand, the project managers and the contractors viewed the factor as being very influential in the inadequate implementation of the control and monitoring techniques. This disparity may be caused by the fact that the client is on the supervision as compared to the other members that implementing the techniques daily.

The fourth and fifth ranked in the list of factor influencing the inadequate implementation of risk management control and monitoring technique is the complexity of the project. Were the majority of the South African construction industry believes that the complexity of the project has an influence in the inadequate implementation of the techniques.

Lack of awareness of benefits of risk management is the fifth most influential factor towards the implementation of the control and monitoring techniques. Were some of the respondents from the contractors pointed out that most of their colleagues are not interested in adopting some of the control and monitoring techniques because they are not aware of the benefits that the techniques had in improving the operations.

The least ranked factor influencing the inadequate implementation of control and monitoring techniques is the complexity of techniques. The factor had a mode score of three from all the parties showing that the majority of the respondents view the technique as moderately influential towards the inadequate implementation of the techniques. These results concur with the ones found in the extent of implementation where the techniques that required computations were less implemented going to show that the complex the techniques the less the techniques were used.

5.3 Assumptions

The study had two assumptions were the first assumption stated that the South African construction industry is inadequately implementing risk management monitoring and control techniques. The assumption was proved to be true as there is literature showed that the techniques were being implemented inadequately. Studies done by Shunmugam and Rwelamila (2014) revealed that during project execution there was poor monitoring of risks that emerged and the documentation of the process was not properly done.

The empirical findings also concur with these findings where it was found that overly it is seen that the majority of the participants do not document control and monitoring of risks throughout the stages of the construction life cycle as prescribed. Also the South African construction industry is not implementing risk control and monitoring techniques all the time or regularly and thus they are being implemented inadequately.

The second assumption for the study was that the construction managers and project managers are professionals that are responsible to ensure that risk management is implemented accordingly in construction projects. This assumption was proved to be correct in the literature

review where Hwang et al (2014) stated that the construction project managers are the ones that oversee the overall risks of the construction projects.

5.4 Overall findings

The findings from the literature and empirical research have revealed that formal risk control and monitoring strategies are present in the standard and guidelines in the South African construction industry. Despite its availability the findings have shown that it has not been adopted with the example of poor documentation practices where it is not done regularly.

To add on the risk control and monitoring techniques are not being frequently implemented as the meetings are the only technique that is being used all the time and the other techniques are mostly used some of the time. Also, the findings of most of the techniques had a significant number of people who were not sure if whether they use the technique or not this also goes to show that a portion of the South African construction industry is unaware of these techniques.

A further investigation conducted showed that the factors that are influential in the inadequate implementation of the control and monitoring techniques include the knowledge of risk management, experience of the company and personnel, the management support and cooperation of the team, the availability of time and funds, the lack of awareness of benefits of risk management and the complexity of the techniques and the project.

5.5 Limitations

The findings of study are limited to:

- Projects done in the past five years;
- Large civil engineering and building projects;
- In the South African construction industry; and
- To the responses from the construction managers and construction project managers registered with the SACPCMP.

5.6 Constraints

- The research had to be done within the time frames of the academic program hence there was a limited time to carry out the research.

- Questions about the exact implementation of the techniques by participants' companies could not be asked as they are more sensitive and could result in a low response rate.

5.7 Recommendations

This section is included to summarize any areas that may require further research to supplement the information in this study. Even though the objectives of the study were successfully addressed, further investigation is required to address certain aspect of the risk management such as finding means to avert the factors that cause the inadequate implementation of risk management. Not much information was able to be retrieved in this field as the research was time constrained to the one year academic year. Below are some recommendations on what may need to be considered to increase the current level of understanding and practice risk management control and monitoring techniques.

5.6.1 Practice

From the study conducted and the results that have been obtained, the recommendation for the industry is that there is need to adopt the set out guidelines and formalise the whole risk management process including the control and monitoring process;

- The industry needs to improve the knowledge it has on the implementation of risk management control and monitoring techniques and knowledge on the benefits that the techniques have for the companies; and
- Management should improve the support of the adoption of the control and monitoring techniques and the team needs to be more cooperative so that there is an effective implementation of the techniques.

5.6.2 Research

The recommendations for future study are:

- To conduct a similar study for the mega construction projects to ascertain if there is an implementation of formalised risk management control and monitoring and whether the techniques are being applied; and
- To investigate if the measures that have been suggested for the industry would actually improve the implementation of the control and monitoring techniques.

5.7 Contribution

The research has made contribution to both the body of knowledge in the study of risk management and as well as its practices in the industry.

5.7.1 Contribution to Practice

The research has highlighted the inadequate implementation of the risk control and monitoring techniques within the practices of risk management in the South African construction industry. The study went on further to unveil that the factors that have caused this poor implementation of the control and monitoring techniques is the lack of knowledge about the techniques and lack of cooperation by management. This is made evident by the poor documentation of the process and unavailability of a control and planning system.

5.7.1 Contribution to body of knowledge

The study has come up with new literature that has pointed how the risk control and monitoring techniques are being inadequately implemented, mainly being the failure to undertake control and monitoring throughout the project cycle and having the project managers use their previous experience to tackle risks than using the techniques which a more accurate. This was followed by identifying the factors that have caused the inadequate implementation of the techniques within the South African construction industry chief being the lack of knowledge on how to implement the techniques.

5.8 Conclusion

The PMBOK (2013) identifies risk control and monitoring as a “process of implementing risk response plans, tracking identified risks, monitoring residual risks, identifying new risks, and evaluating risk process effectiveness throughout the project”. The controlling and monitoring of risks has to be done by implementing the following techniques which include risk reassessment, risk audit, variance analysis, trend analysis, technical performance measurement, reserve analysis and meetings. Previous studies have shown that the South African construction industry has inadequately implemented the control and monitoring techniques. Where the techniques are not done regularly as prescribed by the PMBOK (2013), with an irregular and poor documentation of the risk control and monitoring process (Seku et al, 2015).

In this research it was found that the industry is implementing the control and monitoring techniques most of the time but not always, and that when it came to smaller projects some

participants believed the controlling and monitoring had to be moderate. Also the industry tends to use variance analysis, trend analysis and reverse analysis less frequently which shows that the industry prefers using qualitative techniques to the quantitative techniques. The top three factors that are influencing the inadequate implementation of the control and monitoring risks are lack of knowledge on risk management, experience of the company and personnel and lack of management support and cooperation of the team.

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1.3 ANNEXURE A: ETHICS CLEARANCE

SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE

PROTOCOL NUMBER CEM/18/09/BNM/MS

PROJECT TITLE:

An assessment of factors influencing inadequate implementation of risk control and monitoring techniques

INVESTIGATORS

Bokani Nqoba Mlazi 1774640

SCHOOL/DEPARTMENT

SCHOOL OF CONSTRUCTION ECONOMICS AND MANAGEMENT

DATE CONSIDERED

27/07/2017

DECISION OF THE COMMITTEE

Approved conditionally with respect to the declaration

EXPIRY DATE

26th July 2018

DATE

27th July 2017

CHAIRPERSON

Dr. Kola Ijasan

cc: Supervisor: Dr. Maria Vosloo

DECLARATION OF INVESTIGATOR (S)

To be completed in duplicate and **ONE COPY** returned to the Secretary Mrs. M. Sithole at the CEM reception desk.

I fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the committee. **I agree to completion of a yearly progress report.**

*bmgi*_____

Signature

21 / 09 / 2017

Date

1.3.1 ANNEXURE B PARTICIPATION INFORMATION SHEET

My name is Bokani Mlalazi and I am currently completing my masters degree in construction project management and am being supervised by Dr. Ria Vosloo. I am inviting you to participate in my research on the assessment of factors influencing inadequate implementation of risk management control and monitoring techniques.

Participation will involve completing this online survey that includes a brief demographics having close ended questions then followed by two other sections addressing the extent of implementation of risk management control and monitoring techniques and the evaluation and the ranking of the factors affecting the implementation of risk management control and monitoring techniques, with a last section having open ended questions. Participation is entirely voluntary and the questionnaires should take no longer than 15-20 minutes to complete. You may withdraw from participation at any time during completion of the questionnaires without any penalty. All participants will remain anonymous and there will be aggregated.

To further ensure your anonymity, IP addresses will not be recorded. Only myself and Dr. R.Vosloo will have access to the raw data which will be stored on a password protected computer. While feedback of specific, personal results is not possible due to anonymity, my email address and cell phone number are provided below if you have any further interest in the general results of the study.

Thank you for taking time to consider this invitation. Your participation would be greatly appreciated, and would add onto the existing knowledge of risk management and also to take the first step forward towards improving risk management in South African construction industry by assessing the factors influencing the inadequate implementation of risk control and monitoring techniques.

Researcher contact details:

Bokani Mlalazi Tel: 078 770 2460. Email: bokani.mlalazi1@students.wits.ac.za

Dr Ria Vosloo (Supervisor) Tel: 011 717 7655 Email: drriavosloo@gmail.coM

Dr Kola Ijasan (Ethics committee head) Tel: 0117177681 Email: Kola.Ijasan@wits.ac.za

1.4 ANNEXURE C: QUESTIONNAIRE

1.4.1 DEMOGRAPHICS

1.1 Who do you represent in the project environment?

- ☐ Mark only one oval.
- ☐ Contractor
- ☐ Client
- ☐ Project Manager
- ☐ Other

1.2 Please indicate your role in the company.

- ☐ Mark only one oval.
- ☐ Executive
- ☐ Construction Manager
- ☐ Quantity Surveyor

Other:.....

1.3 Please indicate relevant experience in current position

- ☐ Mark only one oval.
- ☐ Less than 5 Years
- ☐ 5-9 Years
- ☐ 10-20 Years
- ☐ More than 20 Years

1.4 How many persons are employed by your company?

- ☐ Mark only one oval.
- ☐ Less than 20
- ☐ 21-60
- ☐ 61-150
- ☐ 151 - 250
- ☐ More than 251

1.5 The organization that you work for, is it in the public or private sector

- ☐ Mark only one oval
- ☐ Public
- ☐ Private
- ☐ Both

1.6 The majority of projects you have undertaken fall under which size?

- ☐ Mark only one oval
- ☐ Mega projects
- ☐ Large
- ☐ Medium
- ☐ Small projects

1.4.2 SECTION 2: DESCRIBING THE PROJECTS YOU ARE INVOLVED IN.

For the purposes of this study- formal risk control and monitoring involves the tracking identified risks, monitoring residual risks, identifying new risks, evaluating risk process effectiveness throughout the project and documenting the process regularly.

2.1 At which stages do you mostly implement the risk control and monitoring techniques?
Mark only one oval

☐ ☐ ☐ ☐ ☐

Initiate

Plan

Execute

Control

Close out

2.2 For the following sizes of projects how many projects have you conducted formal risk control and monitoring.

Size of project	0-5 projects	6-15 projects	More than 15 projects
Mega			
Large			
Medium			
Small			

2.3 For the following size of projects how often do you use formalized risk control and monitoring.

Size of project				
Mega				
Large				
Medium				
Small				

2.7 To what extent do you normally implement the following risk control and monitoring techniques?

Please tick on the box

Risk reassessment

☐ Never
 ☐ Rarely
 ☐ Not sure
 ☐ Sometimes
 ☐ Always

Risk audit (examining and documenting the efficiency of the risk response to identified risks)

☐ Never
 ☐ Rarely
 ☐ Not sure
 ☐ Sometimes
 ☐ Always

Variance analysis (comparing the planned results to the actual results)

☐ Never
 ☐ Rarely
 ☐ Not sure
 ☐ Sometimes
 ☐ Always

Trend analysis (reviewing the project's execution using the performance information)

☐ Never
 ☐ Rarely
 ☐ Not sure
 ☐ Sometimes
 ☐ Always

Technical performance measurement (comparing the technical accomplishment to the schedule of technical achievements)

☐ Never
 ☐ Rarely
 ☐ Not sure
 ☐ Sometimes
 ☐ Always

Reserve analysis (comparing the risks remaining to the reserve money remaining)

☐ Never
 ☐ Rarely
 ☐ Not sure
 ☐ Sometimes
 ☐ Always

Meetings

☐ Never
 ☐ Rarely
 ☐ Not sure
 ☐ Sometimes
 ☐ Always

☐

1.4.3 SECTION 3

FACTORS THAT INFLUENCE THE INADEQUATE IMPLEMENTATION OF RISK MANAGEMENT (RM) CONTROL AND MONITORING TECHNIQUES.

Rank the following factors in order of influence towards the inadequate implementation of risk control and monitoring techniques where 1 is least influential and 10 is most influential;

3.1 Knowledge of RM

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Least Relevant	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Most Relevant

3.2 Experience of the company and personnel

Mark only one oval.

1 2 3 4 5 6 7 8 9 10

Least Relevant ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Most Relevant

3.3 Availability of previous cases

Mark only one oval.

1 2 3 4 5 6 7 8 9 10
Least Relevant ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Most Relevant

3.4 Management support and cooperation of the team

Mark only one oval.

1 2 3 4 5 6 7 8 9 10
Least Relevant ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Most Relevant

3.5 Size of company

Mark only one oval.

1 2 3 4 5 6 7 8 9 10
Least Relevant ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Most Relevant

3.6 Availability of time

Mark only one oval.

1 2 3 4 5 6 7 8 9 10
Least Relevant ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Most Relevant

3.7 Availability of funds

Mark only one oval.

1 2 3 4 5 6 7 8 9 10
Least Relevant ☐ ☒ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Most Relevant

Relevant

3.8 Legislation

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Least Relevant	☐		☐	☐	☐	☐	☐	☐	☐	☐	Most
☐ Relevant											

Lack of awareness of benefits of RM

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Least Relevant	☐			☐	☐	☐	☐	☐	☐	☐	Most
Relevant											

1.4.4 SECTION 4

GENERAL - Paragraph questions

4.1 From the listed factors that influence the inadequate implementation of RM control and monitoring techniques in section 3. What factor in your opinion is the most relevant?

Please elaborate on why you think the specific factor is the most severe / relevant

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.....
.....

4.2 Do you think that RM on small construction projects is important?

Please elaborate on response

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.....
.....
.....

4.3 Who does the documentation of the risk control and monitoring?

.....
.....

4.4 When is the documentation of the control and monitoring done?

.....
.....

