Evaluation of the impact of risk management on project performance in small construction firms in South Africa: the case study of construction systems

Christopher Amoah[1] and Prof Leon Pretorius[2]

Faculty of Natural and Agricultural Science, Department of Construction Management and Quantity Surveying, University of The Free State, South Africa[1]

Faculty of Engineering, the Built Environment and Information Technology, University of Pretoria, South Africa[2]

Email: amoahc@ufs.ac.za[1], leon.pretorius@up.ac.za[2]

Abstract

Purpose: Risk management has become an integral part of businesses around the world. In the construction industry, risk management has also been introduced and has been mainly entrusted in the hands of the project team to go through a laid down risk management processes to identify possible risk events which may occur during the project execution and the impact they may have on the project deliverables should they occur. It is, however, believed that small construction firms do not take risk management as a serious exercise even though most of the project risks are transferred to them as subcontractors. The aim of this research was therefore to investigate risk management processes in the small construction companies and the impact of risk management on their project deliverables.

Research Design: A case study of a single construction company was used for this study. Data were collected through a structured questionnaire to 16 respondents who are involved in the project execution in the case study company. Two (2) Managing Directors of the case study company were also interviewed. Eleven (11) project site meetings were also attended to observe meeting proceedings and to record issues discussed. Fifteen (15) monthly project reports and project close-out reports were also studied. One hundred and five (105) completed projects of which 58% were renovation projects, 27% were new projects and 15% were civil/structural works were also examined. The data were then analysed using excel analytical tool and the content analysis method.

Research Limitation/Implications: Only one Construction Company was used as a case study for this research and all sources of data were related to a single company. The results may, therefore, be not generalizable.

Findings: The findings indicate that small construction companies with respect to the case study company do not have specifically laid down risk management processes that the project team is made to go through before and during the execution of their projects. There is, however, no conclusive evidence regarding the impact of risk management on project performance as a significant number of projects done were able to meet a successful project performance indicators even though risk management exercises were not done. Some of the identified risk events that caused project failures are payment delays, labour-related issues, subcontractor/main contractor related issues, insufficient contingency reserves/plan, etc.

Practical Implications: The research has discovered that project outcomes could have improved tremendously if proper risk management exercises were implemented before project

execution as most of the causes of project failures could have been identified through the risk management processes. This study hence gives an insight as to why small construction firms like the case study company should take risk management seriously in their project execution to improve on the performance of their projects.

Key Words*:* Project performance, project failures and success, risk management, small construction company

1. Introduction

In the early days of the 1970s when project management became popular, the majority of project decisions heavily concentrated on cost and schedule (Raz and Michael, 2001). This favouritism occurred because people knew more about cost and schedule than they knew about risk in projects. By the mid-1980s businesses recognised the need to integrate risk with cost, quality, and schedule (Kenzner, 1998). Risk management systems were therefore developed where all the risk decisions concerning the projects were entrusted into the hand of a single decision-maker to manage and oversee (Kenzner, 1998). Project risk is defined as any "uncertain event or condition that, if it occurs, has an effect on at least one project objectives" (PMBoK Guide, 2013). Pritchard (2001) also defines project risk as the total effect of probability of uncertain occurrences that may positively or negatively affect project objectives. However, Burek (2016) defines project risk as any uncertainty, or "SURPRISE", that if it occurs, would affect one or more project objectives negatively (a threat hurting the project's cost, time, quality or scope) or positively (an opportunity enhancing the project's cost, time, quality or scope). Project risk has also been defined by Smith and Merritt, (2002) as the possibility that an undesired outcome will disrupt the project. Possibly, there are several risks which could lead to construction project failures, hence it is important to monitor risk factors throughout the project execution. As suggested by Raz et al. (2002), excessive project risks that are undesirable may cause delays in the construction project, disproportionate expenditure, unacceptable project outcomes or even total project failure.

Project risk management is therefore the art and science of identifying, analysing and responding to risk factors through the life of a project and in the best interest of its objectives (PMBoK Guide, 2013) or the culture, processes and structure that are directed toward the effective management of potential opportunities and adverse effect (Cooper et al., 2005). Burek (2016) suggests that matured risk management practitioners recognize that risk uncertainties could produce positive or negative outcomes if the uncertainties occurred; therefore, they look for both types of outcomes when executing their risk management processes. In addition, risk management should focus on maximizing the probability and consequences of positive impacts on project objectives and minimizing the probability and consequences of negative impacts on project objectives. Companies in recent times have seen the importance of project risk management with regard to its effects on project performance. Project risk management is, therefore, an integral part of the company's management programs as its absence or presence can have serious effects on the project outcome.

This research investigated whether the presence or absence of project risk management has any effects on project deliverables of small construction companies and as to whether they really take project risk management seriously in their project's execution. This particular problem needed to be researched because, in recent years, the number of small construction companies entering the construction project environment has been increasing. According to Hauptfeisch and Single, (2009) in South Africa, approximately 95% of the work in the housing sector is done by subcontractors whereas on other projects the percentage varies from approximately 40% to 90%. Risk management principles were, therefore, necessary to be

investigated to establish whether there exists any relationship between risk management and project performance in the small construction companies. In this research, the focus was on the client's viewpoint of a successful project and the contribution of the risk management process was measured against project success indicators such as delivery time, within budget, customer satisfaction, quality and free from defects.

1. 2 Objectives of the research

The main objectives of this research include the following;

- To investigate whether the case study company consider risk management to be important in their project execution.
- To investigate risk management processes the case study company use in their projects.
- To investigate whether risk management has any impact on the performance of their projects.
- To find out what makes their projects successful or unsuccessful.

1.3 The Case Study Company

Construction Systems Limited was incorporated in 1990. The company has its root in a long term commitment to working environments of excellence. The company is made up of planners, project managers and engineers providing well-conceived solutions in the fields of transportation, traffic, and infrastructure. It is one of the leaders in the field of public transport management and technology solutions, social consultation and facilitation, civil and municipal engineering, transportation planning and traffic engineering, development programme and project management, public transport planning financial modelling, Freight and logistics, Special public works projects, project evaluation and funding (Company profile, 2016). The company has offices in Durban. Construction Systems Limited is a design and build the company and also provides project management services to its clients. The company clients are mainly the government departments such Ministry of Education, Ministry of Health, Department of Public Works, Ministry of Transportation and other private institutions. The company normally oversees the execution of government projects such as schools, hospitals, offices, community centres, rural and urban roads by coordinating the activities of other contractors and sub-contractors in executing these projects. The company currently has 22 staff and 4 directors. Based on the experience and numerous projects done by the company, the company is suitable to be used as a case study for this research.

2. Literature Review

2.1 Why project risk management

All projects involve risk according to Santayana (2006) and also there is always at least some level of uncertainty in a project's outcome, regardless of what the Microsoft Project Gantt chart on the wall seems to imply. Projects that succeed generally do so because their leaders do two things well. Santayana (2006) further suggests that leaders must first recognize that much of the work on any project, even a high-tech project, is not new and for that matter the notes, records, and lessons learned on earlier projects can be a road map for identifying, and in many cases avoiding, many potential problems. Secondly, work must be planned thoroughly, especially the

portions that require innovation, to understand the challenges ahead and to anticipate many of the risks. Effective project risk management, therefore, relies on the premise that, by looking backward, past failures may be avoided, and by looking forward through project planning, many future problems can be minimised or eliminated and this can only materialised through effective risk management.

Even though risk management comes to a lot of benefits to companies who undertake an effective risk management system, other companies do not see the need to undertake risk management systems. Burek (2016) assigns several factors that can stand in the way of an effective risk management effort by organisations. These factors are;

- Preparing a risk plan with insufficient project knowledge;
- Risk management is not an integral part of the organization's project methodology;
- Too little time is invested in identifying and managing risk; and
- Too few risks are identified and those that are identified are not fully understood or clearly defined.

Risk and uncertainty characterise situations where the actual outcome of a particular event or activity is likely to deviate from the estimate or forecast value (Garry et al., 2010). Construction is particularly prone to this for, as Leu et al. (2001) note, there are many uncertain variables during project implementation that dynamically affect project duration and cost as well as quality, scope, client and contractor profit and end-user satisfaction (del Caño and de la Cruz, 2002). It is therefore essential for risk management systems to be taken seriously by any business-oriented organisation.

2.2 Risk management in small construction companies

Risks and uncertainties characterise many activities be they in production, services, and exchange. They affect the fundamental variables that determine planning, implementation, monitoring, adjustment, behaviour and explain choices, and bring about decisions. Chapman and Ward (1997) observe that in all fields the future remains uncertain and risky. Okema (2001) argues that risk and uncertainty are the threat of variability, instability, and lack of knowledge of events and activities; and lack of appropriate technology to handle the events and activities. Project risks are also the results of both exogenous and endogenous factors.

Shenhar et al. (1997), argue that the main forces behind the development are man's desire to manage risks. They asserted that the ancient struggle to conquer enemies and the transformation of nature to culture by applying technology is about managing risks. This is to make food supply reliable, the habitat safe and comfortable; work tolerable, transport and communication reliable, sickness curable, etc. Smith and Merritt (2002) suggest that project risk management is considered by most organisations involved in projects as a key discipline that can make or unmake companies attain project objectives. In the decision theory, a risk may lead to either positive or negative consequences (Smith and Merritt, 2002) or the concept of risk reflects the variation in the distribution of possible outcomes (Arrow, 1970). Thus a risky alternative is one for which the variance is large. The view of risk used in decision theory, however, is not consistent with the empirical studies of how managers define risk (March & Shapira, 1987). For managers, the risk associated with positive outcomes is not necessarily considered to be a risk but only the threat of negative outcomes that are typically considered as risk and therefore managers try to concentrate on measures that will curb the possible negative outcomes on their projects (MacCrimmon & Wehrung, 1984). Positive outcomes are perhaps considered as lack and therefore no actions are needed to be taken on it.

Yet most managers do not even consider risk as a critical aspect of a project that must be examined thoroughly before project execution (Khadka et al., 2010). Even though, much has

been written about project risk management and how important project management is, only scanty attention has been paid to small scale construction firms and how it affects the deliverables of their projects. Although most of the project risks are transferred to the small construction companies involved in project as subcontractors, most studies investigating the risk management and project performance have focused on multinational companies, Government sectors and Information Technology projects (Bakker et al., 2010, Wibowo and Mohamed, 2009 and Wallace et al., 2004) with little or no effort being made to shift attention on the small construction companies. Wallace et al. (2004) tried to draw a link between project risk management and project performance, yet their theory was in the Information Technology related field. Dvir et al. (2003) in their research titled **"**An empirical analysis of the relationship between project planning and project success", came to the conclusion that there is a relationship between project planning and project success. They did not at the time, narrow down their research to cover project risk management and project success. In summary, indications are that despite the contribution of project risk management to project performance, it is not known whether small construction companies like the case study company are taking advantage of risk management systems to enable them to benefit from it.

2.3 The risk management and project performance

Several articles (PMI, 2008, Keelling, 2006) have presented risk management as a series of interconnected processes involving specific techniques and tools. The PMI (2008) proposes six risk management processes: risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control. Smith and Merritt (2002) on the other hand suggest five steps in the risk management processes, namely; identify risks, analyse risks, prioritize and map risks, resolve risks and monitor risks. In the opinion of Steyn and Nicholas (2012), risk management should follow the following processes; identify risk, assess risk, plan risk response and track and control risks. The risk management process can also include planning for risk, identifying risks, analyzing risks, developing risk response strategies, and monitoring and controlling risks (Kerzner, 2009). However, Steyn et al. (2016) also propose risk management processes as; plan for risk management, identify risks, analyse risks, evaluate risks, resolve risk and control risk. It can, therefore, be seen that there are several ways in which project risks can be identified and managed to minimise their impact on the project deliverables. For the purpose of this research, the risk management processes proposed by Steyn et al. (2016) would be adopted.

The search for literature on how risk management processes impact on project performance has been scanty. However, more recent studies address the relationship of using this discipline with effective project results. According to Cavignac (2008, cited in Banaitiene and Banaitis, 2012), cost of risk is a notion several construction companies have never considered even though it is one of the major expense items in construction project and that risk management assists project stakeholders to meet their obligations and reduce adverse impacts on performance of their projects in terms of cost, time and quality objectives as most project stakeholder normally tend to associate the success of construction project with these three outcomes (time, cost and quality). The use of risk management practices in projects related to successful projects can be seen in studies by Zwikael and Ahn (2011) where they carried out a study in three countries, (New Zealand, Israel, and Japan), with 701 project managers in 7 industrial sectors. The results from their study suggest that risk management, even when carried out in moderate, has a significant relationship with levels of risk and project success. The study showed the importance of the project context, both the industry and the country, to levels of project risk. In support of this approach, Bakker et al. (2012) emphasize the importance of risk identification as the most influential process in terms of numbers as well as in the

strength of communications effects, followed by risk reporting, risk registration and risk allocation, risk analysis, and finally risk control.

Besner and Hobbs (2006), in support of the view of Bakker et al., state that sharing information about project risk with project' stakeholders, constitutes an important practice for management. For Akintoye and MacLeod (1997) however, this is one of the reasons client companies and project management companies have associated risk managers in their projects. A research done by Akintoye and MacLeod's (1997), in the construction sector, revealed that risk events influenced the project results in terms of schedules, costs, and performance. Thus, they recommend that project activities remain under the attention of risk management and that this must become continuous over the project life cycle.

In light of this, the position of the risk manager is a professional tasked with coordinating activities in order to identify, assess and respond to the risks of an undertaking. For Clark et al. (1990) the risk manager also masters control techniques carrying these out in a continuous form throughout the project life cycle. In terms of revenue, 32.1% of companies involved in the study had revenue of over R$1 billion and 38.4% under R$100 million. Revenue between R$100 and 500 million occupied 17.8% of the sample, and 11.7% of companies had between R$500 million and R$1 billion. Zwikael and Ahn (2011) therefore are of the view that effective risk management has a positive impact on project performance. A study done by Hwang et al. (2014) on "Risk management in small construction projects in Singapore: Status, barriers and impact" revealed that there is a relatively low level of risk management implementation in small projects, and cited the causes of this low patronage as lack of time, lack of budget, low profit margin, and not seeing risk management as economical endeavour by companies. They, however, concluded that there is a positive relationship between risk management implementation and improvement in project performance in terms of quality, cost, and schedule of small projects they reviewed.

2.4 Project performance evaluation

Project success does not come easily. Much has been contributed over the last decade to our understanding of the nature of and reasons for successful and unsuccessful project completion (Koelmans, 2004). In addition, many projects fail to complete at all. Sometimes failure to satisfy all the original goals of a project can still be regarded favourably if the main sponsor is nevertheless satisfied with the outcome and the key stakeholders have gained in some way. In general, the key development considerations are to have the goal clearly defined, to plan how to realise that goal and to implement that plan.

Anyone involved with a project wants it to be a success. The issue of project success is frequently discussed, yet ideas of what constitutes a successful project are many and varied. Pinto and Slevin (1998) cite that many people are aware of projects that come in on time and under budget and were nevertheless considered failures, yet the opposite is equally true. Similarly, Rad and Ginger (2002) state that many cases can be cited from the literature and anecdotal data of projects that fall short of expectations in one or more of the triple constraint items (time, cost and quality), or in terms of client satisfaction and yet the project team officially announces the project a success. Success can mean different things to different people. An interesting example of this has been provided: 'An architect may consider success in terms of aesthetic appearance, an engineer in terms of technical competence, an accountant in terms of dollars spent under budget, a human resources manager in terms of employee satisfaction (Rad and Ginger, 2002). Chief executive officers rate their success in the stock market. Each project has different and unique stakeholders who have their own specific requirements for a project and therefore their own measure of what good project performance is and finally what a successful project entails (Rad and Ginger, 2002). The further removed from the project, the

more obscure these objectives and requirements may be. Different people, even if they are part of the same organization, will view success in a different light at different times (Shenhar et al., 1997)

According to Gido and Clements (1999), project success consists of four components namely budget (costs), schedule (time), performance (quality and utility), and customer satisfaction. The key to project success is the people, the project team and their organization (project management office), the tools and techniques used by the project team and the understanding the team has of the requirements and agendas of the stakeholders. These combined criteria, factors and key issues can be grouped together as the constituents for project success as depicted in Figure 1. Project success is the most debated topic in the management field, but also the least agreed upon (Shenhar et al., 1997).

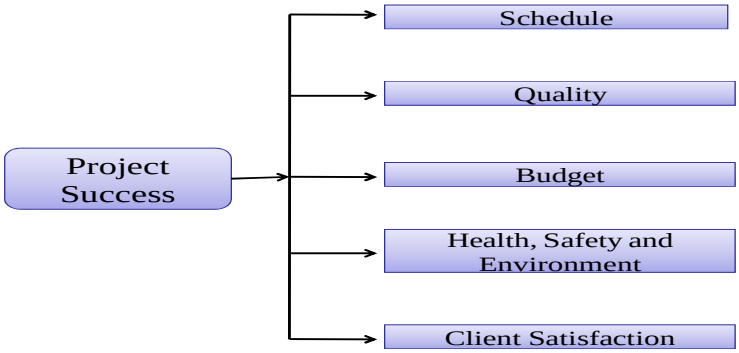

Figure 1. Project Successes (Koelmans, 2004)

Discussion of project failures is never easy for the organizations concerned, but anecdotal data provide many examples of where a project falls short on one or more of the iron triangle items (time, cost and performance) or in terms of client satisfaction, but the team officially pronounce it a success. The converse has also occurred. The team may consider the project a success, while the client declares it a failure. The pronouncement of success or failure may not even be unanimous among the team and or client personnel (Rad and Ginger, 2002).

Morries and Hugh (1986) imply that the success of a project is dependent on having a realistic goal, completion, client satisfaction, a definite goal, profitability, third party satisfaction, market availability, the implementation process of the project and the perceived value of the project. However, according to Teresa and Ramírez, (2002) project success is measured as the ability to complete the project; according to desired specifications, within the specified budget, within the promised time schedule and while keeping the customer and stakeholders happy. When a project is pronounced as a success, the judgment is usually based on some factual evidence, although not everyone uses the same data (Teresa and Ramírez, 2002). Even if different people use the same data, the same set of evaluation indices are not used in arriving at the degree of success of a project (Meredith and Mantel, 2003).

From the above, it is obvious that ‘thing-related’ issues such as data and ‘people-related’ issues such as perceptions play a role in whether a project is considered a success by the different stakeholders. How does one then measure project success?

2.5 Project Success and failures indicators and factors

Many researchers have conducted research on benchmarking and the evaluation of project performance in the construction management discipline. Project Management literature has several definitions of project success. A project may be completely or partially successful. According to Westerveld (2003), the stringent definition of complete project success could be that all key stakeholders are satisfied with the project outcome and therefore, a more relaxed requirement may be that satisfaction of the project sponsor, only, is paramount.

The evolution of factors that determine project success dates back in the 70's, where various authors gave their opinion on what indicates project success. Most authors consider factors such as project monitoring, information management, control mechanism and communication (Cooke-Davies, 2002). Does that mean risk management in the project has no effect on the outcome of the project? Generally, the project success has been influenced by meeting scope, cost and time, eliminating other success criteria. Cooke-Davies (2002) highlights the difference between success criteria (used for evaluating success) and success factors (inputs that lead to success). The list in both cases is long and criteria/factors are often specific to particular types of projects and sponsors. As observed by Westerveld, (2003), success criteria and success factors can be linked at the level of core project constraints.

Widerman (2000) states that in general terms that the requirements for project success are subjective, multi-dimensional and potentially dynamic throughout the life of the project. Also, the terms on which the outcome is judged should be defined at the start of the project. An alternative viewpoint on project success could be that all four of the tetrad project constraints: time, quality, scope, and cost, need to have been addressed to the satisfaction of all key stakeholders.

Cox et al. (2003) stated that there is a great need in the construction industry for identifying a set of common indicators to be used by construction executives and project managers in measuring construction performance at the project level. The focus of their research was to collect management perceptions of the Key Performance Indices (KPIs) currently utilized in the construction industry and came out six indicators which they suggest to be the most useful by every segment of the construction industry, including (1) quality control, 2) timely completion, (3) cost, (4) safety, (5) unit cost, and (6) units/Man Hour (MH).

Mangione (2003) defines project success in the simple economic terms of a positive Return On Investment (ROI), whereby returns from the product exceed the ongoing cost of production. This would tend to emphasize the importance of quality and cost above time and scope, whereby late delivery of fewer functions than was originally proposed is not critical provided the customer accepts this. Johnson (2001) describes the work of the Standish group in describing a successful project as meeting planned time, budget and functionality constraints. This ignores the quality aspect, which may result in large maintenance costs beyond the project hand-over stage. In extreme cases, this may also result in ongoing dissatisfaction with the primary sponsor which may jeopardise chances of future contracts.

Yeung et al. (2007) developed a model using the Delphi survey technique to objectively measure the performance of partnering projects in Hong Kong. The results indicated that the top seven weighted KPIs to evaluate the success of partnering projects in Hong Kong were (1) time performance, (2) cost performance, (3) top management commitment, (4) trust and respect, (5) quality performance, (6) effective communications, and (7) innovation and improvement. Project stakeholders will have different viewpoints on the success of a project. The client will be focused on the outcomes of the project, the deliverables. The focus will be on the goals and objectives of the project, more especially on the scope and quality aspects of the deliverables (Yeung et al., 2007). In certain instances, time and costs issues are of secondary importance but could be just as important as the former aspects and also in some instances, the scope and quality of the

project have been identified as the most influential factor among the elements of the iron triangle (Koelmans, 2004).

The performance in cost and time (schedule) will be measured, similar to scope, against the final values and the relative magnitude of the variances. Client and project team assessment of a successful project according to Koelmans (2004) are represented in Figures 2 and 3 respectively.

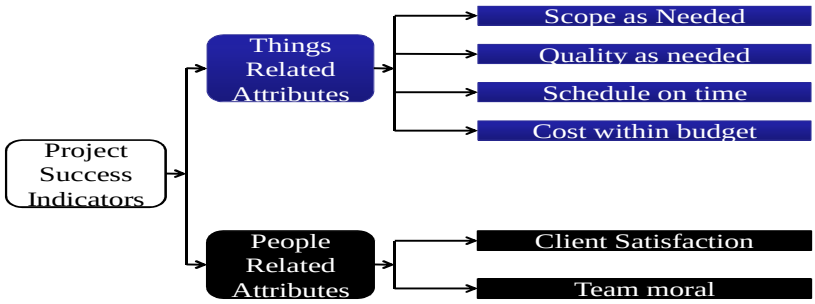

Figure 2. Project Success Indicators, Client View (Koelmans, 2004)

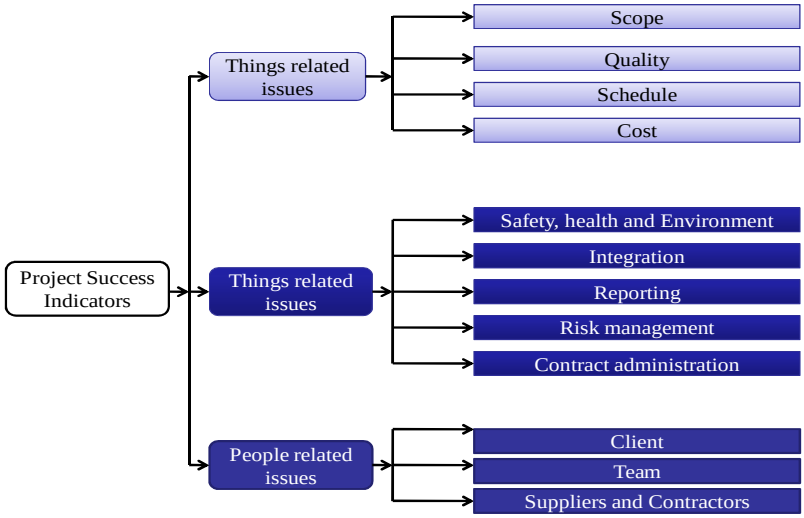

Figure 3. Project Success Indicators: Team View (Koelmans, 2004)

The major difference between client success indicators and team success factors is that client indicators focus largely on the performance characteristics and external appearances of the product. The team's success factors, on the other hand, focus on activities and measures that produce the deliverables of the project (Meredith and Mantel, 2003). The project team wants to deliver the project using best practices and procedures, which not only makes the team

operate effectively but also ensures a project that meets the required performance criteria and objectives of the client.

Ezeldin and Abdel-Ghany (2013) in their research found the main reasons for project failure as construction; managerial; political; financial; and technical factors. Doli et al. (2012) revealed the major critical factors of construction projects failure as lack of commitment; inefficient site management; poor site coordination; improper planning; lack of clarity in project scope; lack of communication; and substandard contracts. Shahhosseini et al. (2016) in their research, on the other hand, grouped the causes of construction projects failure into client and external related causes. They mentioned some of the client related causes of project failures as client interference; payment delay to the contractor; low speed of decision-making; financial problems; and poor cash flow management among others. Some of the external factors of project failures they identified are; extreme weather condition; hostile political conditions; government interference; lack of agreement between project stakeholders; and delay in material delivery.

2.6 Project Success and failure Indicators Proposed for this Research

In this research, the focus was on the client's viewpoint of a successful project and the contribution of the risk management process was measured against project success indicators such as delivery within time, within budget, customer satisfaction, quality and free from defects. Failed projects, on the other hand, are projects that did not meet the indicators stated above.

3. The Research Methodology

A case study approach was adopted for this study. Yin (2003) defines a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context and in which multiple sources of evidence are used. Blumberg et al. (2008) suggested that a case study is suitable for explanatory, descriptive and exploratory research. The rationale for using a case study approach was to have an explanation of the risk management and project performance in the small construction firms.

The primary data were gathered through the interview conducted of the participants involved in the projects and the Directors of the case study company. Secondary data were also obtained from the documented company records of the past projects executed between the years 2010 and 2016. In all, 105 project closeout files were purposefully selected and studied. Welman et al. (2005) define purposive sampling as a non-probability sampling where researchers rely on their experience to obtain units of analysis in such a way that the sample they obtain will be accepted as being representative of the relevant population. In selecting the projects, the size and the amount involved were considered in such a way that small project with an amount less than R2million was not selected for the analysis. The distribution of the selected projects is; 61 renovation projects, 28 new projects, and 16 structural/civil works. A structured interview questionnaire made up of both tick box and open-ended was used to elicit information from the participants in the form of face-to-face interviews. Participants were also encouraged to seek clarification where necessary. The questionnaire was divided into four sections namely demographics, project risk management, project performance, and project failures. Sixteen (16) out of 19 respondents were reached for an interview. This represents 84% response rate. The respondents to the questionnaire comprise 4 Project managers, 1 transport engineer, 6 structural engineers, 4 civil engineers and 1 project administrator. A face-to-face was used to interview 2 Managing Directors of the case study company.

According to Blumberg et al. (2008) personal interview (face-to-face communication) is a two-way conversation initiated by an interviewer to obtain information from a participant.

Blumberg et al. (2008) opined that the advantages of a personal interview are the depth of information and details that can be secured during the interviewing process. This is so because the interviewer can ask a further question for more clarity when the participant responses are not clear enough. Eleven (11) project site meetings where issues are discussed were also attended to observe meeting proceedings and to record issues discussed. These site meetings are organized by the project manager to discuss project progress status and issues that need attention. The attendance of the site meetings enabled the researcher to acquaint himself with the nature of issues that emanate at project sites and to be able to understand whether those issues could have been foreseen if risk management were carried out before the commencement of the project. Eighty-five (85) monthly project reports were also studied to see the major issues reported and the nature of the issues. Putting all of these together, all these approaches enables a good opportunity to gain the kind of in-depth understanding that is a qualitative mark of any single case study (Dyer and Wilkins, 1991). Descriptive statistics were used for the analysis of data. Data received were first coded using an excel sheet and respondents with similar responses were grouped together and analysed through the use of graphs and tables. The characteristics of the respondents are given below;

3.1 Years of experience in the current job and professional qualification

Four (4) of the respondents have worked at the current position for 1 to 3 years, 3 have worked for 3 to 6 years and 9 of them have worked at the current position for over 9 years. The average years of working experience are 7 years. Thirty-eight percent (38%) of the respondents have registered with the professional bodies in their respective work environments.

3.2 Academic qualification of the respondents

Among the 16 respondents, 6.25% of them have a grade 12 certificate, 56.25% have a Diploma certificate, 31.25% have a bachelor's degree and 6.25% have a Master’s degree.

3.3 Nature of the respondent’s profession

Twenty-five percent (25%) of the respondents are working as Project Managers, 37.50% of them are working as Structural Engineers, 25% are working as Civil Engineers, and 6.25% are working as Transport Engineer and Project Administrator respectively.

3.4 Nature of Company’s Projects

A study of the company records revealed that a number of projects were executed under different categories, namely new projects, renovation projects, and civil works. The new projects involve the construction of new facilities such as building new schools or hospitals from scratch or adding new blocks to existing facilities. The renovation projects include the refurbishment of existing buildings damaged normally as a result of rainstorms, wind or wear and tear due to depreciation and the civil works projects involve the construction of roads. The total number of projects (105 projects) executed under each project category between the years 2010 and 2016 was calculated and expressed each category as a percentage of the total projects executed. This is shown in Figure 4.

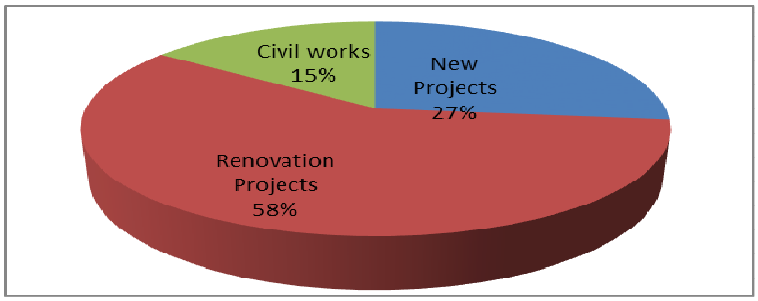

Figure 4. A pie chart showing the percentage of projects executed under each project category (2010 – 2016).

From Figure 4, one can clearly observe that most of the company projects are in the renovation project category. Out of 105 projects analysed within the year under review, 58% of them were found under renovation projects, 27% and 18% were under new projects and civil projects respectively.

4. Results

The results of the investigation are discussed along the lines of the four research objectives put forward.

4.1 The importance of risk management to small construction companies in their project execution

When participants were asked, whether the company has laid down risk management processes one must go through before and during project execution, 69% answered in the negative. The 31%, who answered in the affirmative, were found wanting when asked to list the risk management processes. The implication is that the company does not consider risk management as a necessary exercise to be done before the project execution. The project team thus need not to concentrate on risk management processes before and during the execution of their projects. An interview with the Director of the company also revealed that there is no laid down as far as risk management is concerned. What is important is for the projects to be completed on time. A study of project records (as shown in table 1) within the years under review further revealed that no risk management was done on all the projects executed from 2010 to 2016.

Table 1 Risk assessment on a project executed (2010 – 2016)

Risk management Processes done	Number of projects	Percentage
Yes	0	0%
No	105	100%
Total	**105**	**100%**

(Source: Research Construct from project records, 2016)

From table 1, one can clearly see that the company does not carry out a risk assessment on their projects. Out of 105 projects executed in the years under review, none (0.00%) of the project was a proper risk assessment done either before or during the project

execution. The company, therefore, concentrates on completing projects to meet client deadlines irrespective of what they would do to achieve this objective and do not consider going through the risk management processes as a necessary tool to achieve the set project objectives.

4.2 Risk management processes small construction companies' use in their projects.

The company as an entity does not have any proper risk management procedures in place and hence they do not have a risk management process that they follow to unravel possible risk events in their projects. Individual projects team and leaders tried on their own to find out events that are likely to occur in their projects mainly due to past experience on similar projects. The risk management processes that the individual project team follows are contrary to the generally accepted risk management process proposed by Steyn et al. (2016). However, some of the things mentioned by the interviewees are done in some sections of the generally accepted risk management processes. The risk management processes are separated according to the view of the project managers and Engineers. The respondent's risk management is compared with that of Steyn et al. (2016) in Tables 4.2 and 4.3 respectively with the comment as to whether what they do is really part of the risk management processes or not.

Table 2 Project managers view of risk management process compared to generally accepted risk management process

No	Steyn et al (2016)	Project Managers	Comments on PM risk management processes in relation to generally accepted risk management process
1	Plan for risk	Seek needed information	***
2	Identify risk	Identify scope	**
3	Analyze risk	Proper planning	***
4	Evaluate risk	Proper programming	**
5	Resolve risk	List possible delay	*
6	Control risk	Cost assessment	*
7		Access contractors	*
8		Identify stakeholders	**
9		Assess safety	*
10		Quality control	***
11		Monitor project	***

*Done in the risk management process, ** Somehow done in the risk management process *** Not done in the risk management process

(Source: Researcher's Construct from an interview questionnaire, 2016)

In Table 2, the views of the risk management process of the project managers are shown and compared to that of Steyn et al. (2016). It is clear from Table 2 that, the understanding of the risk management process by the project managers differs from properly accepted risk management processes. It can, however, be seen that some of the things done in their attempt to unravel possible risk events in their projects are done in some sections of a good risk management process. An example is the list of the possible delays which are done in the risk identification process when doing risk management for a project.

Table 3 Project Designers/Engineers view of risk management process compared to generally accepted risk management process

No	Steyn et al (2016)	Designers/Engineers	Comments on PM risk management processes in relation to generally accepted risk management process
1	Plan for risk	Seek detailed brief	***
2	Identify risk	Identify scope	**
3	Analyze risk	Seek client budget	***
4	Evaluate risk	Do detailed design	***
5	Resolve risk	Give information	***
6	Control risk	Quality control	***

*Done in the risk management process, ** Somehow done in risk management process *** Not done in the risk management process

(Source: Researcher's Construct from an interview questionnaire, 2016)

In Table 3 however, it can be seen that the understanding of the risk management process of the Designers and Engineers is totally in contrast with the acceptable risk management process proposed by Steyn et al. (2016). In comparing the process of the Designer's and Engineers' perception of risk management exercises, one can see that none of them is actually done in the risk management process except scope identification, which may somehow be done in planning for risk. It can be deduced that project teams understand risk management processes as risk events likely to occur in their projects but not the processes that must be used to identify the risk events that are likely to occur and how to institute measures to reduce the likelihood of the events occurring during the course of the project. This signifies their lack of understanding of the project risk management processes.

4.3 Impact of Risk Management on Project Performance

Risk assessment was checked on all the projects executed within the years under review and compared to the performance of the projects executed within the same period. Figure 5 shows this comparison.

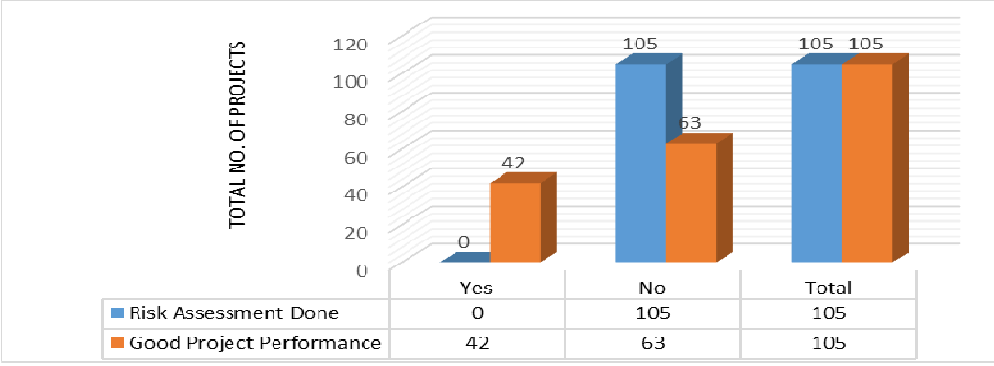

Figure 5. A bar chart showing risk assessment and project deliverable

Out of 105 projects executed between 2010 and 2016, none of them had a risk assessment carried out to identify possible risk events that could occur during the execution of the project. In the same period, out of 105 projects executed, 42 projects representing 40% had an acceptable deliverable whilst 63 projects representing 60% could not meet acceptable project deliverables.

It is shown that there was no risk assessment done on the 42 projects that were successful as well as the 63 projects that were unsuccessful. Project teams, however, revealed that had the company instituted risk management processes for them to go through before the start of all the projects, events that led to the failure of the 63 projects could have been identified. This would have enabled them instituted measures to tackle those events during the course of the project execution and this could have helped improve the performance level of the 63 projects.

It was also revealed that those projects that were successful were as a result of individual attempts made to undergo risk management by trying to draw the attention of the senior managers to things that may go wrong in the project based on the similar experience they had in other projects. Where managers helped in finding solutions to the identified problems, projects come out successful. Based on the evidence shown, one cannot emphatically conclude on the linkage between risk management and project performance in the case study company. This is because no proper project risk management process was followed in situations where projects were successful and situations where projects were unsuccessful. It could, however, be assumed that, had proper risk management process been followed in all the projects, the success rate of projects could have improved as all the causes of project failures could have been identified and resolved during the course of the project.

4.4 Causes of project success and failures

A successful and unsuccessful project in this research is considered to be a project that was able to meet and unable to meet the following criteria respectively;

1. Client satisfaction to the final project deliverables
2. Project completed within the estimated cost
3. Project completed within the estimated time
4. Project completed within the scope
5. The project that was free from defects upon completion

A review of the past completed project records against the parameters above revealed the situation shown in Figure 6.

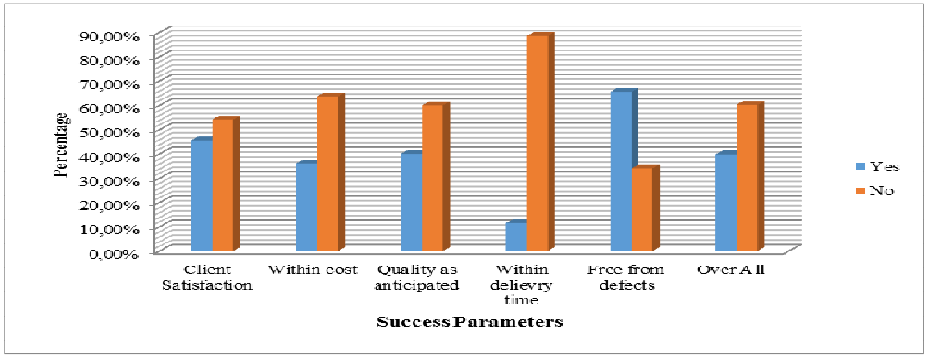

Figure 6: A bar chart showing the success and failure rate of completed projects (2010 – 2016)

From Figure 6, one can clearly see that out of 105 projects executed within the years under review, only 46% were able to meet client satisfaction. Only 36% were completed within the cost, 40% met quality level as anticipated. Surprisingly, only 11% of the projects were completed within the schedule. The majority of the projects (66%) were, however, free from defects upon completion. When average was calculated for the entire performance criterion, it was found out that only 40% of the projects executed within the year under review were able to

meet the success criteria whilst 60% were not able to meet the success parameters. This clearly shows how project performance level has been low from 2010 to 2016. Some factors were found to have contributed to both the success and failures of the projects. The factors that contributed to project success and failures are stated in Figures 7 and 8 respectively.

4.4.1 Contributory Factors to the Project Success

The responses to the questionnaires from the project teams and follow up informal discussion revealed the following factors to be contributory factors to project success. The factors that contributed to project success as stated in Figures 7 are briefly discussed below.

Prompt Payment by the Client: In projects where payments of the contractor were made as scheduled, projects were completed on time. Most of these contractors were upcoming contractors who are not financially sound to execute the project whilst waiting for the client to make payment. They, therefore, rely on the monthly payments as stipulated in the contract to order materials and to pay the workers. Where payments are delayed, the project also delayed.

Team Work: It was revealed from the project team that, projects that were successful were a result of good cooperation from the consultants, contractors, project managers, and the client. Where they worked as a team and helped each other when necessary by taking the project as their own and attended site meetings where information was shared and technical queries answered, the project turned out to be successful.

Right Procedures Followed: where before the implementation of any project, procedures for communication are given to the contractors and the consultants. Where these procedures were followed, project progress went on smoothly and hence contributed to the success of the project.

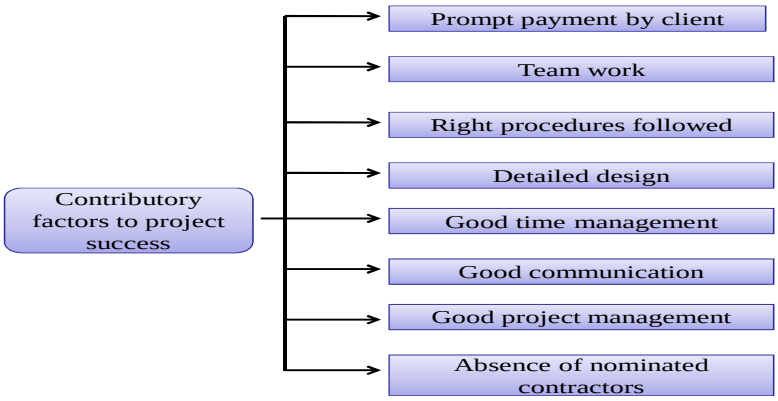

Figure 7: Factors that contribute to project success (project team view)

Detailed Design and Documentation: In projects where detailed design and documentation were given to the contractor and project managers, projects went on smoothly as the technical queries on the part of the contractor to the consultants reduced remarkably. This is because normally consultants have 48 hours to respond to the queries raised by the contractor. In some cases where the consultants delayed in answering the technical queries, contractors implemented their own idea which in most cases were rejected by the consultants and hence contractors either have to redo those works. Where detailed drawings and specifications were given, the technical queries and variation orders were reduced and hence the anticipated scope of project, time, cost and quality were achieved.

Good Time Management: It was observed that contractors with a good program of works do stick to the time allocated to each item on the program and hence managed their time well. These contractors normally finish the project ahead of schedule unless there is a project scope change or additional works. Out of 43 contractors examined in terms of strict adherence to the programme of works, 26 representing 60.46% who followed the programme of works and constantly compared the progress with the programme of works were able to complete the project ahead of or on schedule.

Good Communication/Administration: Projects with good communication among the parties and the stakeholders contributed to the success of the project. It was revealed that where communities within which the projects are taking place were not involved in the communication and administration of the project, project took longer time to complete as a result of the intermittent disruption by the youth in the community who feel they are disregarded and not involved in the execution of the project (not employing them to work on the project). Again when communities were communicated to and the purpose of the project explained to them, they accepted the project and supported the project to succeed for them to enjoy the benefits.

Good Project Management: Projects with good management skills on the part of the project manager also contributed to project success. Project managers with experience in project management were able to coordinate the activities of the project consultants and followed up on issues raised by the contractor immensely contributed to the success of the projects. These project managers through their experience were aware of major project problems in the project management and hence were able to tackle issues when they occurred than inexperienced project managers.

Absence of Nominated Subcontractors: Nominated subcontractors are normally infant contractors forced on the main contractors by the client (normally government) to work with the main contractor. The purpose of this arrangement is for the main contractor to train these nominated contractors to acquire construction knowledge and to upgrade their skills. These mentorship subcontractors normally disrupt the work program through strike actions by their employees and prolong the project completion time. Since these mentorship subcontractors are appointed by the client, the main contractor has to work with them until they complete the portion of the work allocated to them. Projects where these arrangements were absent, the main contractor concentrated on the projects and finished within the schedule to avoid penalty payments.

4.4.2 Causes of Project Failures

A careful study of the project records and also the interview of the project team to find out the reasons why most of the company projects failed to meet the success criterion set out for the purposes of this research, revealed several causes. These causes were then grouped under different categories as presented in Figure 8.

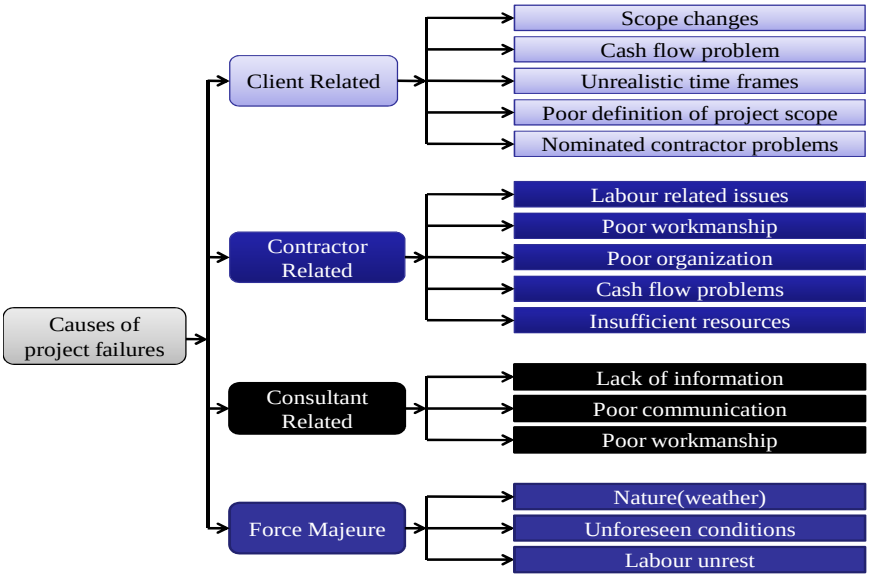

Figure 8. Causes of project failures

4.4.2.1 Client Related Causes of Project Failures

These are the causes of project failures as a result of the actions of the client (the project owner). The main client causes of project failures identified are explained below.

Scope Changes: Most of the projects executed by the company are government projects such as schools, hospitals, and offices. Projects are normally rushed through without proper scope definition. In most cases, projects even started before the actual decisions are made by the concerned department as to the nature of the facilities needed in the community. The original project scope is therefore changed in the middle of the project and hence project completion time and estimated cost are exceeded due to the changes to the originally proposed project scope.

Cash Flow Problems: The amount budgeted for every project in the government sector needs to go through many processes before approval. Because of these cumbersome processes allocated budget for projects have to go through, funds are normally not approved at the time it is most needed to pay the contractors and consultants working on the projects. Contractors and consultants are therefore not paid on time and this affects mostly the cash flow of the infant subcontractors. The infants (nominated) subcontractors without sound financial background have to wait for the payment certificate submitted to be paid before new materials could be ordered thereby prolonging the project completion time. Even in some situations where the allocated budget has been approved, the signing of payment certificates to the contractors may take months because of the official concerned being on leave or out of the country. This finding is in line with the findings of Shahhosseini et al. (2016) regarding the client related causes of project failures such as payment delay to the contractor, financial problems and poor cash flow management.

Unrealistic Time Frames: Project duration given by the client in most projects were found to be unrealistic. As stated earlier, the client for the case study company is mostly government and therefore most of the projects undertaken by the government are for political purposes and these projects must be executed as soon as possible especially when elections are near in order to win the vote of the community concerned. Contractors do not want to lose projects and therefore they accepted to complete the project within the time given by the client. However, in most cases, project completion time exceeded the time given by the client.

Poor Project Scope Definition: Interview with the project team revealed that the client normally poorly defines project scope as projects are normally rushed through. This leads to excessive variations and additional works in the middle of the project execution thereby exceeding the project time and budget and hence causing the project to fail. This finding is in line with the findings of Doli et al. (2012) where they found improper planning and lack of clarity in project scope as some of the causes of project failures.

Nominated Subcontractor Problem: The aim of the government is to promote local black contractors to empower them to carry out government projects and to improve their living standards. These local contractors are, therefore, as a government policy given to the big companies who bid for the government projects to work with them. These contractors understudy the main contractors to acquire skills and upgrade their knowledge in construction. As they are learning on the job, the workmanship is normally not up to the standard thereby affecting the quality of the project. In most cases, the employees embark on strike actions due to payment related issues and extend the project completion date. As the client appoints them, the main contractor has no contractual obligation to them.

4.4.2.2 Contractor Related Causes of Project Failures

These are causes of project failures caused by the contractor. The main contractor causes of project failures identified are explained below.

Labour Related Issues: Strike actions by the workers of the contractors normally prolong the project completion date. Workers were not paid on time, which led to strike actions. In other cases, the demand for wage increases by workers created conflict between the employers and the employees as the employers were not prepared to pay the wages being demanded by the workers. This led to striking actions in some cases and project execution had to be put on hold until the wage disputes were resolved and hence affecting the project completion time.

Poor Workmanship: Due to the government's aim of promoting local black contractors, most of the contracts were awarded to contractors who did not have the capacity to execute the project. This led to poor execution of work and hence affecting the quality of work as anticipated. In some instances, the contractors due to lack of resources abandoned projects and the project had to be re-tendered thereby extending the project completion time.

Poor Organization: Most of the contractors lacked constructional organization skills such as site management, procurement management, health, and safety management and cost management. This led to situations whereby work progress on site was disrupted due to injury or fatality and the site had to be closed down by the law enforcement agencies for the investigation to be completed before works could resume. The procurement of materials to the site was not done properly leading to material shortages on site. In some instances, the credit record of the contractors was not encouraging and hence suppliers refused to supply them the materials ordered and hence affecting the project completion time. This finding is in line with the reasons for project failure proposed by Doli et al., (2012) such as inefficient site management, poor site coordination and improper planning and Ezeldin and Abdel-Ghany, (2003), where they identified managerial and technical factors as some of the causes of project failures.

Cash Flow Problems: Cash flow problems on the part of the contractors also contributed to the project failures. Most contractors even though paid by the client, did not use the money to acquire the necessary material needed for the project. There were two instances where the contractor used the advanced payment to buy a private car instead of paying for the materials ordered and the workers on site. This led to labour unrest and material shortages. Subsequently, the contractor abandoned the project and the project had to be re-tendered thereby affecting the project completing time. This finding is also in line with the reasons for project failure such as managerial and financial identified by Ezeldin and Abdel-Ghany, (2003).

Insufficient Resources: Many contractors lack the necessary construction equipment needed to execute the magnitude of the project they have been awarded as a result of the government's aim of promoting the local black contractors. In most cases, contractors had to rely on hiring companies for that equipment and when the hiring company fails to deliver the equipment as anticipated, it delayed the project as contractors had to wait for the delivery before works could commence on site.

4.4.2.3 Consultants Related Cause of Project Failures

These are causes of project failures caused by the consultants involved in the project execution. The main consultant's causes of project failures identified are explained below.

Lack of Information: Contractors rely on the information from the consultants, to execute the project. Where this information is lacking, contractors had to slow progress or stop that aspect of the project until the concerned consultant provides the information needed. Most consultants normally delayed in answering the technical queries raised by the contractors. Generally, consultants have to reply to technical queries within 48 hours, however, some consultants took more than 48 hours to answer these queries because they were not available or they could not access their emails and hence they were not aware of the queries raised by the contractor. This situation delayed the project completion time. This finding is in line with the findings of Doli et al. (2012) where they indicated poor site coordination, lack of clarity in project scope and lack of communication as some of the causes of project failures.

Poor Communication: Consultants were found not having enough communication among themselves during the design and implementation stages of some projects. There were some instances where there were discrepancies between the architectural drawings and the structural drawings and the contractor had to wait for these differences to be resolved before that particular aspect of the project could be executed thereby delaying the project completion date. In other cases, some of the items in the architectural and structural drawings were not found in the bill of quantity documents. This led to unwarranted variations and additional works causing project budget and time to be exceeded. This finding is in line with the findings of Doli et al. (2012) on causes of project failures where they stated poor site coordination and lack of communication some of the reasons why projects fail.

Poor Workmanship: Information provided on the drawing documents were in some instances insufficient for the proper execution of the projects. There were instances where structural drawings were found not to be compactable to the existing soil conditions. It was found out that in those situations, Engineers did not do feasibility studies to ascertain the soil conditions before designing. Foundation designs had to be redone to suit the soil conditions and hence affecting project completion time and cost. There were also instances where the cost consultants omitted items such as concrete works and joinery fittings from the bill of quantity documents submitted for tender. These omitted items are noticed at the project execution phase where the client had already approved the project budget. This led to variation orders and hence project budgets were exceeded. This finding is in line with that of Doli et al., (2012), where they found a lack of commitment, lack of communication, inefficient site management, poor site coordination, and improper planning as some of the contributory factors to project failures.

4.4.2.4 Force Majeure Related Causes of Project Failures

These are causes of project failures that were beyond the control of all the parties involved in the projects. They are unforeseen circumstances that occurred during the course of the project and disrupted the progress of works. Some of these causes identified are as follows.

Nature (Weather Related): Nature also contributed to project failures. This was found to be mainly in the form of rainfall or cold/hot weather, as a result, works on site had to be

suspended and thereby affecting project completion time. This also confirms the findings of Shahhosseini et al. (2016) where they stated some of the external factors of project failures as extreme weather conditions.

Labour Unrest*:* Labour unrest such as strike action by labour unions was also found to be a contributory factor to project failures. Strike by steelworkers affected the supply of iron rods and roofing sheets needed for structural works and roofing respectively and project progress had to come to a halt until the strike actions were over and this affected project completion time. This also confirms the findings of Shahhosseini et al. (2016) on the external causes of project failures such as hostile political conditions, government interference and lack of agreement between project stakeholders.

Unforeseen site Conditions: In some circumstances, projects were delayed because the soil conditions at the project site were found to be different from anticipated. In such circumstances, projects were halted for the drawings to be revised to suit the conditions on the site thereby prolonging the project completion time, as new drawings had to be submitted for approval and the new budget approved before the project could resume.

5. Conclusion and Recommendations

In conclusion, this research provides some empirical evidence concerning the impact of project risk management on the performance of the project in small construction firms. The research could not establish a firm conclusion on the impact of risk management on the final project deliverables as far as the case study company is concerned. Small construction companies like the case company do not have a laid down risk management processes that the project team has to go through before and during the project execution, yet 40% of their projects were able to meet project performance criteria set for the purposes of this research. Project leaders in some instances tried to identify what could go wrong in their projects based on their experience, which was not enough to unravel most of the project risks and proper response strategies put in place to reduce the severity of those risk events when they occurred during the cause of the projects. It, therefore, became known that the events that negatively affected project performance could have been identified if proper risk management processes had been followed. A proper risk management process could have helped project teams to institute measures to resolve risk events that occurred and that could have improved the final deliverables of some projects. Management must, therefore, institute actions regarding risk management to reduce the failure rate of their projects.

Small construction companies like the case study company must reconsider instituting risk management processes that must be followed before project execution to see how it will affect the performance of their projects. Project managers and leaders in small construction firms like the case study company must be encouraged to embrace project risk management before projects are started to enable them to identify possible risk events likely to occur and be able to institute correct response strategies to reduce the severity of the risk should they occur during the course of the project. Small construction companies like the case study company should put proper risk management guidelines such as those proposed by Steyn et al. (2016) or any suitable risk management procedures in place and ensure they are followed by the project team and leaders at all times before and during project execution. The case study company should train project leaders in project risk management processes. The case study company should constantly monitor the performance of their projects against risk management and to ensure projects are able to meet at least the three most important project performance indicators namely, cost, time and quality. The limitation of the study is that only one construction firm was used and therefore it is recommended that more construction firms should be included in future research to see if the result will differ from the findings of this study.

References

Akintoye, A.S., and Macleod, M., (1997). Risk analysis and management in construction. International Journal of Project Management, 15(1), 1-38.

Arrow, K., (1970). Essays in the theory of risk-bearing. Amsterdam: North-Holland

Bakker, K., Boonstra, A., and Wortmann, H., (2010), Does risk management contribute to IT project success? A meta-analysis of empirical evidence. International Journal of Project Management, 28(5), 493-503.

Bakker, K. D, Boonstra, A., and Wortmann, H. (2012). Risk management's communicative effects influencing IT project success. International Journal of Project Management, 30, 444–457.

Banaitiene N. and Banaitis A., (2012). Risk Management in Construction Projects. Chapter 19. Available from https://urldefense.proofpoint.com/v2/url?u=http3A__dx.doi.org_10.5772_51460&d=DwIFaQ&c=vTCSeBKl9YZZHWJzzzQUQ&r=RmdpeYEYXEhLcp2bgQdpVA&m=aTj5SibkDCeUKionMelbNAPzolL7dccjcOKBCdk3SQ&s=P7YeHdmBRPb4zD4CQdmraXUV1abAuBTQvMm8YXJK_Xc&e. Accessed on 20 September 2018

Besner, C., and Hobbs, B., (2006). The perceived value and potential contribution of project management practices to project success. Project Management Journal, 37(3), 37-48.

Blumberg, B., Cooper D. R., and Schindler, S.P., (2008). Business Research Methods, Second Edition, McGraw-Hill Education

Burek, P. (2016), Uncovering All Of The Risks On Your Projects PM World Journal, 5(11).

Chapman, C., and Ward, S., (1997). Project Risk Management: Processes, Techniques, and Insights. John Wiley.

Clark, R.C., Pledger, M., and Needler, H.M.J., (1990). Risk analysis in the evaluation of non-aerospace projects. Risk Management, 8(1), 17-24.

Cooper, D, Grey, S., Raymond, G. and Walker, P., (2005). Project Risk Management Guidelines: Managing Risk in Large Projects and Complex Procurements, John Wiley and Sons

Cox, R. F., Issa, R. R. A., and Ahrens, D., (2003). Management's perception of key performance indicators for construction. Journal for Construction and Engineering Management, 129(2), 142–151.

Cooke-Davies, T., (2002). The "real" success factors on projects. International Journal of Project Management. 20(3), 185-190.

del Caño, A., and de la Cruz P.M., (2002). Integrated methodology for project risk management." J. Constr. Eng. Manage., 1286, 473–484.

Doli, H., Sawhney, A., Iyer, K.C., and Rentala, S., (2012). Analysing factors affecting delays in Indian construction projects. International Journal of Project Management, 30, 479-489.

Dyer, W.G, and Wilkins, A.L., (1991). Better stories, not better constructs, to generate better theory: a rejoinder to Eisenhardt. Academy of Management Review 16(3), 613 – 619.

Dvir, D., Raz, T. and Shenhar, A.J., (2003). An empirical analysis of the relationship between project planning and project success, International Journal of Project Management. Volume 21, Issue 2, Pages 89-95

Ezeldin, A. and Abdel-Ghany, M., (2013). Causes of construction delays for engineering projects: an Egyptian perspective. AEI, 54-63.

Garry, D. C., Skitmore M, and Wong J.K.W., (2010). Evaluation of Risk Factors Leading to Cost Overrun in Delivery of Highway Construction Projects Journal of Construction Engineering and Management. 537.

Gido, J. and Clements, J.P., (1999). Successful Project Management, Ohio, South-Western College Publishing.

Hauptfeisch, A.C., and Single, H.M, (2009). Structure of the Built Environment in South Africa, Business Print Centre, Pretoria.

Hwang, B.-G., Zhao, X. and Toh, L.P. (2014). Risk management in small construction projects in Singapore: Status, barriers, and impact. International Journal of Project Management, 32(1), 116–124.

Johnson, J., (2001). Collaboration: Development & Management - Collaborating on Project Success, Software Magazine.

Khadka, S.B. et al., (2010). Applying Risk Management to Project Performance, MBP Outlook, Spring.

Keeling, R., (2006). Gestão de projetos: uma abordagem global. Saraiva, São Paulo.

Kenzner, H., (1998). Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Chapter 17, John Wiley & Sons, 6th edition.

Kerzner, H., (2009). Project Management: A systems approach to planning, scheduling, and controlling (10th ed.). New Jersy: John Wiley and Sons.

Koelmans, R.G., (2004). Project success and performance evaluation, International Platinum Conference Platinum Adding Value, The South African Institute of Mining and Metallurgy.

Leu, S. S., Chen, A. T., and Yang, C. H. (2001). A GA-based optimal model for construction time-cost trade-off. Int. J. Proj. Manage, 19, 47–58.

MacCrimmon, K. R., and Wehrung, D. A., (1984). The risk in-basket. Journal of Business, 57(3), 367–387.

Mangione, C., (2003). Software Project Failure: The Reasons, The Costs, CIO Information Network, USA.

March, J.G., and Shapira, Z., (1987). Managerial perspectives on risk and risk-taking. Management Science, 33(11), 1404 – 1418.

Meredith, J.R. and Mantel, S.J. (Jr.), (2003). Project Management; A Managerial Approach. John Wily & Sons, Inc., United States of America.

Morris, P.W.G. and Hugh, G.H., (1986). Preconditions of success and failures in major projects, Templeton College, the Oxford Centre for Management Studies, Kinnington, Oxford.

Okema, J.E., (2001). Risk and Uncertainty Management of Project: Challenges of Construction Industry. Department of Architecture, Makerere University, Uganda.

Pinto, J.K. and Slevin, D.P., (1998). Project Success: Definitions and Measurement Techniques. Project Management Journal, 21(2), 67.

Pritchard, C.L., (2001). Risk Management: Concepts and Guidance - International, Virginia, Chapter 2: Risk Concepts, 9- 23.

Project Management Institute (2013). Project management Body of Knowledge PMBoK. Pennsylvania.

Project Management Institute (2008). Project management Body of Knowledge PMBoK. Pennsylvania

Rad, P.F. and Ginger, L., (2002). The Advanced Project Management Office; A Comprehensive Look at Function and Implementation. Florida, St Lucie Press.

Raz Z, Shenhar AJ, Dvir D. Risk management, project success, and technological uncertainty. R&D Manage 2002; 32(2), 101–109.

Raz, T. and Michael, E., (2001). Use and benefits of tools for project risk management, International, Journal of Project Management. 19(1), 9-17.

Santayana, G., (2006). Why project risk management. Chapter 1 in Identifying and Managing Project Risk, (Kendrick, 2015). Third edition, Amacom Publishers.

Shahhosseini V., Afshar M.R., and Amiri O., (2016). The root causes of construction project failure. Scientia Iranica. 25(1), 93-108

Shenhar, A.J., Levy, O., and Dvir, D., (1997). Mapping the Dimensions of Project Success. Project Management Journal, 28(1), 13.

Styen, H, Carruthers, M., du Plessis, Y., Kruger, D., Kuschke, B., van Eck S., and Visser K., (2016), Project Management: A Multi-Disciplinary Approach. Fourth edition, FPM Publishing, Pretoria

Styen, H. and Nicholas M.J., (2012). Project management for business, engineering, and technology. Fourth edition

Smith, P.G. and Merritt, G.M., (2002). Proactive Risk management: Controlling Uncertainty in Product development. Productivity Press.

Teresa, M. and Ramírez, PMP., (2002). You Can't Manage What You Don't Measure: Measuring Project Performance. Unpublished. Available from https://www.scribd.com/document/56809324/You-Cant-Manage-What-You-Dont-Measure. Accessed on 12 July 2016.

Wallace, L., Keil, M., and Rai, A., (2004). How Software Project Risk Affects Project Performance: An Investigation of the Dimensions of Risk and an Exploratory Model. Decision Sciences, 35, 289–321.

Welman, C., Kruger F., and Mitchell B., (2005) Research methodology. Third edition, Oxford University Press, Southern Africa

Westerveld, E., (2003). The Project Excellence Model®: linking success criteria and critical success factors. International Journal of Project Management. 21(6), 411-418.

Wibowo, A., and Mohamed, S., (2009). Risk criticality and allocation in privatized water supply projects in Indonesia, Centre for Infrastructure Engineering and Management, Griffith University, Australia.

Widerman, M., (2000). First Principles of Project Management, AEW Services, Vancouver.

Yeung, J. F. Y., Chan, A. P. C., Chan, D. W. M., and Li, L. K., (2007). Development of a partnering performance index (PPI) for construction projects in Hong Kong: A Delphi study. Constr. Manage. Econ., 25(12), 1219–1237.

Yin, R., (2003). Case Study Research, Design, and Methods 3rd edition, London, Sage Publications.

Zwikael, O., Ahn, M., (2011). The effectiveness of risk management: an analysis of project risk planning across industries and countries. Risk analysis, 31(1), 25-37.