IMPROVING THE PERFORMANCE OF CONSTRUCTION PROJECTS USING THE ENTERPRISE BASED RISK MANAGEMENT PRACTICES AND PROJECT RISK MANAGEMENT PRACTICES

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ABSTRACT

A number of construction projects are experiencing some pitfalls and these failures are due to not meeting the budget and schedule constraints. The literature review of this study covered different aspects of construction projects in the use of ERM practices and PRM maturity models.

This study examines enterprise based risk management practices and to use project risk management maturity models in the delivery of construction projects. Data was collected by means of interviews where 10 respondents involved in different projects and departments were interviewed on a one-on-one basis in order to address the research questions. The study found that lack of a risk management culture and therefore shared levels of awareness due to lack of communication amongst the key stakeholders was a problem. The study also found that integration with other knowledge management areas was ineffective. Participants further indicated that project risk gets communicated within a specific stage of the project, but as they move through the stages the communication gets lost to a certain degree. The study recommends that for organisations to execute successful projects, it is fundamental to apply risk management best practices. Further recommendations to address gaps found were made within the study.

Key words: Construction Project management; Risk Management; Stakeholder Management; Culture

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM

1.1 Research Background

Project management has been found to be highly complementary to the execution of the capital investment process and as such has been adopted as a method for solving complex organisational problems. The field of project management has matured from the traditional project management through management of projects to modern project management (Anderson & Merna, 2005). Nonetheless a number of high capital construction projects have been experiencing serious pitfalls and these failures are due to not meeting the budget and schedule constraints.

Risk management is one of the knowledge areas of project management and has been accepted as a key discipline by organisations and individual projects. The increasing value of risk management has been recognised by companies in search for improvement steps in order to be more competitive in the industry (Ongel, 2009). Risk Management has emerged as a supporting process to the project from its inception, through to execution and completion (Raz *et al*, 2001). Risk management is seen as a critical knowledge area in businesses since it impacts on profitability, efficiency and sustainability (Zwikael *et al*, 2011). It is perceived as an important area influencing project success and is a pivotal aspect in capital projects (Krane *et al*, 2010).

The core elements of project risk management have been used by many organisations, however risk management needs to be developed in various areas to improve the foundation. There are different risk management models that have been developed to meet this need (Ongel, 2009).

1.2 Research Problem

Construction projects are characterised by long lead times and high project costs. This in most cases happens to be out of the initial scope of the project, and as a result poses a risk to such projects. The industry is identified by high fragmentation,

low productivity, cost and time overruns conflict and disputes, and relies heavily on human interaction. Most projects are unable to reach their objectives due to lack of project risk management function within construction projects. For a project to be successful, it should not just be completed on time and be within budget it should also achieve project objectives. Project risks tend to have an impact in one or more of the project objectives. Various processes have been used in risk management in assessing the risk inherent in projects. Still a high percentage of infrastructure projects experience pitfalls.

Construction projects involve different participants, methods and various teams of different skills and background. The project success rates as well as the returns on investment on the project have been questioned by both corporates and the academics. Project maturity models have created the awareness on competences and offer the standard on which to assess the organisations and their levels of maturity. The emphasis on maturity models shows the desire to link project management competency to corporate achievement.

Various areas of risks in the project are inclusive of operations, project, health and safety risks. In most of the cases, some risks within the projects are not integrated at the project level, and different risk owners deal with different categories of risks at different levels within the project. Risk management ensures that all activities are fulfilled in order to achieve project objectives. Risk management maturity modelling is a reflection of an organisation's understanding of its risk portfolio and on how to manage those risks. It helps in identifying the strength and the weaknesses of an organisation and can help to identify areas needing improvement.

Failure of most construction projects to meet their budgets and to be completed on scheduled time has created the need for risk management in construction projects. Construction projects are capital intensive and as such the activities of these projects should not be left to chance. They need to be examined and relevant processes need to be put in place. Various maturity models have been used in risk management in assessing the risk inherent in projects. Still a high percentage of construction projects experience pitfalls. There is thus a need to relook and inspect the maturity level of the project risk management in construction concurrently with enterprise risk

management practices in order to minimise the rate of failure of the projects and to improve on performance.

Since risks in a project are measured by their potential impact on the project objectives, there is a link between success of projects and effective risk management practices. Effective risk management in projects can turn some of the risks into opportunities to make profits.

Organisations that have an established risk management maturity can have competitive advantage over their competitors. Thus Porter's five forces model could be adapted to project risk management environment. According to Porter's model, there is intensity of rivalry among industry competitors and external forces (i.e. new entrants, bargaining power of buyers and suppliers, and substitutes) act as a threat on the industry. (Rice, 2010)

1.3 Research Scope

South Africa is a developing country where the development of construction projects is underway and is inclusive of projects such as transport, roads, power plants and ports. Construction projects involve significant risks and are capital intensive. Risk management is one of the knowledge areas in project management, and it has been used to improve the performance of construction projects in the past. This poses a challenge since a higher percentage of construction projects are experiencing some failures.

The research problem is centred on the need to improve the performance of construction projects using the adopted models from the enterprise based risk management practices.

The focus of the study will be based in a global organisation consulting in the construction projects within South Africa, which is involved in various projects around the globe.

1.3.1 Limitations

There are various kinds of construction projects in the industry. Some are infrastructure projects which may span over a long period. Due to timeframe limitations, the data collected is therefore is not representative of all the construction projects in South Africa.

1.4 Research Objectives

The aim of this research is to adopt enterprise based risk management practices and to use project risk management maturity models in the delivery of construction projects in order to minimise failure and improve on performance.

The central theme in the study will revolve around the following objectives of the proposed research topic:

i. To establish the importance of project risk management in construction projects

ii. To examine if there is improvement on the project's performance by the effective use of enterprise based risk management maturity principles

iii. To benchmark the existing project risk management models with the enterprise based models

1.5 The Layout of the Report

This report is composed of seven chapters.

Chapter 1 - is prelude to the research problem, and it highlights the need for the research and the objectives of the study.

Chapter 2 - covers the literature review on enterprise risk management, organisational culture, and risk management maturity in construction projects.

Chapter 3 - states the clear objectives and tries to answer the questions raised as the result of the gap in the study.

Chapter 4 - gives the detailed methodology used to collect the data. The unit of analysis is defined and the population, the sample size and sampling method, and the research instrument.

Chapter 5 - deals with the results of the research based on the data and the research objectives. The sample and the results of the research are presented clearly.

Chapter 6 - discusses the results of the questions raised at the beginning of the study. It will highlight in details the how the research objectives are met.

Chapter 7 - highlights the main findings of the research, gives recommendations based on the findings and for the future research.

CHAPTER 2: LITERATURE REVIEW

The literature reviewed in this chapter defines and describes the enterprise risk management and its implementation and its value add to the firm. Prior research has been done with regards to the enterprise risk management and its implementation, and henceforth the focus will be on the value derived on its success as far as the application to construction projects is concerned.

Construction industry relies heavily on human interaction. There is a need for collaboration of the project team in order to achieve the project objectives. The researcher will attempt to show that literature has focused on different aspects of construction projects in the use of Enterprise Risk Management (ERM) practices and Project Risk Management (PRM) maturity models and the following topics will be discussed:

- Enterprise Risk Management (ERM) and its value to the firm
- Risk management in construction projects
- Project risk management (PRM) maturity
- Improving performance of construction projects

2.1 Enterprise Risk Management and Its Value to the Firm

Verbano and Venturirni (2011) define enterprise as the removal of traditional functional, divisional, departmental, or cultural barriers.

Kimbrough and Componation (2009, p18) defines enterprise risk management (ERM) as “a systematic approach to managing all forms of risk faced by an organization, including those in the purview of an engineering manager”. ERM has evolved as an approach of managing the portfolio of risks within an organisation. It looks at risks holistically and uses systematic methods to manage those risks. ERM methodology is characterised by identification and assessment of risks in a standardised fashion to help respond to the risks. The aim is to deal with risks that threaten the organisation's

objectives. ERM is all encompassing since it addresses risks related to the operations, finance, supply chain, safety, environment etc. (Kimbrough & Componation, 2009).

Kimbrough (2009) further points out that there have been challenges encountered in the implementation of ERM initiatives within the organisations. It was found that organisational culture plays a critical role in the implementation of enterprise risk management. ERM has been designed to identify the potential events that threaten the implementation of the organisation strategy. Thus in a mature culture, ERM is viewed not as a project but as the way of doing things. Kimbrough (2009) emphasises that the appointment of the risk officer within the organisation spurs the implementation of the ERM. This highlights the importance of having the buy in from top management to succed in the implementation process.

Hoyt & Liebenburg (2011) share the same understanding with Kimbrough (2009) in the interpretation of ERM as the holistic view of risk across the enterprise. It has the benefits of creating the synergies between different risk activities and manages to break down the silos inherent within viewing the individual risks within the categories. "ERM promotes risk awareness that facilitates better operational and strategic decision making" (Hoyt & Liebenburg, 2011). Coordinating risk management across all the departments helps avoid duplication of both costs and management strategies.

While the views of Kimbrough *et al* (2009) and (Hoyt & Liebenburg, 2011) seem congruent to each other, McShane *et al* (2011) has the view that ERM's aim is to coordinate and manage risks faced by a firm across all functional areas within the value chain. The purpose is therefore to gain the understanding of the interdependencies of risks across the board. The overall concept of ERM is the consolidation of risks into a portfolio to manage them, which is more efficient than dealing with individual risks independently. Therefore in applying the portfolio theory, ERM can increase the firm value since the risk of an aggregate portfolio would be less than the sum of individual risks. (Hoyt & Liebenburg, 2011). found a positive correlation between the appointment of the chief risk officer and the firm value while on the other hand Gordon *et al* (2009) emphasises that the relationship depends on

how well ERM implementation was matched with other firm-specific factors. There is thus no empirical evidence of the impact of ERM on firm performance, but the movement in equity markets due to appointments of risk specialists to oversee the firm's ERM process suggests that the firm benefits from the implementation of ERM (McShane, Nair, & Rustambekov; 2011). McShane *et al* (2011) further point out that the goal of risk management as not being to reduce total risk but to allocate risks to play on the firm's strength. Furthermore, McShane *et al* (2011, p645) assertedt that "the firm should reduce exposure to risk in areas where it has no comparative information advantage and exploit risks in areas where it has an advantage". This implies that there is a possibility of risk increasing under ERM risk allocation.

"A holistic approach towards managing the organisation's risk is referred to as *enterprise risk management*" as defined by Gordon, Loeb andTseng (2009, p302). The argument presented is that the ERM implementation lowers the firm's risk of failure and thereby improves the performance and the value of the organisation. This is in agreement with (Hoyt & Liebenburg, 2011). that ERM improves the firm value. According to Gordon *et al* (2009) the factors believed to have the impact on ERM-firm performance relationship are:

i. Environmental uncertainty - ERM system is intended to identify and manage future uncertain events that may impact negatively on the firm's performance.

ii. Industry competition - Fierce competition within the industry causes the firm to have a risk of not earning substantial profits. Thus there is a relation between the ERM system and the industry competition.

iii. Firm complexity - The firm's complexity is likely to result in less integration of information and more difficulties in managing the internal controls, and hence the need for ERM system.

iv. Firm size - The firm size has an influence in the adoption of ERM systems. Thus the bigger the size of the firm, the more complex is its functional structure and the higher the risk. Thus there is a need for the ERM system.

v. Board of Director's monitoring - For an ERM system to be effective there must be a buy in from the board of directors.

Thus it was found that the ERM-firm relation was dependent on the match between ERM and the five variables of interest (Gordon *et al*, 2009).

Beasley, Clune and Hermanson (2005) agree with (Hoyt & Liebenburg, 2011). that the effective implementation of ERM is related to the presence of chief risk officer, the board's independence, the support of both the CEO and the CFO. That ERM “is designed to increase management's ability to oversee the portfolio of risks facing the enterprise" and that “it provides a significant source of competitive advantage for those who can demonstrate a strong ERM capability and discipline” (Beasley *et al,* 2005,p522;). Thus organisations implementing ERM process increase their risk management activities with the ultimate goal of increasing the customer value.

There is a common understanding between (Gordon *et al*, 2009) and (Beasley *et al*, 2005) that the increase in the size of the organisation may increase the scope of uncertain events threatening the organisation. This may call for the effective implementation of ERM as a result of greater resources. Accordingly the larger firms are more in a position to adopt the integrated risk management than the smaller firms. (Beasley *et al*, 2005)

Interestingly enough Nocco, Tultz and Nationwide Insurance (2006) suggested that companies that manage risks holistically using effective ERM, have a competitive advantage over those that manage one risk at a time on a decentralised basis, which is in agreement with Gordon *et al* (2009). ERM creates value since it allows management to quantify and manage risk-return trade-off for the entire organisation. The challenge experienced with ERM is its implementation, which Kimbrough *et al* (2009) alluded to it when stating the importance of the organisational culture in implementing ERM. In order to get the buy-in of implementing the ERM throughout the organisation, people need to understand how it can create value. They need to understand that ERM is a critical tool for executing the organisation's strategy. For the whole organisation to get behind it, a thought should be given on the performance evaluation and on how to incentivise the staff. (Nocco *et al*, 2006)

2.2 Risk Management in Construction Projects

Risk is defined by Krane, Rolstada and Olsson (2010p82,) as “an uncertain event or condition that if it occurs, has a positive or negative effect on a project’s objectives”, which was adopted from PMI (2008). Lehtiranta (2011) refers to relational risk in relation to achieving the goals of collaboration, and performance risk in relation to achieving the goals of the technical undertaking, provided the collaboration functions properly.

In construction industry, a planned solution guides project delivery and the challenge facing construction companies is the uncertainty inherent in a project. Relational contracting addresses the collaborative work and therefore improves overall performance in project implementation. Again, in large construction projects relational risk is a major determinant of project success and collaborative work has the potential to either add value or to withhold it. (Lehtiranta, 2011)

Project risk management is one of the knowledge areas of project management processes (Project Management Body of Knowledge by PMI). Project risk management is seen as a supporting process to the project from its inception, through to execution and completion.

Various project risk management processes have been proposed. One such process consists of two stages of risk assessment and risk control with sub-processes. Raz and Michael (2001), highlight another interesting process by Chapman and Ward (1997) with nine phases. These consist of:

- defining the key aspects of the project
- focus on the strategic approach to risk management
- identification of risks
- risk assumptions and relationship structure
- assigning ownership of risks
- estimate the extent of uncertainty
- evaluate the magnitude of various risks
- plan response

- monitor and control

This has been the more generic view of the process adopted in project risk management. Raz and Michael (2001) are of the opinion that “in order to strive for the competitive advantage, one should adopt the tools that are associated with the better performing project management practices”. (Raz & Michael, 2001)

Research has identified risk management as a critical knowledge area in businesses since it impacts on profitability, efficiency and sustainability (Zwikael & Ahn, 2011). Construction projects have high levels of uncertainty by nature of their compressed schedules, uncertainty in budgets, change in design scope and frequently changing requirements. Since planning is a critical phase in project management and a critical tool in uncertainty reduction, it is vital that risk management be performed at the planning phase of a project. Zwikael and Ahn (2011) associate the perceived levels of risk with the maturity of the project manager, organisation and the industry. The researcher’s view with regards to maturity models (i.e. the effectiveness of organisational processes) is that construction industry and engineering have the highest levels of maturity. (Zwikael & Ahn, 2011)

The project progress and performance in most cases results from the actions of various participants collaborating in the project. The participant's actions are influenced by the objectives/context and the capabilities of the participant. These are inclusive of the nature of the project, the work environment, the role and of other participants and the project's progress. Risk management process is more effective when applied at an early stage of the project's life. The process needs to take into account the actions of other stakeholders involved in the project. Information about project risks needs to be shared with all involved in the project. An observation made is that different stakeholders tend to have different commercial objectives and hence different objectives for risk management. Thus they manage risks to further their own business objectives. The challenge for risk management is to integrate these differing objectives. An effective risk management will consider working environment since it has an impact on the project participants.

Krane, Rolstada and Olsson (2010) mentions risk management as the major factor influencing the success of the project and thus regards project risk managemnt as an important activity influencing capital projects and as a pivotal aspect in projects. Additionaly, project risk management is seen as part of most maturity models. The researcher refers to other factors that contribute to the success of the project which are inclusive of project mission, management support, schedule/plan, client consultation, client acceptance, personnel, technical aspects, monitoring, communication and feedback.

Project risk is defined as an uncertain event that may have a positive or negative effect on a project's objective (Carbone & Tippett, 2004). Early identification of the risks within the projects leads to a successful completion of the project. It has been recommended by the researcher that the project should have an effective risk management plan that a project team can use and apply. Thus risk management process must become part of the culture in the organisation as well as within the project. The benefits to doing this “include an increased focus on the most imminent risks, prioritising risk contingency planning, improved team participation in the risk management process, and development of improved risk controls.” (Carbone & Tippett; p28 2004)

Sanchez, Robert and Pellerin (2008) introduced the concept of portfolio risk and suggests that focus should be on the trade-offs between risk and the strategic benefit rather than viewing the portfolio risks only in terms of schedule or budget variations. The researcher recommends that that an integrated risk management be considered since it is “a contineous, proactive, and systematic process to understand, manage and communicate risk from organisation-wide perspective” (Sanchez *et al* ;p97 2008). This was alluded to by Gordon *et al* (2009) in his recommendation of viewing risk holisticaly for the application of enterprise risk management. the researcher’s argument is that integration of portfolio management and risk management approach will esure that the strategic objectives and the maximization of portfolio value are achieved. This will take into account the resources, knowledge, and strategy interrelations as fundamental to maximising the value of the portfolio. (Sanchez *et al* ;p97 2008)

Over the time span between project initiation and completion of construction many factors influence the final project costs. It is quite a challenge to control the project budget during this period. Developing the cost estimates that accurately reflect the project scope and the impact of macroeconomic conditions provide management with the baseline cost that they can use to impart discipline into the construction process. For projects to be delivered on budget, it "requires a good starting estimate, awareness of factors that can cause cost escalation, and project management discipline" (Shane, Molenaar, Anderson & Schexnayder; p221 2009). Contingency budget is meant to cover the unforeseen events that are not identified in the initial stages of the project and misuse of such funds could lead to estimation problems. Lessons learnt from the past project can serve one well in understanding the challenges involved in in delivering the quality project and in understanding the factors that cause project cost escalation.

"Managing construction projects requires the coordination of a multitude of human, organisational, technical and natural resources" (Shane *et al,* 2009;p221), and such factors as economic, societal and political challenges might overshadow the project which can influence cost to escalate. This may trigger disruption to the project. Cost escalation may occur during the planning and the design phase, but it mostly manifests itself during the construction phase.

Touran *et al* (2006) points to project delays as "the most important contributing factor to the magnitude of cost overrun" in construction projects (Touran & Lopez, 2006). Further, reference was made to the length of project development phase from planning to construction as the major factor in the extension of cost overrun. It is expected in many construction projects that span over a long period for the costs to escalate. The increase is caused by factors such as inflation, market conditions, risk allocation clauses in contract, interest rate, and taxes. It is noted that estimating the increase in prices over the long term is beyond the control of many parties due to uncertainties. The contributors suggested that "the more prudent way would be to calculate the range of possible cost rather than just a single figure" Touran *et al* (2006)

2.3 Risk Management Maturity in Construction Projects

Zou, Chen, and Chan (2010, p854,) define risk as “a chance of something happening that will have an impact on objectives and risk management in the culture, processes, and structures that are directed towards realising potential opportunities while managing adverse effects”.

The construction industry relies heavily on human interaction and as such a good cultural environment plays a significant role in the morale of the project participants and by extension in the productivity of the organisation. The key areas of assessment for project risk management are thus “related to systems, process, people and culture which collectively include applications of risk identification and analysis techniques and standardised process, as well as top management, people and leadership in implementing risk management that ultimately shapes the organisational culture towards risk management”, (Zou *et al*, 2010).

Additional areas of assessment may be inclusive of governance which relates to setting up the risk tolerance for the project at hand and keeping the stakeholders informed should the tolerance level be exceeded. Zou *et al* (2010) suggested that combining all the attributes stated above will lead to the overall project risk maturity level.

Risk management maturity reveals organisation’s understanding of its risks and more importantly how to manage those risks to achieve the project objectives. It helps with identifying the strengths and the weaknesses of the organisation and in detecting areas that need improvement. When reviewing risk management practices, systems and culture it is vital to establish the risk management maturity of the organisation (Zou et al, 2010).

Legislatively, organisations dealing with the construction projects are expected to implement risk management systems since it is a legal requirement that organisations assess and manage risks associated with their business. Construction projects involve different contractors with varying skills and background, and without a mature risk management the project would be impacted negatively which could

lead to increased uncertainty. This in turn could result in project pitfalls and cost overrun (Zou *et al*, 2010).

According to Yazini (2009), organisations with higher maturity levels are presumed to have a competitive advantage due to their project efficiency and effectiveness. The researcher indicates that the link between culture and project management maturity leads to higher project and thus business performance.

The four dimensions used to measure project success in addition to it being completed on time and within budget are: 1) meeting project goal; 2) customer benefits; 3) benefit to the organisation; and 4) benefit to the community and infrastructure.

From a project management point of view, Ward (1999) suggests that collaboration of all participants involved in the project be scrutinised in order to have a success in project delivery. Thus the participants would be influenced by context and the characteristics of other participants in the team. These characteristics include motivation which in turn is driven by the person's objectives towards the project and is influenced by the perceived outcomes of the participant's actions and the associated project progress. Ward (1999) suggests that risk management process be applied at the early stages of the project life cycle for it to be more effective and that risk management be the culture of the project with risk information being shared among different contractors.

Ward's (1999) view that different parties involved in the project have different commercial objectives and hence different approach to risk management process, is by contrast different to Raz and Michael's (2001) view of the various processess used. The researcher alludes that different parties will seek to manage risk to fulfil their own business objectives first, and suggests that integration of the risk management process within these differing perspectives and with other project management functions take place (Ward, 1999).

Jugdev and Thomas (2002) propose that implementing strategy should involve setting the direction for the organisation to achieve the targets and thus the objectives of the company and that the involvement of middle management in in this

process helps the organisation to achieve better performance and thus achieves a competitive edge.

The data indicates that firms are turning to project management as part of their competitive advantage and building blocks of business value. The strength of a firm's competitive advantage lies in its resources. Because investments in projects are time, money and resource intensive, firms take interest in practices that will enhances their competitive positions in the market. Project management maturity models help to create awareness on competence and to measure the organisation on the project management competence. (Jugdev *et al*, 2002)

2.4 Improving Performance of Construction Projects

The success of the project should not be measured only by delivery within time and budget, but it should also encompass its contribution to the company's goals. Thus the priority on the project tends to be different for both the project owner and the project manager within the same project. Their different perspective on the project success generates different attitudes towards risk as shown in figure 1 below. Research has shown that the project manager was risk averse whereas the project owner would be inclined to take risk. Thus the project owner's focus was for the project to contribute to the organisation strategy, whereas for the project manager was more focused on delivering the project within time and budget. Consequently the project manager's view for measuring success tends to be short and narrow whereas the owner's view of measurement was long-term. (Krane, Olsson & Rolstadas; 2012)

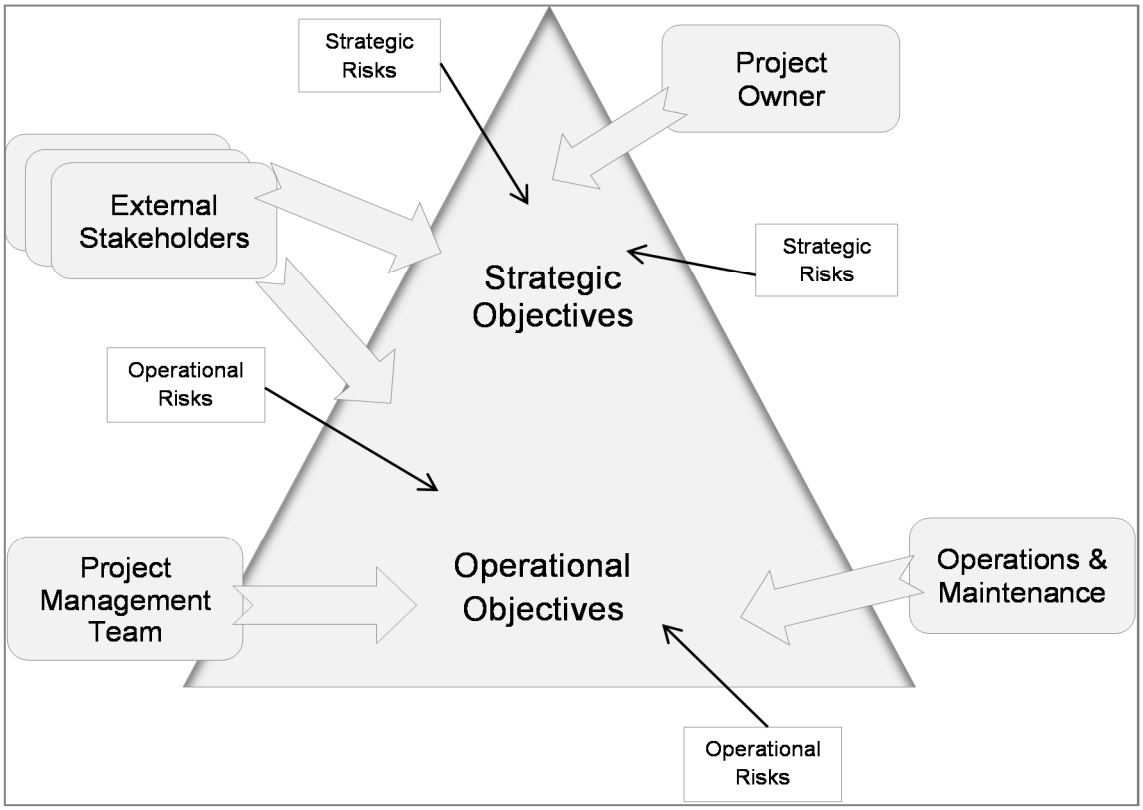

Figure 2.1: The main stakeholders, their objective types, and corresponding risks (Krane *et al,* 2012)

For the project to have a success, both views need to be aligned. Therefore an element of trust should be shown by both parties. Thus the project success would encompass various perspectives from both the project owner and the project manager, and these are inclusive of project deliverables in terms of cost and schedule; the benefits of the project to the user, and the long-term benefit of delivering to the company strategy. (Krane, Olsson & Rolstadas; 2012)

Research has shown that a project needs to have well defined objectives. These are inclusive of project objectives which are tied to the deliverables; business objectives which are defined as benefits to the project deliverables; and the social objectives with the long-term benefits to the society as a whole. (Krane, Olsson & Rolstadas; 2012)

Various projects have shown a link between operational, the strategic risks; and that operational risk may be converted to strategic risk, and on the other hand the operational risk may evolve as strategic risk. This will take place if risks are coordinated within the project.

Construction projects are characterised by large number of stakeholders such as the owner, consultants, contractors, subcontractors, and suppliers. These stakeholders have to work together to meet the project's objectives. Many of these stakeholders have no interest in working together since they pursue economic benefits that maximise themselves. Research has shown that the fragmentation of processes in the construction industry has resulted in poor performance, low productivity and non-competitiveness (Xue, Shen & Ren, 2010). Additionally globalisation and competitiveness has changed the business environment, and the construction industry needs to align itself to the trends so as to be efficient and effective.

The researcher defined the organisational culture from Schein's (1985) definition as "a pattern of basic assumptions developed, invented or discovered by a given group as it learns to cope with its problems of external adaptation and internal problems". Thus the understanding of influential cultural factors will help to reduce conflicts in a project and there by foster improvements in the efficiency and profitability of projects. Collaborative working is an emerging trend in the construction industry for improving performance and enhancing competitiveness of the changing business environment. Collaboration has the advantage that it propels organisations to achieve more than it could have achieved on its own by building effective working relationships with other organisations. Another area that has received attention in construction industry is partnering and alliance. They both drive results through collaborative relationship. The difference is in their contractual obligations. (Xue *et al*, 2010)

Corporate strategy is a way of articulating the organisational goals and objectives and how they will be achieved. Projects are therefore important channels to drive the strategy in the enterprise. On the other hand project management was seen as execution orientated, and thus was not viewed in a favourable light by senior managers since it was not thought to be strategically important. Another school of thought proposed that project managers be involved in strategy formulation and not

execution due to their limited exposure in factors that initiate change in projects. (Morris & Jamieson, 2005)

Empirical research has shown that the reason projects fail is that they lack organisational support. According to the researcher, there is a need for senior management to be involved in the projects for a successful strategy implementation in projects (Morris & Jamieson, 2005) which is in agreement with the statement made by Kimbrough *et al* (2009) and Beasley *et al* (2005) about the presence of the senior management in support of ERM.

Rice (2010) argues that Porter's five forces model could be adapted to risk management with the five forces being replaced by the risk forces which are inclusive of internal organisation, industry, information, construction, and influences.

Internal organisational risk would focus on functions such as task sharing, cross training, assignment duration, and related functions. Industry risk on the other hand would look at the contractual matters, risks associated with the contractor and sub-contractor organisation, technology maturity and product support. Information risk would include the information system backup and network security. Construction would refer to physical security and communication networks, and influences refer to external demands and policy mandates. The forces are thus risk related rather than competitive in nature. The model could be used to identify the strength and opportunities thereby reducing risk or taking advantage of the opportunities to improve the profits (Rice, 2010).

Most of construction project teams consist of participants coming from various backgrounds and having a common objective of delivering the project. Integrating the individual workgroups is imperative to the successful delivery of the project.

Baiden, Price and Dainty (2006) question the traditional project success criterion of time, cost and quality. The researcher argues that the industry needs to mature above those measures and start replacing them with new measures in order to fully benefit from the diverse expertise present in project teams. Thus traditional project drivers should be replaced with outcomes related to behaviour and cultural improvement. The changes in this regard would thus help the teams to meet the

project's quality requirements within the stipulated time and cost. (Baiden, Price & Dainty, 2006)

Ochieng and Price (2010) confirms the value of deriving value from the collaboration of the project team. The researcher acknowledged the composition of a multicultural project team consisting of participants coming from various political, legal, economic and cultural backgrounds, and argues that the primary key to improving product delivery within the construction industry is to integrate the team work. Ochieng *et al(2010)* concludes that the best performance is achieved when the whole project team is fully integrated and aligned with project objectives, and that effective communication in multicultural teams stimulates the formation of emergent team culture.

Verbano and Venturini's (2011) concern is the integrated management of all types of risks within the project. The researcher acknowledges that the aim of risk management is to create value for a firm through proactive and integrated approach which aligns strategy, processes, people, technology and knowledge with the purpose of evaluating and managing threats and opportunities that the enterprise faces as it creates value. Additionally, it helps in managing all key business risks within the organisation with the aim of maximising the shareholder value for the enterprise. (Verbano & Venturini, 2011)

The construction industry is experiencing a rapid change in technologies, workforce, globalisation, economic integration and international partnering. The challenge is how to educate personnel to respond to these changes in the industry. These changes require that the construction organisations evolve from knowledge management programmes into being learning organisations. Chinowsky and Carrillo (2007) believe that learning within the organisation should be enhanced and knowledge be sought after for continuous learning in order to establish a learning culture. This is in congruent with Xue *et al* (2010) statement that organisational culture and organisational learning are closely related. The researcher concludes that "a learning organisation is skilled at creating, acquiring, sharing, and applying knowledge, and embracing change and innovation at all levels, resulting in optimum performance and maximum competitive advantage" (Chinowsky & Carrillo, 2007. p124;).

Risk management activities have been found to be used to convey messages to other stakeholders with the aim to influence their behaviour to become more responsible. de Bakker, Boonstra and Wortmann (2011) believe that the project success is largely influenced by good communication between the stakeholders, good collaboration, and more creative thinking. Another element of concern was the creation of the project team spirit as an additional effect of the project risk management process. The collection of information from key stakeholders has been noted to enhance the risk management process by supporting the decision making process and fine tuning the stakeholder perceptions and expectations to create commonly defined environment. The argument was rather on the approach to determine the project success based on time and money, and was perceived as limiting, and that it should rather be seen as subsets of project success. (de Bakker, Boonstra & Wortmann; 2011)

The project delivery method plays a vital role in the successful delivery of a project since there is a trade-off between risk and control. The project delivery method is selected early in the project life cycle and it equates to all the contractual relations, roles and responsibilities of the entities involved in a project. One possible approach to select the delivery method is to set the number of criteria and compare the characteristics of the delivery method against the effects on the criteria. Some of the criteria are the ability to manage risk effectively and to exert control over the project, schedule shortening and cost reduction. This shows the usefulness of a risk assessment in a project as well as the importance of considering the risk distribution as a parameter in delivery method selection. (Ghavamifar & Touran, 2009)

CHAPTER 3: RESEARCH QUESTIONS AND OBJECTIVES

According to Saunders and Lewis (2012,), research strategy should be guided by research questions, objectives as well as the extent of the existing knowledge, the amount of time and the resources available. It is further noted that a survey is a structured way of collecting data about the same things from a large number of people in a cost-effective way. For this research the tool was employed is the use of interviews in collecting data.

The objectives were broken down into the following research questions which the study focused on answering:

3.1 Research Question 1

What are the risk points in construction projects (e.g. reasons for failure) that cause them not to meet their objectives?

This question sought to understand the value of risk management in construction projects. Shane *et al* (2009) asserted that classification of cost escalation factors empowers the construction pesonnel to readily identify when specific factors are impacting a project and allows for appropriate actions to mitigate the impacts.

3.2 Research Question 2

Have risk management maturity frameworks stood the test of time?

The question sought to understand the impact of risk management models on construction projects that is if there is improvement on the project's performance by the effective use of enterprise based risk management maturity level. Raz (2001) indicated that in order to strive for the competitive advantage, one should adopt the tools that are associated with the better performing project management practices.

3.3 Research Question 3

To what extend do current methods work? Are they effective?

The question sought to benchmark the existing risk management models used with the enterprise based model. Nocco *et al* (2006) compares and contrasts companies that manage risks holistically using effective ERM to those that manage one risk at a time on a decentralised basis. Nocco *et al* (2006) highlights that these companies have a competitive advantage over those that manage one risk at a time on a decentralised basis. ERM creates value since it allows management to quantify and manage risk-return trade-off for the entire organisation.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Research Design

De Vaus (2001, p9) describes the function of the research design as to ensure compatibility of the evidence obtained to answer the questions raised in the research. De Vause further states “obtaining relevant evidence entails specifying the type of evidence needed to answer the research question, to test a theory, to evaluate a programme or to accurately describe some phenomenon”.

Different approaches of the research would entail both theory and method. The scope of the research was guided by the reviews of the related literature that emphasized on enterprise risk management practices and on the value of improving risk management capability to achieve the desired results in projects (Zou, Chen, & Chan, 2010; Yazici, 2009). The past research focused on issues around improving the maturity level of projects and of project risk management to achieve competitive results within a single organisation with the same culture. The study adopted these techniques in a broader scale of construction projects with different organisational groups involved.

There are differing approaches to research. Creswell (1994) defines quantitative research as an inquiry into an identified problem based on testing a theory, and further defines qualitative research as a process of inquiry that has a goal of understanding a social problem from multiple perspectives. Creswell (1994) further confirmed that the choice of research methodology guides the choice of questions asked and the statistical analysis used. Saunders *et al* (2012) highlighted the difference between the quantitative and qualitative approaches in that quantitative data is collected in a standardised way, whereas qualitative data is collected in a non-standardised way.

4.1.1 Quantitative Research

Quantitative research focuses on measurement of variables and on testing the hypothesis that are linked to general causal explanation. The strategy is about hard numbers in the form of data.

Quantitative research is descriptive and uses the deductive approach in that the researcher tries to verify what has already been formulated as shown in Figure 2 below.

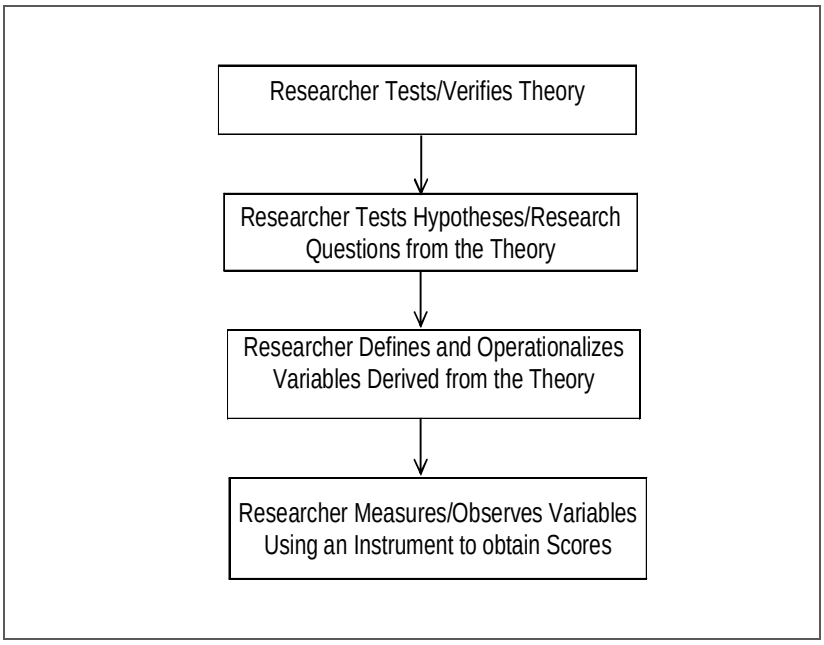

Figure 4.1: The deductive approach used in quantitative research (Creswell, 1994)

4.1.2 Qualitative research

According to Saunders and Lewis (2012, p110), exploratory study is about discovering general information about the topic that is not understood clearly by the researcher. The questions of “what”, “why”, “when”, “where”, and “how” were addressed. Saunders *et al* (2012, p114,), emphasised that the choice of research strategy should be guided by research questions, objectives as well as the extent of

the existing knowledge, the amount of time and the resources available. It is further noted that a survey is a structured way of collecting data about the same things from a large number of people in a cost-effective way.

Qualitative data are text data in the form of words and have been recorded as text and are usually word processed (Saunders *et al*; 2012, p167). It consists of the information gathered in a non-numeric format and is principally derived from focus group discussions and interviews. This study attempted to qualify the information regarding the performance of construction projects on adopting the enterprise risk management practices and the project risk management models to improve the performance of the projects.

4.2 Data Collection

Qualitative research is more concerned with the richness of data since the emphasis is on gaining understanding of the meanings humans attach to events (Saunders *et al;* 2012, p114). To this end, the data collection instrument that was used was the interactive face to face interviews. The main form of data collection comprised semi-structured interviews with directors who have worked on different construction projects.

4.2.1 Semi-Structured Interviews

An informed consent letter was sent through an email to all the respondents, and the purpose of the interview was explained. The semi-structured interview was designed to explore the research questions in chapter 3. In-depth interview was used to facilitate the collection of primary data.

The choice of the instrument used to collect the data was informed by the research strategy chosen. Data was collected by means of face to face interviews with key stakeholders to prevent misunderstanding about the questions and to gather more reliable and rich data. This enabled the probing of responses to explore the

comments given by the participants. The use of the interviews allowed the researcher to elaborate the points that were not clear to participants. Since the sample involved a small number of participants, questions were designed in such a way that the same data was collected from different correspondents in different sitting for each of the targeted participants. The questions were the same but the order of questioning varied for all respondents to illicit more information.

The interview was semi-structured to help focus on different themes, but at the same time varying the order of questions in which the themes were covered. Information was recorded electronically by means of recording device.

4.2.2 Interview Schedule

Before the interviews were carried out, the company of interest and the roles of the respondents were researched. In each session, clarity was given with regard to the purpose of the interview and the researcher ensured that the permission to record was obtained from the respondents.

The interview guide was used with the same set of questions. The location was chosen by the respondents for their convenience and comfort. Standard of grooming is one of the important aspects that the researcher took into account. In-depth interview was used to illicit in-depth information from few people. The questioning techniques employed were focused on:

- specific
- probing - used in getting the details
- direct - which will apply more to the respondent
- indirect - focus attention on others
- structured questions - which will be arranged according to themes

The interview schedule was designed to allow the flow of discussion. The schedule comprised of ten questions that addressed the following research question:

Research Question 1: What are the risk points in construction projects (e.g. reasons for failure) that cause them not to meet their objectives?

Questions 1, 2, 3, 5, 6

Research Question 2: Have risk management maturity frameworks stood the test of time?

Questions 4, 5, 6

Research Question 3: To what extend do current methods work? Are they effective?

Questions 7, 8

There was a pilot testing of the interview questions helped in refinement of questions to make sure they address the research questions and to ensure a smooth conversation flow.

4.3 Research Population

As regards the construction developments, the tender for the construction projects has previously been awarded to different contractors, who on the other end sub-contracted other businesses. The population of this research work was all the teams directly involved in construction projects which are inclusive of the owners' team taking part in the activities of the project, the contractors and consultants directly involved in various roles of the project, and the risk managers as well as the risk consultants.

4.4 Sampling

Sampling entails drawing up a subgroup of the whole population (Saunders & Lewis, 2012, p132-133). A non-probability sampling technique was used and the sample was homogeneous in terms of the exposure to the same industry and their role within the same company. The targeted sample was a small group of participants involved in different projects, with the focus mainly on project managers and project

consultants. The participants were selected to serve a specific purpose and the purpose of the sample plan was to maximise the value of data by uncovering rich data from the participants. Each sampling unit was chosen due to their exposure on the various construction projects.

The sampling frame was divided into various strata which consist of directors and associate directors with varying experiences according to their field of speciality. A total of eleven interviews were conducted with one interviewee being used for pilot testing. The objective was to have in the first sample the participants who were senior and have authority over some tasks on the projects. This ensured the access to middle management involved in the projects.

The unit of analysis is the private company of interest consulting in construction developments within South Africa. The focus will be on the construction projects that the company has been involved in the past years. The choice of consulting company of interest is driven by convenience on the part of the researcher.

In order to establish the importance of project risk management in construction projects, it was necessary to have a panel of interviewees from different departments which consisted of Mining and Metals; Industrial and Infrastructure; Energy; Cost Management; Management Solutions; Facilities Management and Business Management. The selected departments were well balanced in terms of the projects management. The ten participants were selected according to their long standing experience in project management. Each participant provided information regarding the management of the projects at their disposal, and how risk management has been applied in the projects. The purpose of the research was to gather multiple sources of evidence that would validate the findings.

4.5 Data Analysis

For each respondent, data was collected and analysed after transcription of information. This helped in the follow up of the initial insights suggested by the early interviews in later stage to determine if data saturation has been reached (Saunders

and Lewis, 2012, pp.187). In the collection of the qualitative data, data was grouped into different categories and was stored in a matrix format so that it could be easily and jointly viewed.

4.6 Ethics, Validity and Reliability

Saunders and Lewis (2012) define ethics with regard to research as "the appropriateness of the researcher's behaviour in relation to the rights of those who become the subjects of the research project, or who are affected by it." The assurance of confidentiality on the part of the participants and the organisation was given in the form of an informed consent letter that was signed in the presence of both the researcher and the participants. The purpose of the research was given in details and the exclusivity of the information obtained was confirmed to be for the use of the research. (Saunders & Lewis; 2012)

The researcher's concern was to explain the research setting with regard to construction project. The research schedule with the same set of questions was used for all the respondents with the order of the questioning being different.

4.7 Research Limitations

The selection criteria were the researcher's accessibility to the respondents.

The construction projects by nature span over a long period. Thus there are limitations in terms of the period spent on one project.

Data collection was from few respondents in one Consultation Company. The analysis could thus not be conclusive since it was not representative of all the construction projects. Again since the culture plays an important role for the project, it differs from project to project and across the globe.

The next chapter presents the interview results with data being clustered around research questions.

CHAPTER 5: RESULTS

5.1 Introduction

In this chapter, the sample and the results obtained from the semi-structured interviews conducted are presented. The data analysis was designed with the intention to answer the research questions described in chapter three. The interviews were conducted in order to establish the importance of project risk management in construction projects and to examine if the performance of the projects could be enhanced by the effective use of enterprise based risk management practices. A qualitative design was chosen and questionnaires were designed where a one on one method of interview was done in order to collect the data. This chapter presents risk management's best practices as suggested by the literature review to analyse if the construction projects comply with what is suggested as the best practice of risk management process. The chapter also presents the data analysis of the results to the interviews that was conducted and the data will be analysed using the qualitative analysis tools.

5.2 Best Practices of Risk Management Processes

From this study, the literature review in chapter two suggested standards as the best practices for risk management processes to make a successful project. These suggested practices will be used to analyse the results from the interviews based to examine if the companies running the projects comply with what is suggested as the best practice of risk management process.

5.3 Results of the Interview

Data was collected by means of interviews where 10 respondents involved in different projects and departments were interviewed on a one on one basis. All the respondents were asked to comment on the validity of factors as identified in the

literature. It was also stressed to the interviewees that all information provided would be treated as confidential.

Table 5.1 below shows the statistical results of the interviews conducted with 10 respondents and their relative position with regard to the years of experience, managerial status, project budget range, project team range and the types of projects they were involved with.

Statistical Information						
Case (ID)	Managerial Status	Department	Years of Experience	Project Budget (Range)	Project Team (Range)	Risk Management Application
C1	Director	Industrial & Infrastructure	25	> R1m	500 - 6000	Yes
C2	Director	Mining & Metals	29	R6b	300 - 400	Yes
C3	Director	Energy	14	R3b - $8b	3000 - 3500	Partly
C4	Director	Management Solutions	5	Rb	120 - 200	Partly
C5	Director	Mining & Metals	26	R100m - $18b	30 - 200	Yes
C6	Director	Cost Management	25	R100m - R400m	24+	Yes
C7	Director	Cost Management	29	R20m - R28b	8 - 402	No
C8	Associate Director	Facilities Management	20	R200m - R8b	30	No
C9	Associate Director	Business Development	4	$1b - $23b	100 - 400	Yes
C10	Associate Director	Cost Management	4	R30m - R300m	15 - 20	No

Table 5.1: Statistical Information of interview responses

A significant number of the respondents (i.e. six of them) had over 20 years of experience of working on the construction projects, and 20 percent of them came from the Cost Management department and are directors. Overlaps of the majority of the respondents were in some projects part of a team of more than 100 people. Five out of ten of the respondents were involved in projects that had applied risk management practices. An additional 20 percent had partly applied the risk management processes within the projects. The other three respondents had not

been involved in construction projects where risk management processes were applied.

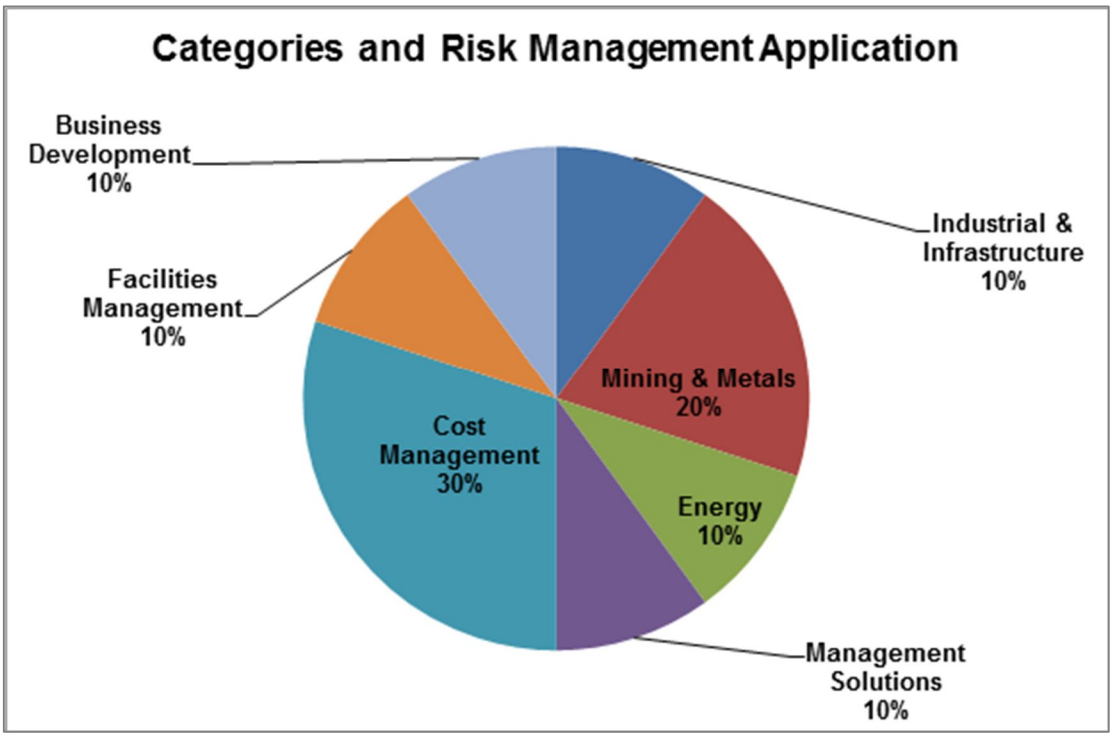

Figure 5.1: Categories and risk management application

Interviews were conducted with 10 directors involved in different project categories. About three directors interviewed were from Cost Management department which makes 30 percent of the total respondents. The other 20 percent of the respondents came from Mining and Metals department, with 10 percent each from Industrial and Infrastructure, Energy, Management Solution, Facilities Management, and Business Development. (See Figure 5.1 above)

5.4 Analysis of Qualitative Results

The results to the interviews that were conducted are analysed based on the qualitative analysis as follows:

5.4.1 The application of risk management at all levels within the project

The respondents were probed to find out if the standard risk management processes were applied in the projects that they took part in, and if the processes they used were reviewed on a timely basis. The results are displayed in Table 5.2 below.

Categories	Risk Management Application (%)			Total
	Yes	No	Partly	
Industrial & Infrastructure	10	-	-	**10**
Mining & Metals	20	-	-	**20**
Energy	-	-	10	**10**
Management Solutions	-	-	10	**10**
Cost Management	10	20	-	**30**
Facilities Management	-	10	-	**10**
Business Development	10	-	-	**10**
Total	**50**	**30**	**20**	**100**

Table 5.2: Application of risk management processes based on categories

Of the 10 respondents the different categories were compared, and 50 percent stated that they do apply and have risk management processes in place and these will be explained in detail in the discussion section of this study. From the outcomes, 40 percent do not practice risk management at all and only 20 percent partly apply risk management processes. Of the 50 percent of those who apply risk management processes, 40 percent are from the Mining and Metals department; while 30 percent of those who do not apply risk management standards consists of 50 percent coming from Cost Management department. Energy and Management Solutions are the departments who partly apply risk management standards.

Budget (R)	Magnitude of the Project	Risk Management Application (%)			Total
		Yes	No	Partly	
<R1b	Small	20	10	-	**30**
R1b - R20b	Medium	10	10	10	**30**
R21b - R50b	Large	-	10	-	**10**
≥ R50b	Very Large	20	-	10	**30**
Total		**50**	**30**	**20**	**100**

Table 5.3: Application of risk management processes based on budget

From the interview outcomes in Table 5.3, there was a need to examine if the quantity of the project had anything to do with no intensions of applying risk management process in order to optimise the project results. From the outcomes, it was interesting to find that 10 percent of small, medium and large projects do not apply risk management standards. However 50 percent from small, medium and very large projects did agree to apply risk management standards while 30 percent did not and 20 percent partly applied.

5.4.2 The use and the review of the standard risk management process used to ensure effectiveness

All the respondents were asked if they used the risk management processes, and of those respondents who said ‘yes’, they were asked to provide the information of whether the process was reviewed and if it was effective.

Review of Standard Process	Risk Management Application (%)			Total
	Yes	No	Partly	
Yes	20	10	10	40
No	30	20	10	60
Total	50	30	20	100

Table 5.4: Application of risk management processes based on standard process review

Of the 40 percent of the respondents who believe in reviewing the process, only 50 percent applied risk management processes, as shown in Table 5.4. Sixty percent of the respondents did not did not see any value in reviewing the process and yet 50 percent of them applied risk management process.

5.4.3 The priority placed on risk management by the project managers was inspected

The respondents were asked if project managers give risk management high or low priority, and to elaborate on their project experience.

Priority of Risk Management by Project Manager	Risk Management Application (%)			Total
	Yes	No	Partially	
Low	10	20	10	40
High	40	10	10	60
Total	50	30	20	100

Table 5.5: Priority of risk management by project managers

Fourty percent of respondents apply risk management processes, it was found that only 40 percent of the respondents agreed to project managers giving risk management a high priority. While 30 percent of the 40 percent who do not apply risk management processes give risk management process a low priority. (Refer to Table 5.5 above)

5.4.4 The awareness of risk management within the project team

Communication was seen to be a key aspect in dealing with uncertainties within the project. The respondents were asked to give some insights on the communication of the information and awareness on risk management with other stakeholders.

Project Team Size	Magnitude of the Project	Risk Management Awareness (%)			Total
		Yes	No	Partly	
< 25	Small	-	-	10	**10**
25 - 500	Medium	10	20	40	**70**
501 - 3500	Large	10	-	-	**10**
≥ 3500	Very Large	-	10	-	**10**
Total		**20**	**30**	**50**	**100**

Table 5.6: Application of risk management processes based on project team

The interview results from Table 5.6 show the various sizes of the project teams and their attitude towards the awareness of risk management in the respective projects. Fifty percent of small and medium projects partially apply risk management awareness during their project life cycle while 30 percent of medium and very large projects never have awareness of risk management. Twenty percent from medium and large projects does have awareness of risk within the project.

5.4.5 The integration and the level of integration of risk management with other management areas in the project

All respondents were asked an open ended question to explain integration of risk management with other management areas within the project and to state the level of integration.

Integration With Other Management Areas	Risk Management Application (%)			Total
	Yes	No	Partly	
Yes	20	10	10	**40**
No	20	10	-	**30**
Partially	10	10	10	**30**
Total	**50**	**30**	**20**	**100**

Table 5.7: Application of risk management based on integration with other management areas

A moderate number of respondents felt that there was not enough emphasis placed on the work streams; and a significant amount of them stated the importance of the inputs from different disciplines; and yet two put emphasis on the importance of all stakeholders involved in the project to be on site in order to carry out proper integration. Still a moderate number of other respondents were concerned that it does not happen at the level that it should be at and recommended that there be improvement in integration of other knowledge areas.

About 20 percent of respondent highlighted the importance of leadership with respect to the project manager as the essential feature in supporting integration of risk management with other management areas. From Table 5.7, 40 percent believe that integration should take place with other management areas, and 30 percent partially agree while another 30 percent don't agree.

5.4.6 Risk management practices within the construction projects

Risk management was described as an interactive process and that is both a quantitative and qualitative process of addressing risk within the project. It was described more in terms of a step by step approach, whereby the Delphi method is applied in terms of identifying the risk within the project.

Other respondents mentioned that the process gets to be outsourced to a third party, but still the risk management process is applied within the project. Thus there was cohesion in terms of the same practices that are followed. More insights are provided in Table 5.4 below.

Experience (Years)	Risk Management Application (%)			Total
	Yes	No	Partly	
<5	10	-	10	**20**
5 - 10	-	-	-	**-**
10 - 15	-	-	10	**10**
15 - 20	10	-	-	**10**
20 - 25	-	-	-	**-**
≥ 25	30	30	-	**60**
Total	**50**	**30**	**20**	**100**

Table 5.8: Application of risk management processes based on experience

When examining if the level of experience in directing the project has anything to do with application of risk management standards, it was interesting to note that 50 percent of the total respondents with extensive experience do apply risk management standards while at the same time 30 percent do not apply such standards, as highlighted in Table 5.8 above. But it is also interesting to note that 50 percent ranging from less experience to very high experience do apply risk management standards with 30 percent not applying these and only 20 percent partly applying risk management.

5.4.7 Lessons learnt from enterprise risk management and the replication of practices into construction risk management

The respondents were asked if they would, going forward do things differently and if they would replicate some of the lessons learnt from enterprise risk management practices into construction projects to improve on the process of project risk management. They were prompted to give additional comments on the value of risk management in construction projects. The comments by divisions within the construction companies were as follows:

Respondents	Lessons learnt from enterprise risk management and the replication of practices into construction risk management
Respondent 1	Building up a relationship with a certain guy and working in a proper team the more people are made aware and take ownerships of risks the greater your chance of making a success of the project.
Respondent 2	And so I suppose with enterprise management we could almost argue there is a process of enterprise management in the construction process you know, because the project is viewed as part of the enterprise.
Respondent 3	I think there will always be some people who want to outsource it, 90% of the risk managers that are with the client are probably doing risk management associated work for the enterprise itself…
Respondent 4	So definitely it will evolve and enhance and there is great integration between enterprise risk and project risk, it is happening all the time. So the more and more the executives, the more it is on the executive agenda, so the board starts looking at risk management, but right now at board level you have risk informing committee. As it becomes more of an agenda of the board in terms of risks and project risks or whether they need capital then it will actually enforce the integration between enterprise and project risk.
Respondent 5	-
Respondent 6	I think it is going to be far more structured, far more objective, methods and discussion as to how we arrive at risk – risk quantities, risk numbers – and I think certainly it will have far more positive effect on our industry. There is going to be a lot more I think than what we are doing at the moment. But it will depend on the client. Sometimes clients like to say the right things but they don't want to spend money on it.
Respondent 7	I would say if risk management finds the bridge to, or to find a way to bridge the gap between corporate risk as in terms of how companies administer their internal risks from a day to day point of view, through to managing construction risks; if you can find a way to bridge that gap, to integrate the two so that they could find a value add.
Respondent 8	I think definitely without a doubt it is critical to a project. In any project, whether large or small I think risk management is crucial. The only concern I have got going forward is that in all the projects we deal with, is that there is no real drive to improve the processes.
Respondent 9	RM should be looked at holistically and it should be integrated. It doesn't have to be just budget or the cost and just going back to the previous point, it can be the quality that is impacted, it can be the safety of the contractor and the socio economic impact on whatever it is, all those things need to be factored in and they should be there.
Respondent 10	if you are going to have it, go big or go home

Table 5.9: Applications of lessons learnt from projects

5.5 Conclusion

The main purpose of this chapter was to present the outcome of data analysis. The qualitative results from in-depth face-to-face interviews were analysed and will be used to answer the research questions described in chapter three. More detailed discussion of the results will be conducted in chapter six and will be tied back to the literature review of chapter two.

CHAPTER 6: DISCUSSION OF RESULTS

6.1 Introduction

This chapter will discuss the results in terms of the research questions stated in chapter three. The preceding chapter presented the outcome of the results from the qualitative, face-to-face in-depth interviews with ten directors. This chapter will be analysed and interpreted based on two input chapters, that is, the results presented in chapter five and what is suggested as risk management best practices from literature review covered in chapter two. Chapter six will provide more insights into the research problem and will address the gaps. Each research question will be separately analysed and interpreted, and will indicate that the research objectives have been met.

6.2 The Best Practices of Risk Management based on the outcomes of the interview results

Literature has suggested factors that could contribute to a good Risk Management System processes. The findings of the literature review summarized will be used to formulate the methodology which comprises of interview questions in order to identify any consistencies or differences in what is indicated by literature.

Based on the literature (Manab *et al*; 2012), successful risk management best practices should include the following:

i. Organisational culture – the success and failures of the business depends on the organisational staff. Thus the function and the effectiveness of other critical success factors are dependent strong organisational culture.

ii. Risk management base has impact on the shareholder value

iii. Knowledge management which is the information of risk and its management shared by the staff in the organisation, which is required to improve the effectiveness and efficiency of risk management practices.

6.3 Discussion of Results of Research Question 1: What are the risk points in construction projects (e.g. reasons for failure) that cause them not to meet their objectives?

The research outcomes related to this question are shown in Tables 5.1, 5.2, 5.3, 5.4, 5.6, and 5.7. In Table 5.1 the outcome of the research results has shown that average number of respondents, that is 50 percent of them have found that risk management is widely practised at all levels within the project. They make up the participants that replied with an affirmative 'yes', and their years of experience average more than 20 years in different categories of construction projects.

6.3.1 Lack of Application of Risk Management in Construction Project

As indicated in Table 5.2, twenty percent of the respondents came from Mining and Metals department with the maximum years of experience. The response given by one participant was that:

'The objectives of the project should be to deliver assets into the business and risk management focus on the operational part of the project'. Respondent 2

The above results support the literature which indicates that risk management is the major factor influencing the success of the project and thus regards project risk management as an important activity influencing capital projects and as a pivotal aspect in projects. Additionaly, project risk management is seen as part of most maturity models (Krane, Rolstada & Olsson; 2010). From the results of the interviews, the deduction is that failure to apply risk manegement cause them not to

meet their objectives. In contrast to the above view, project risk management was found to be based on rational problem solving. This was found to have limited positive effect on the success of the projects (de Bakker, K., Boonstra, A., & Wortmann, H.; 2011).

The results of Table 5.3 show that a total of 30 percent of the small, medium and large projects, with a budget ranging between one billion rands and 50 billion rands do not apply the risk management process. It is interesting to note the comment made by one respondent with reference to the monetary value of the budget, that:

'The projects that are below billion rands turn not to be given a proper attention as far as risk management is concerned'. Respondent 5

6.3.2 Ineffective Use of Risk Management Processes

According to Table 5.4, of the 50 percent of the respondents who apply risk management processes there is only 40 percent of them who believe in reviewing their process in a timely base. Thus 20 percent of the entire respondent sample reviews their risk management processes '*on project by project basis*' as was indicated by one respondent who has been exposed to a project team of not more than 200 people.

6.3.3 Less Priority Placed on Risk Management

With reference to Table 5.5, it was found that of the fifty percent of the respondents who apply risk management processes, 40 percent of the respondents agreed to project managers giving risk management a high priority.

Different respondents had differing views about the level of priority shown by the project managers:

'Risk manager are not involved at the planning stage where there is a critical risk assessment that supposed to take place'. Respondent 1

'Throughout the project life the risk registers are kept and there are risk committees that sit and deliberate and feed information into the management processes. Respondent 6

According to literature, planning is viewed as a critical phase in project management and a critical tool in uncertainty reduction. It is vital that risk management be performed at the planning phase of a project (Zwikael & Ahn; 2011). This is in direct contrast with the first comment made by the respondents that risk managers are not involved at the planning stage of the project. Literature associates the perceived levels of risk with the maturity of the project manager (Zwikael & Ahn; 2011). It is futher invesaged that leadership plays a vital role in the success of the project (Beasley *et al*; 2005).

6.3.4 Lack of Risk Management Awareness

As high as 50 percent of the respondents interviewed stated awareness of risks being partialy present within some of the projects they have worked on and 80 percent of these (that is 40 percent of the respondents) are from the medium sized teams. Ten percent of the respondents have indicated that there is no awareness of risks in very large projects. Only 20 percent of the respondents have indicated that there was enough awareness of risks within the projects they have been involved in. (Refer to Table 5.6)

The literature indicated ERM to be the holistic view of risk across the enterprise, and that "ERM promotes risk awareness that facilitates better operational and strategic decision making" (Hoyt *et al*; 2011). Henceforth unawareness of risks within the project causes the projects not to meet their objectives.

6.3.5 Risk Management Not Integrated with Other Management Areas

Integration of risk with other management areas was stated as critical to the success of the project. An effective process also needs to interface with risk management

activities of other project participants (Ward; 1999). Twenty percent of the respondents who agreed to have applied risk management process within the projects indicated that integration of the process with other management areas was done. This will ensure the success of the project and hence results in the delivery of the project objectives. Below are some of the views of the respondents:

'There is not enough emphasis put on the work streams, its crisis management all the time'. Respondent 3

'We should have more integration of office staff onto the site'. Respondent 6

The responses of the two participants above give a clear indication of lack of integration taking place in construction projects.

6.4 Discussion of Results of Research Question 2: Have risk management maturity frameworks stood the test of time?

The question sought to understand the impact of risk management models on construction projects, that is if there has been any improvement on the project's performance by the effective use of enterprise based risk management maturity level. Risk management maturity model is a reflection of an organisation's understanding of its risk portfolio and how to manage those risks. The research outcomes on this section will be addressed by Tables 5.6, 5.7, and 5.8.

6.4.1 Risk Management Awareness

The interview results from Table 5.6 indicate that only 20 percent of the respondents were involved in construction projects where the awareness on risks was part of the culture, and they range between the small and the medium size project team. For a very large project the study has shown that no awareness is made within the project group. Thus the respondents have identified the awareness, which is part of the ERM holistic view, as lacking within the projects that they took part in. This was indicated by the responses from the participants such as:

'*I think within a specific stage of our projects they get communicated, but as you move through the stages I think that is lost to a certain degree'.* Respondent 8

'It often depends who forms part of certain meetings, or steering committee meetings' Respondent 10

Hoyt & Liebenburg (2011) shares the common understanding with Kimbrough & Componation (2009) in the interpretation of ERM as the holistic view of risk across the enterprise. The literature states the benefits of creating the synergies between different risk activities and manages to break down the silos inherent with viewing the individual risks according to their categories.

6.4.2 Integration of Risk Management with Other Management Areas

In Table 5.7, 40 percent of the respondents believe that integration of risk management with other management areas should take place within the project and yet only 50 percent of these apply risk management processes. There seem to be misalignment since the significant number of the respondents believes in integration of the project management knowledge areas and yet there is no application of the processes from the risk management that contributes to the success of the project.

Ochieng *et al* (2010) alludes to the fact that the best performance is achieved when the whole project team is fully integrated and aligned with project objectives, and that effective communication in multicultural teams stimulates the formation of the team culture.

According to the literature, the project maturity models (i.e. the effectiveness of organisational processes) in construction industry and engineering have the highest levels of maturity. (Zwikael & Ahn; 2011) these models have not proven to be successful due to the overruns of construction projects. Gordon *et al* (2009)'s argument is that integration of portfolio management and risk management approach will ensure that the strategic objectives and the maximization of portfolio value are achieved.

6.4.3 Risk Management Practices within Construction

It is interesting to note that there is an increase of the application of risk management practices with an increase in years of experience. This is shown in Table 5.8 by the increase from 10 percent of those who agreed to apply risk management practices with less than five years' experience to an increase of 30 percent to those with more than 25 years' experience. Thus with more years of experience, there has been an improvement in the level of risk maturity.

The core elements of project risk management have been used by many organisations, however risk management needs to be developed in various areas to improve the foundation. There are a number of different risk management models that were developed to meet this need (Ongel; 2009).

6.4.4 Discussion of Results of Research Question 3: To what extent do current methods work? Are they effective?

The question sought to benchmark the existing risk management models used with the enterprise based model. The research outcomes relevant to this question are shown in Sections 5.4.6 and 5.4.7. The later sections addresses on average the construction projects do apply risk management best practises and where these standards are applied the projects were executed successfully. These sections also showed 30 percent of construction projects that do not apply the risk management standards and reported problems in implementing the project leading to project failures. However the results do show that there is 20 percent of construction projects that partially apply the risk management best practice.

The results from the respondent does indicate that applying the risk management best practises is effective as on average projects that applied these best practices were reported successful.

Another respondent indicated that risk management function gets to be outsourced:

'Well what they tend to do is bring somebody in to do risk, go through the risks, sit with them and they usually have a risk work shop, sit down and then brainstorm all the risks'. Respondent 5. And another respondent mentioned that

'*an interactive process and by the time you have got all this lot you can then add a more dedicated approach'*. Respondent 1

Nocco *et al* (2006) highlights that these companies have a competitive advantage over those that manage one risk at a time on a decentralised basis.

Section 5.4.7 addressed the application of lessons learnt from enterprise risk management and the replication of practices into construction risk management. Respondents commented their view as indicated in table 5.9. The respondents pointed out that it is vital to apply the risk management best practises holistically and not just in isolation and emphasised on collaboration within project team.

Xue *et al*, (2010), supported collaboration within project team in that collaboration has the advantage that it propels organisations to achieve more that it could have achieved on its own by building effective working relationship with other organisations.

6.5 Conclusion

The previous chapter discussed the results in terms of the research questions stated in chapter three. This chapter analysed and interpreted the result of the interviews based on what is suggested as risk management best practices from literature review covered in chapter two. More insight into the research problem and gaps were addressed. Each research question was separately analysed and interpreted, and covered research objectives of this study as stated in chapter one.

CHAPTER 7: CONCLUSION

7.1 Introduction

The purpose of this chapter is to highlight the main findings of the research study in line with the objectives and make recommendation for future research based directly on the findings of the research study.

7.2 Findings

Risk management best practises were suggested in chapter two of this study. The results of the interview collected were analysed based on the best practices and addressing the research questions in line with the objectives as stated in chapters one and three respectively. The following are the findings:

i. The results have shown that risk management is widely practised at all levels within the project looking at the size of the project team, experience of the respondents conducting the projects, and the budget allocated to the project. However the results do show an insignificant percentage where risk management best practises are partially applied and not applied at all.

ii. The importance of project risk management in construction projects was measured by identifying if in the construction project there was lack of application of risk management processes; ineffective use of risk management processes, less priority placed on risk management, lack of risk management awareness, and risk management not Integrated with other management areas.

Lack of application of Risk Management processes - It was found that 50 percent of the construction projects do apply the risk management processes although 30 percent are of the view that the process should be reviewed. It was also found that

10 percent of the projects below a billion rands tend not to be given proper attention as far as risk management is concerned.

Ineffective Use of Risk Management Processes - About 50 percent of the respondents who apply risk management processes only 40 percent consider reviewing their process on timely bases. Thus 20 percent of the entire respondent sample reviews their risk management processes 'on project by project basis'

Less Priority Placed on Risk Management - It was also found that of the fifty percent of the respondents who apply risk management processes, 40 percent of the respondents agreed to project managers giving risk management a high priority. In this case, different respondents had differing views about the level of priority shown by the project managers:

'Risk manager are not involved at the planning stage where there is a critical risk assessment that supposed to take place'.

'Throughout the project life the risk registers are kept and there are risk committees that sit and deliberate and feed information into the management processes.

Lack of Risk Management Awareness - In terms of awareness, only 20 percent of the respondents have indicated that there was enough awareness of risks within the projects they have been involved in and 50 percent stated that awareness of risks is partially present within some of the projects they have worked on.

Risk Management Not Integrated with Other Management - Only twenty percent of the respondents who agreed to have applied risk management process within the projects indicated that integration of the process with other management areas was done. An insignificant percentage does agree lack of integration taking place in construction projects.

One of the objectives was to examine if there is improvement on the project's performance by the effective use of enterprise based risk management maturity level. The improvement of project's performance looking at the effective use of enterprise based risk management maturity level in construction projects was measured by Risk

Management Awareness, Integration of Risk Management with Other Management Areas and Risk Management Practices within Construction.

Risk Management Awareness – The interview results have shown that only 20 percent of the respondents were involved in construction projects where the awareness on risks was part of the culture, and they range between the small and the medium size project team. For a very large project the study has shown that no awareness is made within the project group. Thus awareness, which is part of the ERM holistic view, is lacking within the projects. For example, one of the respondent's commented on awareness as follows:

'I think within a specific stage of our projects they get communicated, but as you move through the stages I think that it is lost to a certain degree'.

The question sought to understand the impact of risk management models on construction projects, that is if there has been any improvement on the project's performance by the effective use of enterprise based risk management maturity level.

Integration of Risk Management with Other Management Areas – It was found that about 40 percent of the respondents believe that integration of risk management with other management areas should take place within the project and yet only 50 percent of these apply risk management processes. There seem to be misalignment since the significant number of the respondents believes in integration of the project management knowledge areas and yet no application of the processes from the risk management that contributes to the success of the project.

Risk Management Practices within Construction – It was found that there is an increase of application of risk management practices with an increase in years of experience. An increase from 10 percent of those who agreed to apply risk management practices with less than five years' experience to an increase of 30 percent to those with more than 25 years' experience. Thus with more years of experience, there has been an improvement in the level of risk maturity.

In order to assess the objective in benchmarking the existing project risk management models with the enterprise based models and their effectiveness,

respondents were asked to comment on these effects. It was found that on average, the construction projects do apply risk management best practises and where these standards were applied the projects were executed successfully. These sections also showed 30 percent of construction projects that do not apply the risk management standards and reported problems in implementing the project leading to project failures. However the results do show that there is 20 percent of construction projects that partially apply the risk management best practice.

The results from the respondent does indicate that applying the risk management best practises is effective as on average projects that applied these best practices were reported successful.

Another respondent indicated that risk management function gets to be outsourced:

'Well what they tend to do is bring somebody in to do risk, go through the risks, sit with them and they usually have a risk work shop, sit down and then brainstorm all the risks'. And another respondent mentioned that

'*an interactive process and by the time you have got all this lot you can then add a more dedicated approach'*.

This was clearly addressed by the application of lessons learnt from enterprise risk management and the replication of practices into construction risk management. The respondents pointed out that it is vital to apply the risk management best practises holistically and not just in isolation and emphasised on collaboration within project team.

Based on the risk management best practices, although 50 percent of the construction project does apply these risk management standards, there are gaps that are identified as follows:

One of the standards that were outlined from the literature was that of culture which embraced the elements such as collaboration of the project team. From the results of the interviews it was found that there was a lack of awareness of risk within the project. This was due to lack of communication from the key stakeholders to the project team.

One of the standards for risk management best practices is that of risk management integration with other knowledge management areas to ensure that the strategic objectives and the maximization of portfolio value are achieved. From the results it was found that, there seems to be misalignment since the significant number of the respondents believes in integration of the project management knowledge areas and yet no application of the processes from the risk management that contributes to the success of the project.

Another standard from the risk management best practices that suffered gaps is knowledge management which is the information of risk and its management shared by the staff in the organisation, which is required to improve the effectiveness and efficiency of risk management practices. From the respondent's comments, it was found that within a specific stage of the projects risk get communicated, but as they move through the stages, the communication gets lost to a certain degree. So from inception to actual delivery of a project those risks might not necessarily be carried across appropriately.

Another standard suggested is that ERM promotes risk awareness that facilitates better operational and strategic decision making and that coordinating risk management across all the departments helps avoid duplication of both costs and management strategies. For a very large project the study has shown that no awareness was made within the project group. Thus awareness, which is part of the ERM holistic view, is lacking within very larger projects.

The findings based on the research data analysis and risk management best practises as suggested from the literature review chapter in line with the objectives of the study and the gaps thereof were presented. The next section presents the recommendation based on the findings of the research study.

7.3 Recommendations

The following are the recommendations:

For organisations to make a successful project, it is fundamental to apply risk management best practices as suggested by the literature review in chapter two. Based on research finding and gaps identified, the following are recommendations:

Culture - As suggested by Nohria, *et al* (2006), culture and values are strongly influenced by the top executive. When implementing culture within the organisation, which is acknowledged not to be easy, it is eminent to consider the Foundations of A Productivity-Focused Culture and Strategies to Create A Culture for Productivity Improvement and Actions to Change Culture as follows:

Foundations of a Productivity-Focused Culture

- Survivor mentality
- Productivity through people
- Respect for people
- Creating reality from expectations
- Challenging targets with resource commitment
- Managing change
- Developing capabilities
- Committed to constant change, innovation, and value-added operations - continuous improvement: productivity improvement is a direction, not a destination
- Committed to be a “world-class organization” - to be better than the best
- Being prepared to keep moving on

Strategies to Create a Culture for Productivity Improvement

- Inspire all employees to achieve high performance
- Empower employees to make decisions and seek improvements
- Reward employees based on individual and group performance

- Create a challenging but satisfying work environment
- Follow a clear set of values

Actions to Change Culture

- Change people's behaviours through reward, training, policies, etc.
- Justify the new behaviours using new culture; analogy stories, symbols, rituals, heroes
- Communicate the new analogy widely and consistently
- Hire new employees who match the new culture

Risk management integration with other knowledge management areas - Either fully integrated teams are not necessary for effective project delivery, or that the sector must overcome the existing organisation and behaviour barriers if further improvements in project performance are to be fully realised in the future.

The traditional project success criterion of time, cost and quality are questioned in terms of performance measure. The industry needs to mature above those measures and start replacing them with new measure to fully benefit from the diverse expertise present in project teams. Thus traditional project drivers should be replaced with outcomes related to behaviour and cultural improvement. The changes will help the teams to meet the project's quality requirements within the stipulated time and cost.

Mutual agreed goals can be formed by the project team before the commencement of the project if time is set aside for the team to work together at the initial design phase to allow the participants to know each other.

Knowledge management - The construction industry is experiencing a rapid change in technologies, workforce, globalisation, economic integration, and international partnering. These changes require that the construction organisations evolve from knowledge management programmes into being learning organisations.

To establish a learning culture, the learning within the organisation should be enhanced. Thus knowledge should be sought after for continuous learning. There are two types of learning suggested namely, single-loop learning and double-loop learning.

Single-loop learning takes place after a problem has occurred, making it a reactive process, whereas double-loop learning focuses on fixing processes before a problem occurs, making it a proactive process.

Adaptive learning is a company's method of reacting to a dynamic work environment, and a company making use of only adaptive learning remains stagnant in its knowledge. Generative learning on the other hand enhances our ability to create. Generative learning is inspired by the changes in the future while adaptive learning is imposed by actual changes in the present.

Single-loop learning is an adaptive process, whereas double-loop learning is a generative process.

Construction industry is characterised by its focus on reacting to the problems and striving to keep problem projects. Due to the high fragmentation of the industry, the focus tends to be on short-term survival.

A learning organisation is skilled at creating, acquiring, sharing, and applying knowledge, and embracing change and innovation at all levels, resulting in optimum performance and maximum competitive advantage

Risk awareness – For awareness it is recommended that PMMM model be implemented in order to ensure that there is proper awareness in the organisation. PMMM will help to create awareness on competence and to measure the organisation on the project management competence

7.4 Conclusion

This study has presented a compressive literature review on the ERM enterprise risk management, organisational culture, and risk management maturity in construction

projects with data collection done through in-depth face-to-face interviews were analysed using qualitative method. From the results of the data analyses and literature review in chapter two, from findings although construction project does apply risk management standards, there were gaps identified and were addressed in line with objectives of the study and research question outlined in chapter one and three respectively and recommendations were made.

7.5 Future Research

Projects are built to deliver assets into the business, and assets are delivered so that they offer a return into the business. Review the criterion for defining project success and rather look at the project success in terms of the delivery of the asset into the business. Some organisations using maturity models appear to have reached the highest level of maturity for a longer period, and thus are stagnant. Maturity models need to be reviewed and be aligned to the changing global environment and achieve a competitive advantage.

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APPENDIX 1: INTERVIEW SCHEDULE FOR DIRECTORS

1. Statistical Information:

   1.1. What kind of projects have you pursued/dealt with in your area?

   - Residential
   - Building construction
   - Construction
   - Transportation
   - Other (please specify)

   1.2. How many years of experience do you have working on projects?

   1.3. What was the value in ZAR of the project you have worked on? Give range

   1.4. What was the number of people involved in each project? Give range

2. Do you find that RM is being widely practiced at all levels within the project?

3. In your experience, is risk management given high or lower importance by project managers? Please elaborate

4. Is there a standardised risk management process that you used for all the projects? How often was it reviewed to ensure the effectiveness?

5. Does RM information gets distributed and communicated to the project team?

6. Is there integration of risk management with other management areas in your projects? At what level?

7. Could you describe the risk management practices within the projects you managed?

8. Do you think we can derive any lessons from enterprise risk management, if so can we replicate the practices in the delivery of construction projects?

APPENDIX 2: LIST OF INTERVIEW RESPONDENTS

Name	Designation
Interviewee 1	Director
Interviewee 2	Director
Interviewee 3	Director
Interviewee 4	Director
Interviewee 5	Director
Interviewee 6	Director
Interviewee 7	Director
Interviewee 8	Associate Director
Interviewee 9	Associate Director
Interviewee 10	Associate Director