Tools and Techniques for Project Risk Management: Perspective of Micro to Small Scale Construction Firms in Ghana

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Abstract

Management of risk in project is one of the vital project management processes. There are numerous tools and techniques available to support project risk management (PRM) at different phases of a project. Whereas tools commonly utilised by large firms are much publicised, little is known about tools and techniques used by small-to medium-scale enterprise (SMEs) in managing project risk. Considering the economic importance of SMEs, this research sort to identify tools and techniques used in PRM among SMEs in the construction sector of Ghana. The report present the findings of a study based on administering of questionnaires to project personnel drawn from SMEs operating in the construction sector of Ghana. The response data were analysed to identify the techniques and tools which are most utilised. The findings showed that top three risks faced by SMEs in construction project are price fluctuation, inflation and delays in payment or lack of funds. Checklist, brainstorming and benchmarking were the top three tools utilised in project risk management.

Keywords: project risk management, tools, techniques, small-to micro-scale enterprise

Acknowledgement

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List of Acronyms

SMEs: Small-to Micro Enterprise

PRM: Project Risk Management

PMBOK: Project Management Body of Knowledge

PMI: Project Management Institute

PM: Project management

NBSSI: National Board for Small and Medium Scale Industries

GSS: Ghana Statistical Service

HND: Higher National Diploma

MWWOH: Ministry of Water Resources, Works and Housing

GDP: Gross Domestic Product

ISSER: Institute of Statistical, Social and Economic Research

NGOs: Non-Governmental Organisations

WBS: Work Breakdown Structure

APM: Association for Project Managers

AS/NZS: Australian Standards/New Zealand Standards

Definitions

Risk: is the exposure to the consequence of uncertainty.

Project risk: is the chance of something happening that will have an impact on achieving project objective

Risk management: is the culture, processes and structure directed towards the effective management of potential opportunities and adverse effects

Risk management process: it involves the systematic application of management processes and procedures to the tasks of establishing the context, identifying, and analysing, assessing, treating, monitoring and communicating risk

Risk identification: is the process of determining what, how, why and where things may happen

Risk analysis: is the systematic use of available information to determine how often specified events may occur and the magnitude of their consequences

Risk evaluation: determines whether the risk is tolerable or not and identifies the risk that should be accorded the highest priority in developing responses for treatment

Risk treatment: establishes and implement management responses for dealing with the risks, in ways appropriate to the significance of the risk and the importance of the project.

Chapter One

1.0 Introduction

Managing of project risk is an integral part of quality project management system, and fundamental to achieving good project outcomes. That is, systematic identification and assessment of risk and effectively dealing with the results is significant to the success of the project. Risk management in projects is one of the major areas of interest in the area of project management. Risk management is designated as one of the main project management knowledge areas in the project management body of knowledge (PMBOK) by the Project Management Institute[1] (PMI, 2008). It is described as a process that accompanies all the phases in project life cycle – from project definition phase through to the project closure phase. The concept of risk management is therefore central to all aspect of a project.

A number of researchers have proposed various project management processes for risk management in projects. Boehm (1991) proposed a two phase process of risk management consisting of risk assessment phase which is made up of three steps; identification, analysis and prioritization; and risk control phase made up of risk management planning, risk resolution and monitoring, and risk tracking and corrective actions.

Klien and Ludin (1996) proposed a four step process – risk identification, analysis, control and reporting. Their proposal parallel Deming's four steps of quality management – plan, do, check and act.

Fairley (1994), suggested seven steps of project risk management – (1) risk identification; (2) risk probabilities and effect assessment; (3) creation of strategy to mitigate identified risks; (4) monitoring risk elements; (5) invoking a contingency risk plan; (6) treatment of the risk; and (7) recovering from the risk.

Chapman and Ward (1997) proposed a nine phase generic process – definition of the key aspect of the project, focusing on a strategic approach to risk management; identifying elements of risks; structuring the data about risk assumptions and relationships; assigning risk ownership and responses; approximation of the extent of

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[1] PMI is the largest professional organisation dedicated to the field of project management

uncertainty; estimate the relative impact of the various risks; plan risk responses and manage risk by controlling and monitoring the implementation.

The Software Engineering Institute (SEI)[2] proposed five phases of project risk management (PRM) process consisting of – risk identification; risk analysis; risk response planning; risk tracking and risk control. The five phases are linked by continuous risk communication effort (Dorofee et al., 1996).

The short review of the PRM processes above shows a general agreement of what is entailed in the PRM processes. The differences in the various PRM processes presented above are the level of steps or activities of each process. Thus there are variations in the level of detail and assignments activities to phases. Organisations can adopt a process to suite their management style or sector of operation.

1.1 Problem Statement

It is undisputable fact that any PRM process requires tools and techniques regardless of the number of process steps, details or the level of activities in the various PRM processes. Adopting a process requires investment. The magnitude of investment in certain cases can be very significant, depending on the size of organisation, nature and sector of operations. While there are a number of well-established tools and techniques used for managing project risks in large organisations (White and Fortune, 2002), there has not been much research publications on the tools and techniques used in managing project risks in small organisation (Bryde, 2003).

1.2 Purpose of Research

This research aims to identify the tools and techniques used in managing project risks in small-to medium-scale enterprise (SMEs). The research focuses on SMEs in the sector of Ghana. The research will highlight the common risks faced by the SMEs in the construction sector, the tools and techniques most frequently utilised to manage the risks faced, and project success criteria most frequently accepted by SMEs.

1.3 Research Questions

The research investigated the answers to the following main questions:

1. What are the challenges faced by SMEs in construction projects in Ghana?

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[2] A leading source of methodologies for managing software development projects

2. What are the tools and techniques used in managing the challenges faced?

3. What factors are considered more important to define project success

1.4 Method of Study

The study uses combination of quantitative and qualitative research approach. Review of literature was first used to gather previous data and information regarding the research topic. Structured questionnaire were developed based on previous research. Data for the present research were gathered through distributed questionnaire and structured interviewing of selected personnel and entrepreneurs of SMEs involved in projects. The responses to the questionnaire were analysed using statistical approach.

1.5 Organisation of the Thesis

The research is organised in five main chapters with each main chapter consisting of auxiliary sections.

Chapter 1 introduces the research problem and objectives of the whole research. Chapter 2 follows with relevant review of past research to extract useful information. Chapter 3 gives description of the research methodology approach. The subsequent chapters contain the description of result, analysis and conclusion of the study as shown in **figure 1**.

Conclusion

Result and Analysis

Research Methodology

Literature Review

Introduction
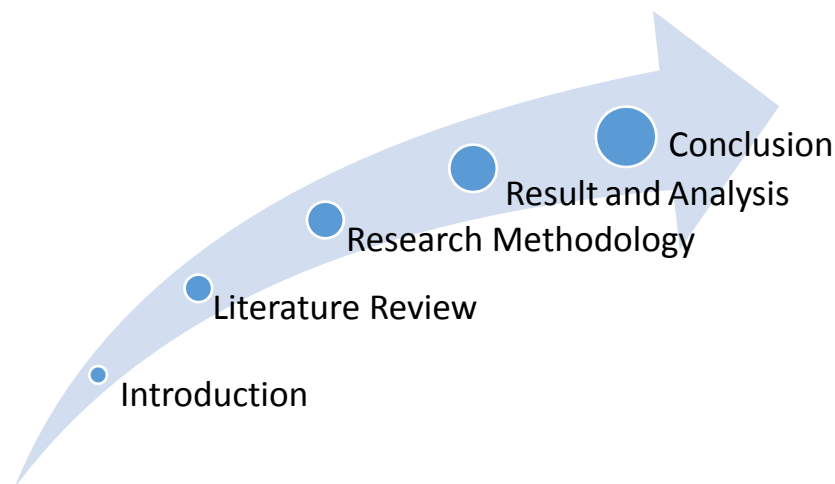
Figure 1: The five main chapters of the research work

1.6 Significance of the Thesis

As stated above, most of the past research on tools and techniques for project risk management has focused on large enterprises. The few publications on SMEs however mainly focus on organisation in developed countries. This research focuses

on small organisations in a developing country using Ghana as a case study. The findings of this research will contribute to knowledge in PRM and aid project management practitioners, researchers and investors in future proposals and selection of tools and techniques for project risk management and project management in general. The choice of SMEs in the construction firms is due to their growing and strategic role in the economy of developing countries like Ghana. The construction sector in Ghana is projected to grow at a record rate of 13% with the recent discovery and production of crude oil in commercial quantities (ISSER, 2008)[3].

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[3] Institute of Statistical, Social and Economic Research of the University of Ghana

Chapter Two

2.0 Small-to Medium-Scale Enterprise

There is no single definition of small-to medium-scale (SMEs) enterprise. The definition has varied over time with lack of agreement among researchers about what constitute small or medium sized enterprise (McAdam et. al., 2005).

Bolton committee (1971, cited by Mensah, 2004), uses two approach for defining SMEs, based on statistical or economic criteria. On the economic criteria, an organisation is classified as SMEs under the following three (3) requirements:

1. An organisation with relatively small share of the relevant market;
2. Enterprise managed by a sole proprietor or part owners in a personalized style rather than a formal management structure;
3. Small enterprise operating independently and not a part of bigger company.

On the statistical criteria, the committee adopt analysis of three (3) criteria as follows: (1) the size and sector of the enterprise as quantified according to their impact on GDP, innovations, export and employment; (2) compare the extent to which the economic contribution of the enterprise has changed over time; and (3) a statistical definition in principle that makes it possible to compare the contributions of a small enterprise in one country to those in other countries. The criteria as applied to define SMEs in various sector is given in **table 1** below

Table 1: Summary of the EU criteria for defining SMEs

Sector	Definition
Manufacturing	Up to 200 employees
Mining and quarrying	Up to 25 employees
Construction	Up to 25 employees
Road transport	Up to 5 vehicles
Whole sale	Turnover of up to £200,000
Retailing	Turnover of up to £50,000
Services (miscellaneous)	Turnover of up to £50,000
Motor trades	Turnover of up to £100,000
Catering	All excluding multiple and brewery managed houses

The EU (2003, cited by Murphy and Ledwith, 2007) describe SMEs as enterprises with fewer than 250 employees and/or annual turnover of up to EUR 50 million. Other categorise of SMEs include fewer than 15 employees under the Australian Fair Work Act (2009) to fewer than 500 workforce under small business administration programme in the United State. The definition criteria have varied over time and some researchers argue there is lack of consistency in the classification. Thus the definition criterion varies and is largely dependent on whose point of view or context (McAdam, et al. 2005).

In Ghana, the most commonly used definition criteria for SMEs is based on the number of employees. However, there is controversy surrounding the randomness and cut-off point used by various government and private sector organisations (World Bank, 2010). The Ghana Statistical Service (GSS) defines firms employing less than 10 persons as small enterprise and those employing more than 10 as medium-to-large enterprise. The National Board for Small Scale Industries (NBSSI)[4] defines SMEs using both the number of employees and the fixed asset of the enterprise as the criteria. The NBSSI defines small enterprise as those employing not more than 9 workers with a fixed asset of plants and machinery (excluding vehicles, land and buildings) not exceeding $10000.

For the purpose of this study, we adopt a definition by Mensah (2004) which gives broader criteria to include more organisations. Mensah (2004) categorise SMEs into three groups: (1) Micro enterprise which employs up to 5 persons with a fixed asset (excluding buildings, land and vehicle) not exceeding $10000; (2) small enterprise as organisations employing between 10 and 30 with a fixed asset not exceeding $100,000; medium enterprises as organisation employing between 30 and 100 with fixed assets not exceeding $1,000,000 as seen in **table 2**.

Table 2: Summary of the SMEs criteria adopted from Mensah and Bell

Category	Number of employees	Capital investment
Micro	1-5	$10,000
Small enterprise	6-50	$100,000
Medium enterprise	51-100	$1,000,000

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[4] Public funded organisation charged with the responsibility for the promotion and development of SMEs in Ghana

2.1 Characteristics of SMEs

SMEs are predominantly founded by entrepreneurs who create business based on a discovery of new product and/or services (Oakey and Mukhtar, 1999). They tend to have entrepreneur management style – a simple management structure with direct involvement of the owner in the daily operations of the business. This allows for flexibility and fast decision making regarding changes to product or services when necessary. The system avoids the obligation of seeking board management or stakeholders' approval in top decision making. The success of the organisation is therefore usually based on sound knowledge of the entrepreneur, highly skilled employees and the ability to spot a niche in the market (Warren and Hutchinson, 2000). This observation is no different from SMEs in the Ghanaian context. SMEs in Ghana is generally characterised by sole proprietorship with varied number of employees or apprentices.

SMEs in general, compared to large enterprises, exhibit both advantage and disadvantage features. As mentioned earlier, they generally have greater eventual flexibility and potential closeness and an edge for innovation and customisation (Audretsch et al., 1998). This allows them to seek markets where their advantage count and avoid direct competition with large firms. They exhibit innovative advantage of responding rapidly to external opportunities or threats, more simple and efficient internal communications and interactive management cycles (Edwards et al., 2001). In spite of these advantages, most SMEs still lack economic scale, learning and scope (Murphy and Ledwith, 2007).

Studies by Rothwell (1992), however shows that SMEs are limited in their ability to innovate as most of them lack the material and technics as well as the financial resources which enables large enterprises to spread risk over a project portfolio and fund large and longer term research and development.

It has also been shown that majority of entrepreneurs and projects in small firms are generally weak in terms of motivation, marketing and management (Ledwith, 2004). That is SMEs often demonstrate limited practise of project management techniques and benefit little in terms of increased new product success. In spite of this, it has been observed that with improving of project planning, establishing of clear objectives and outlining of priorities; small firms could reduce project delivery times to improve new product development performance (Murphy and Ledwith, 2007).

2.2 Characteristics of SMEs in the Context of Construction Firms in Ghana

In Ghana, SMEs operating in the construction sector are registered under various public agencies or private associations. For example, building and civil construction firms are registered[5] under the Ministry of Water Resources, Works and Housing (MWWOH) in collaboration with the Registrar General Department.

MWWOH, for example, group firms into two categories which are further subdivided into four classes: K1, K2, K3 and K4 for civil works firms and D1, D2, D3 and D4 for building contractors. Class K3/K4 and D3/D4 firms are commonly referred to as small-scale firms, and K1/K2 and D1/D2 are typically large firms (Ahiadzie et. al., 1995).

A typical characteristic of K3/K4 and D3/D4 firm is that, they are often-supposed to be a one-man firm, with low funds and capital base and lack the necessary management skills to effectively face up to the frequent and difficult challenges they face frequently in growing developing economies such as Ghana (Ahiadzie, 1995). Like most SMEs, the reality in Ghana is that, most small firms operate a personalised management style with limited resources without or with little due regards to effective modern management practice.

2.3 Role of SMEs Construction Firm in Ghana's Economy

The ISSER (2008) project the construction sector with the recent discovery and production of crude oil, which has attracted an immense flow of capital, to grow at a rate of 13%. Well position SMEs in the construction sector therefore stand to benefit with the high projected growth rate in the sector. SMEs in the construction sector of Ghana, notwithstanding the many difficulties cited earlier, represent over 90% of registered firm operating in the economy and employs more than 60% of the labour force engage in the sector, and approximately 80% of all short-term employment in rural communities of Ghana (Ofori, 1994). Their activities in this regard is useful to stimulating growth in rural communities where the government and various international organisations, NGO's and donor agencies are supporting local development and improved standard of living. The low requirement of entry coupled with the demand for their service dictate the ascendancy of SMEs in the construction sector of developing economies.

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[5] Registration is not compulsory but a requirement to tender for government projects or contracts

In the context of Ghana, it is common, just as in other countries, for large firms to award sub-project or contract to small firms. A typical construction firm is essentially a representative of large industry of small enterprise in various construction economies (Fellows, et al., 1983).

2.4 Definition of a Project

The project management body of knowledge (PMBOK) defines a project as "a temporary endeavour undertaken to create a unique product or service" (PMI, 2008). Project, unlike an organisations normal operation, must eventually come to end. Thus projects temporarily exist and therefore have lifeline. It is typically of a one-time effort to accomplish an explicit objective within a specific time (PMI, 2008). Projects can be carried out at all levels of an organisation. Typical project may involve one unit of an organisation or spun to several organisational units depending on the complexity of the project. It may consist of a single person or several persons in a team.

2.5 Brief Characteristics of a Project

To better understand the nature of projects, it is very important to mention typical unique characteristics that are generally associated with all projects. Typical characteristics of projects as described by Kerzner (2009) are: specific objectives; defined tasks; defined timescale; budget or cost constraints; limited resources; deliverables; involve elements of risk; and achieve useful result or change. Projects in general should exhibit these characteristics to a varied extent. The extent of each characteristic differs depending on the size and complexity of the projects.

2.6 Project Management in Brief

Project management focuses on the management of all the aspect of a project. The PMBOK defines project management as the application of knowledge, skills, tools and techniques to project activities to meet requirement (PMI, 2008). Thus project management brings together all the needed resources for a project and optimise them for the successful completion of the project. The resources include human, tools and equipment, techniques, money and information. Most of these resources are inevitable regardless of the nature or complexity of the project. A systematic methodology to the management of a project, irrespective of the size and complexity, cost and duration is necessary to ensure the success of the project. This will help the

project manager to apply a degree of structure to the project, to manage all the project aspect and achieve project success. This will benefit the project manager by:

- – Ensuring that the objective of the project is well defined and closely aligned to the vision of the organisation,
- – Ensuring a well-defined, and understood by all stakeholders, product and/or services which the project sort to deliver,
- – Promoting a logical approach to the project planning and a more accurate budget and schedule,
- – And provides a consistent means to monitor and control the project.

Embarking on any project now involves overcoming many complications (Kerzner, 2009) that may include the project complexity, project risk, client requirements and organisational restructuring. It is therefore vital to have a systematic structure such as project management to help account for obstacles and how to overcome them to ensure success of the project. Kerzner (2009) outline some of the benefits of project management as follows:

- – Identifying functional responsibility to ensure all activities are accounted for
- – Identifying time limits for schedules
- – Measurement of accomplishment against time
- – Early identification of project risks
- – Enhance estimating capabilities

2.7 Project Management Process

There are four (4) primary phases in project management process. Each of these phases is characterised by some amount of risks. The four (4) phases are project initiation, project planning, project execution and control, and project closure.

Project initiation

Project initiation is the first phase of project management process. This phase consists of activities performed to assess the size, scope and complexity of the project and to establish procedures to support later project activities. Activities performed at this phase include creating the project team and project manager, founding stakeholders, instituting project initiation plan and management procedures etc. The initial activities may well depend on the type of the project. This means

some of this initial activities may be avoidable where as some may be very vital to the project.

Project planning

Project planning is performed at the beginning and at the end of each project phase. It is a critical phase of the project which provides an overall framework for managing the three projects constraints - cost, time and quality. It involves a clear definition of discrete tasks or activities of the project and the work needed to complete each task or activity. Activities are basic units or work that the project team plans, execute and monitors and may be defined as any work that has a beginning and an end and requires the use of project resources such as money, time and people. Project activities include project scope, work breakdown structure (WBS), estimating resource plan, developing project schedules and communication plan, establishing standards and requirements, developing statement of work, setting a baseline project plan, and identifying and assessing project risks.

Project execution and control

This is the third phase in project management process. It is the phase in which the project plans made in the initial project phases are actually implemented. The success of this phase much depends on the project planning phase. The execution phase is more likely to be successful if the quality of the planning phase is high and more thorough.

Project closure

Project closure is the final phase of the project management process which marks the end of a project. It is a very important phase where the project is estimated as successful or failure. Activities performed at this phase include post-project review and closing of contract with stakeholders.

2.8 Project Risk Management

The Association for Project Management defines PRM as the process and techniques which enables effective management of risk associated with a project (APM, 2000). Because every project is unique, dealing with risk in project may therefore be different from situations. However, a general simple framework for risk management

involve four (4) steps which many different PRM tools and processes have revolve around. The four steps are:

1. Identification of risks
2. Quantification of risks
3. Planning for risks
4. Monitoring and control of risks

To manage project risk effectively requires all four steps and it is a continuous iterative process of management. It is therefore carried out from time to time at each phase of the project and whenever there is a deviation from the project plan. Risk management is perhaps the most difficult side of project management. The project team must be able to recognise risks faced and identify the root causes and trace these through the project to their consequences. In the context of construction project, the use of risk management from the early stage of the project, where major decisions are such as design and selection of construction method can be influenced, is very essential

2.9 Risk Management Process

Various risk management processes are described in the introduction chapter 1.0 above. In this section, we present the risk management processes as described by the Australian standards/New Zealand standards AS/NZS 4360:2004. The main elements of this process are:

a. Commination and consultation: it is a continuous process throughout the risk management process. Communication and consultation with both external and internal stakeholders appropriately at stage of the risk management process;

b. Establishing the context: internal, external and risk management context in which the rest of the process will take place is establish. The risk evaluation criteria and definition of the analysis structure is established;

c. Risk identification: the identification process should indicate where, when, why and how and occurrence of an event could delay, prevent, degrade or enhance the achievement of the objectives;

d. Risk analysis: this comprise identification and evaluation of existing controls. It also includes determination and evaluation of likelihood, consequences and

the level of risk. It is vital that range of potential consequences and how they could occur are taken into consideration;

e. Risk evaluation: this consist of comparison of estimated risk levels against pre-established criteria. The balance between adverse outcomes and potential benefits is considered to enables decisions to be made about the nature and extent of treatment required and priorities;

f. Risk treatment: it involves development and application of specific cost-effective strategies and action plans to reduce potential adverse cost and increase potential benefits;

g. Monitoring and review: the risk management process is an iteration process. It is therefore important to continuously monitor and review the effectiveness of all the steps in the whole risk management process. This is vital for continuous improvement and ensures changing circumstances do not alter priorities.

The whole risk management process as described in AS/NZS 4360:2004 is shown in **figure 2**. (Adopted from Williams et al., 2006)
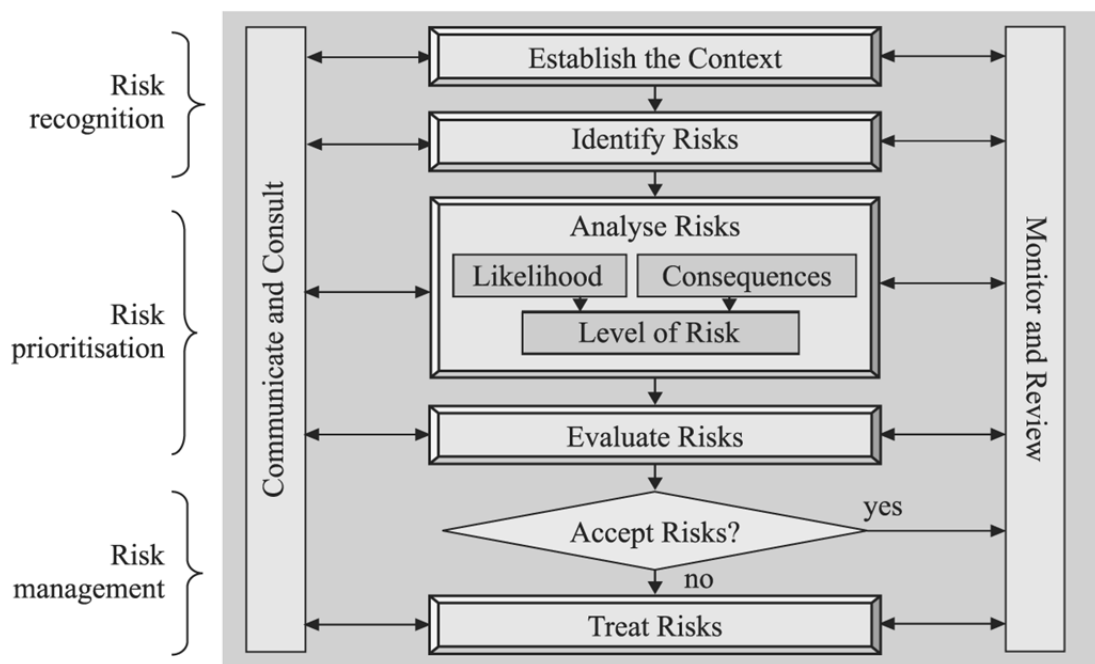
Figure 2: Risk management process – overview according to AS/NZS 4360:2004

2.10 Overview of PRM Tools and Techniques

There are a number of well-established tools and techniques used in managing risk in projects. Raz and Michael (2001) summarises various project management tools and techniques into five (5) groups according to the stages of risk management process. The five groups are identification process (with tools and techniques including checklist, brainstorming, etc.), analysis process (with tools and techniques including risk probability assessment, risk classification, etc.), planning process (with tools and techniques including responsibility assignment, cost-benefit analysis, cause and effect analysis, etc.), control process (with tools and techniques including analysis of trends, project re-planning, etc.) and the background process (with tools and techniques requirement management, prototyping, training programs etc.). The AS/NZS 4360:2004 standard reported some of the tools and techniques for risk identification as checklists, brainstorming, flow-chart, judgement based on records, scenario analysis and systems engineering techniques. The standard further gives sources of information for risk analysis including;

- Past records;
- Experiment and prototypes;
- Specialist and expert judgement;
- Relevant literature survey;
- Market research;
- Economic and engineering and other models.

Examples of techniques for risk analysis as mentioned in the AS/NZS 4360:2004 include;

- Structured interviews with expert in area of interest;
- Use of models and simulations;
- Use of multi-disciplinary groups of expert;
- Individual's evaluation using questionnaires.

Chapter three

3.0 Research Methodology

The aim of the research was to identify tools and techniques used in project risk management in SMEs operating in the construction sector of Ghana. This chapter focuses on the methods used for the collection and analysis of data for this research. Literature review was first used to gather information on the extent of studies within the context of this research. Information on existing risk variables and application of existing tools and techniques in general and within the context of SMEs were gathered from literature.

3.1 Survey Method

Survey method through the distribution of structured questionnaire via email was primary used for gathering data for this research. This method of survey distribution is cheap and allows more respondents to be reached. However, the initial response to the questionnaire turned out to be very low and time consuming. This initial responses to the questionnaire corresponded well with earlier studies by Bryman and Bell (2003) which concluded on a declining rate of responses to online questionnaire. Their result also showed this method of research takes longer period of time to get response from respondents. To fit in the Ghanaian context, alternative distribution of questionnaire by regular post was considered but was too expensive to venture. This necessitated another alternative via direct telephone interview of respondents. Direct telephone interview and regular post method was more expensive for this research considering the geographic location of respondents and the authors. However, direct telephone interview gave fast response and allowed follow-up questions to respondents for clarification at the course of the interview. Very narrow number of respondents was therefore targeted. Respondents were selected such that more reliable information was obtained from the overall narrow data gathered.

3.2 Design of Questionnaire

Design of questionnaire was the man tools used in the survey for this research. A questionnaire containing three divisions was design to facilitate in collection of data from respondents. The three parts of the questionnaire are.

1. *Background information*: these first set of questions sort the background information of respondents, eg. Type of organisation, position in the organisation, education, work experience, etc. The aim is to identify the influence of their background on project management;

2. *Risk Management tools and Techniques:* these second set of questions sort to identify the type of risks faced by their organisation and the tools and techniques used in managing those risks. The aim here is to identify the risks faced and to the common risk management techniques and tools primarily used in the mitigation process;

3. *Critical success factors*: the last sample of questions sort to identify factors perceived as or used to rate the success of projects undertaken the firms. The aim is to identify the criteria most used by the firms to rate the success of their projects.

Further follow up question were asked during the interview section to get further details or clarification from respondents. Those questions varied from respondents to respondents.

The initial responds to the questionnaire were very low. We attribute this to the bulky nature of the initial design of the questionnaires. The initial questionnaire was adopted from risk management questionnaire by the Audit office of New South Wales. The design of that questionnaire was predominantly based on the requirement of risk management standard AS/NZS 4360:1999 issued by the Australian standards. We review the questionnaire and sent out a simplified and short version to the respondents again.

To fit into the SMEs context in the construction sector of Ghana, a pilot survey of the questionnaire were sent by emails and followed up by a direct telephone interview to two prominent entrepreneurs of SMEs operating in the construction sector of Ghana. The two professional were ask to examine and criticise the questionnaire by trying to answer them. Piloting this way was necessary to predict how respondents perceive and interpret the questions (Gill and Johnsson, 1991). Their inputs and suggestions were used to shape the final design of the questionnaire which was sent out by email to respondents. The steps for the final design of the questionnaire are given in **figure 3** below:

Step 1	Step 2	Step 3	Step 4
•Pilot questionnaire	•Pilot telephone interview	•Final questionnaire	•Follow-up telephone Interview
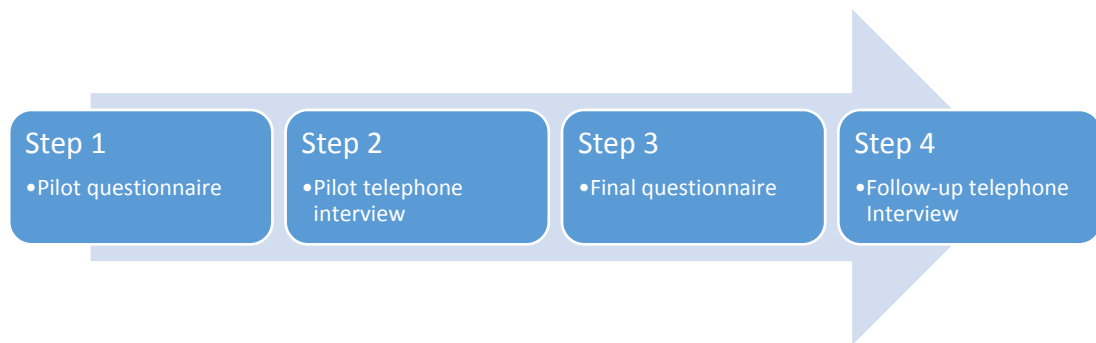
Figure 3: Process step for the design of questionnaires for this research

3.3 Sample Definition

It was vital to define the sample for this nature of research. This is to ensure a more reliable source of the information obtained. Number of criteria was used to sample respondents. The target respondents are grouped into three (3):

1. Project managers or equivalent in the organisation,
2. Project staff members,
3. Entrepreneurs directly involve in project

Only respondents drawn from SMEs operating in the construction sector within the greater Accra region were involved in this research.

Both qualitative and quantitative method was used in gathering data for this for this research. In all, 53 fully completed responses to the questionnaires from 38 organisations were analysed and complemented with direct follow-up telephone interview, using a semi structured questionnaire, to four selected respondents[6]. Important points from the interview section were written down to complement the analysis and interpretation of the data gathered.

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[6] Four (4) respondents randomly chosen with varied project experience to ensure a more reliable and unbiased perspective or information

Chapter four

4.0 Summary of Results and Discussion

This chapter analyse the findings of the research. Analysis and description are made from the data collected from respondents involved in the research. Results analyses are presented in tables and figures. Data were analysed in Microsoft excel sheet into tables, figures and chart.

4.1 Demographics of Respondents

As mentioned in section 3.1, the first set of question sort to identify the background of respondents and basic characteristic of their organisation. This section therefore present the data and analysis of the responses received in the first part of the questionnaire.

Profile of Organisation

In **figure 4** is the baseline characteristics of the organisations involved in this research, by sector of operations within the construction industry. Of the 38 organisations involved in the study, approximately 34% comprises masonry works, woodworks comprises 21%, electrical works about 15%, plumbing 13%, heavy duty transport 8%, and window and glass works comprises 8%. The activities and the number of firms in the various sectors are mostly to meet the local market demands.
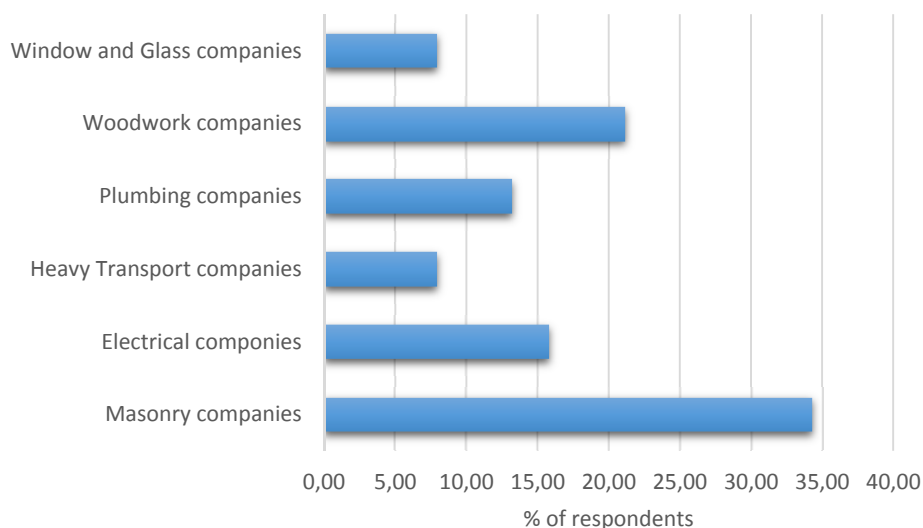
Figure 4: Profile of operational sector of respondents within the construction sector

Organisation Size

The size of organisation is given in the **table 3** below. The data shows SMEs involved in this research are from micro-to small-scale enterprise according to our criteria for defining SMEs, adopted from the definition of Mensah (2004), as shown in table 2, in chapter 2.0. The size of organisation is important to satisfy the organisation as SME according to the definition of SME described in section 2.4. The data in the table therefore shows all the organisations involved in the studies are within the defined sample boundary for this research. It is equally worth to mention from the data in table 3 that none of the organisation used for these studies described themselves as medium-scale enterprise.

Table 3: Organisational size of SMEs involved in the study

Organisation size	Frequency	%
1 - 5	13	24.53
6 - 50	40	75.47

Position of Respondents in their Organisation

In **table 4** below shows the position of respondents within their organisation. The number of respondents is dominated by site managers comprising approximately 32%. Engineers and entrepreneurs follow in that order with approximately 22% and 20% respectively. The number of respondents identified as project managers comprises approximately 16% with about 7% of respondents made of project team members. The position of respondents is vital to ensure some degree of reliability of the data received for this research. Majority of respondents as shown in table 4 are in high rank positions. This makes them credible and reliable source of information which is vital for this research.

Table 4: Position of respondents within their organisation

Position of Respondents	Frequency	%
Project managers/site managers	26	49.06
Entreprenuers	11	20.75
Engineers	12	22.64
Project members	4	7.55

Educational Background of Respondents

In **figure 5** is the data on the educational background of respondents. It could be seen from the data that one-third majority of respondents went through apprenticeship system. This is common and most used form of acquiring skills and training in the construction sector of Ghana. The large number of respondents passing through the informal approach of acquiring knowledge means they are less likely to come across modern project management tools and techniques especially in risk management. This is an indication that majority of the labour force in the sector are less likely to have project management knowledge and more likely to lack adequate skills and techniques for project risk management.

■ BSc degree or higher ■ HND Diploma ■ Intermediate certificate ■ Apprenticeship ■ No formal training or education
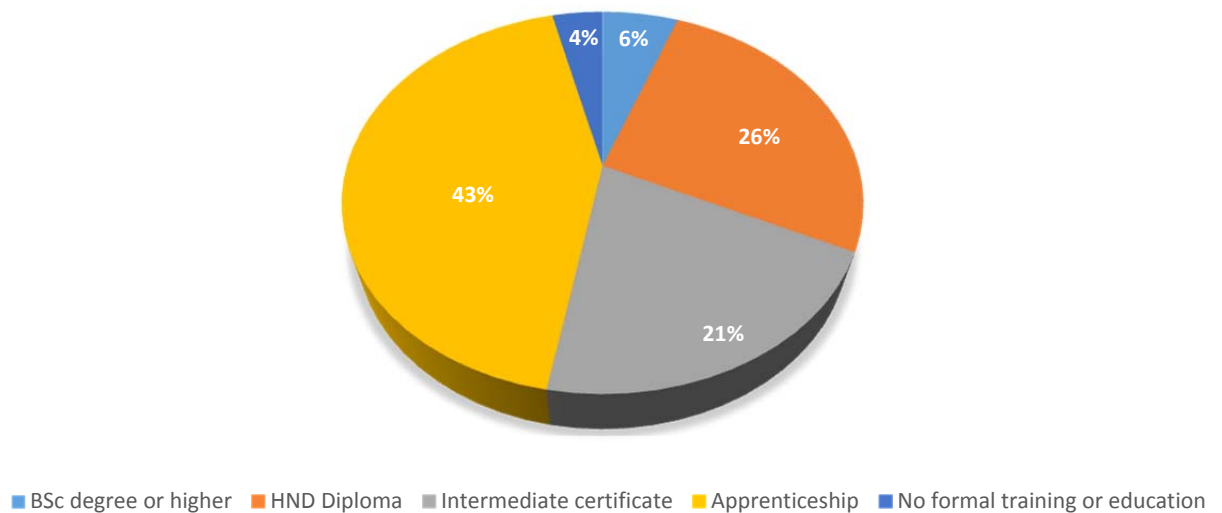
Figure 5: Educational level of respondents involved in this research

Length of Experience in their Sector

The work experience of respondents is presented in **table 5**. The data show approximately one-third of respondents indicates they have been in the sector for more than ten years; another group of approximately 20% have varied experience of 5 to 10 years in the sector. Approximately 26% and 13% indicated level of 1 to 5 years and less than a year work experience in the sector. Generally, table 5 indicate majority of respondents have some project experience which is vital in this case to give some degree of reliability to the data given. The length of experience in the sector of operation is vital to contribute to crucial decision making in project risk management in particular and project management in general. Here, the more

experience you are the more weighted is your opinion in decision making. This is true in the sense that previous knowledge especially on similar projects could be vital as benchmarking for new projects which is usually the case of projects undertaken by SMEs.

Table 5: Work experience of respondents

Years of Experience in PM	Frequency	%
> 10	21	39.62
5 to 10	11	20.75
1 to 5	14	26.42
<1	7	13.21

Knowledge of Project Management

Respondents were asked to identify the mode through which they acquired basic knowledge in project management. Mode of knowledge transfer is vital as it gives more credibility to the knowledge acquired. The result, as shown in **table 6** indicates majority of respondents claim to have acquired some level of project management training through workshops. Only one respondent have formal education in project risk management. Also, almost half of the respondents have either had no PRM training or have some sort of PRM knowledge through apprenticeship. However, the later source cannot that reliable as it is more based on the experience of the supervisors or trainers of the apprentices instead of a more formal knowledge transfer. In this case, the apprentices learn simple management techniques from their supervisors more than learning a more advanced process like project management.

Table 6: Mode of acquiring PRM knowledge

Training in PRM	Frequency	%
Knowledge of PRM through formal education	1	1.89
Knowledge of PRM through workshop	27	50.94
Knowledge of PRM Apprenticeship	16	30.19
No training in PRM	9	16.98

4.2 Risk Factors Faced By Organisations

This section examines some of the risks usually faced in construction projects by SMEs. Set of common risk variables surveyed from literature were presented to

respondents to select as it applies to their organisation. Analysis of data received is presented in this section.

Risk Variables

Risk elements commonly related to construction projects were surveyed and presented to respondents to select as it applies to project undertaken by their organisation. The result is presented in **table 7** below. The factors in the table are ranked based on the frequency according to the data received from respondents. The data show price fluctuation, delays in payment and inflation as the top three ranked risk factors. Chileshe et al. (2012) in their studies found similar results in large construction organisations with delays in payment and inflation as the toped ranked risk variables impacting the construction industry in Ghana. Scarcity of labour, low productivity and flaws in contract were least ranked. With the least ranked variables, it is said that there is generally available labour for the construction industry. However, the major problem is finding labour with adequate training and skills which is not always the case in SMEs. A situation attributed to low financial strength to price the more skilled labour away from the large firms.

Table 7: Risk variables that impact on project

To what extent does your project experience:	Frequency	Rank[7]
Design changes	37	11
Difficulties in construction methods	13	4
Scarcity of labour and machinery	7	1
Low productivity	12	3
Delays in payment/lack of funds	49	15
Poor communication among project team	19	5
Accidents and injuries	37	11
Low organisation's satisfaction	39	13
On-site theft and vandalism	21	7
Changes and flaws in contract	11	2
Change of government and government policy	12	3
Local law	33	9
Effect of environment eg. site conditions	21	7
Material shortage	33	9
Inflation	47	14
Price fluctuation	51	16

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[7] The least variable is ranked as 1, lowest and highest variables ranked as 16

4.3 Tools and Techniques for Risk Management

This section present the results and analysis of common tools and techniques applied in SMEs for managing risk.

Tools and techniques for risk management

Selected tools and techniques commonly applied to risk management in projects were presented to respondents to select as it applies to projects in their organisations. The data as presented in **table 8** shows checklist, brainstorming and benchmarking as the most ranked. Risk simulation, risk probability assessment, graphical representation of risk and risk classification were the listed ranked. The results here indicate that though factors of risk quantification and impact assessment were not used, by experience respondents or organisations are able to prioritise according to their perceived impact on project using prior project experience or perception.

Table 8: Selected tools and techniques for PRM

Which of these applies to your projects	Frequency	Mean	Rank
Checklist	53	0,155	22
Brainstorming	39	0,114	20
Training Programmes	17	0,050	15
Analysis Of Trend And Deviations	7	0,021	8
Requirement Management	11	0,032	11
Benchmarking	45	0,132	21
Cause And Effect Analysis	16	0,047	14
Cost-Benefit Analysis	22	0,065	17
Contingency Plans For Risk Analysis	8	0,023	9
Time-Limited Actions	11	0,032	11
Customer Satisfaction	31	0,091	19
Replanning Of Project	11	0,032	11
Graphic Representation Of Risk	2	0,006	3
Responsibility Assignment	23	0,067	18
Quality Control And Management	6	0,018	6
Risk Classification	2	0,006	3
Risk Quantative Simulation	0	0,000	1
Risk Documentation	3	0,009	5
Ranking Of Risk	9	0,026	10
Risk Prioritization	19	0,056	16
Risk Impact Assessment	6	0,018	6
Risk Quantative Probability Assesment	0	0,000	1

The result in table 8 could be interpreted that a more of qualitative analysis based on experience, perception or expert opinion is applied by SMEs in which case prior project experience or length of work experience in project is vital to the organisation. The problem here is that in such situation, experienced staff within the organisation could undermine the contribution or opinion of the less experienced staff and ultimately impose their decision on them. As shown in **figure 6** below, top three most influenced decision makers in the order of highest ranked are site managers, entrepreneurs and project managers. Most previous research suggests entrepreneurs in general, to have the most influence in decision making among SMEs. It is however not the case in this research as shown in figure 5. This could perhaps be attributed to on-site decision makings by site managers in the construction sector rather than the overall decision making of entrepreneurs or project managers on the project. The reality here also is that most of the entrepreneurs double as the project manager or site managers. This presents conflicting issue to answering of the questionnaire. Respondents are more likely to select the title as it applies to their organisation. It is therefore possible respondents are talking of the same person under different role or title names.

■ Project managers/site managers ■ Entreprenuers ■ Engineers ■ Project members
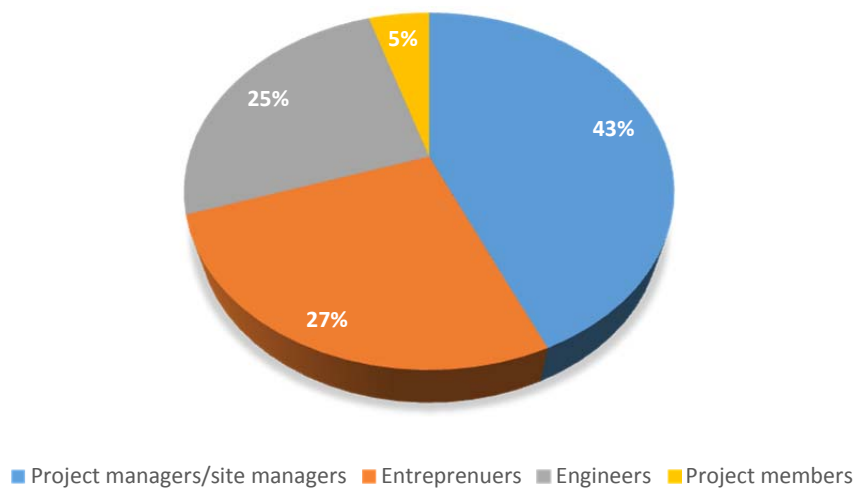
Figure 6: Most influence decision makers in Projects

Data for selected software tools for project decisions presented in **table 9** shows that most commonly used software tool, as indicated by respondents, is Gantt chart. More advanced tools such as Microsoft project were not being applied. Advanced software are more expensive for these small organisations to usually invest in. The low level of training and skills in project management among respondents means their

organisations are less likely to give priority and invest in such expensive management tools were no staffs is likely to utilise in their operations for the benefit of the organisation. Gantt chart as used by some organisations is simpler and required less training to use. This result shows the extent of application in project management among SMEs organisations in the construction sector. An indication that only time among the three project constraints is more likely to be tracked in project in SMEs using modern project management tools.

Table 9: Selected software tools for PM

Which of these tools applies to your projects	Frequency	Rank
PERT	4	4
Microsoft project	0	1
Gantt chart	27	6
Critical path method	4	4
Stage gate process	0	1
Earned Value Measurement	0	1

4.4 Statement Analysis

Statements in **table 10** below were design to test the extent of importance of general project management tools and techniques in project risk management in the organisations involved in the research.

Table 10: Statement of the extent of importance of PRM and PM to SMEs

Which of this statement applies to your organisations	Frequency	%
Your organisation work by project	49	14.0
Appointment of project manager/leader	37	10.6
Appointment of project teams	21	6.0
Sufficient risk analysis is carried out before undertaken new projects	3	0.9
Adequate research and training in risk management is available	7	2.0
Appointment of risk manager	2	0.6
Previous project experience is important to manage project risk	51	14.6
Organisation structure affect management of project risk	17	4.9
project undertaken are complex in nature	19	5.4
Project undertaken is closely collaborated with stakeholders	43	12.3
Successful project is dependents on external factors	31	8.9
Successful project is dependents on internal factors	34	9.7
Project can be more successful with identifiable project management process	36	10.3

It is apparent from table 10 that most respondents agree their organisation operate by projects. It is also obvious most of the project have project leaders. The project leaders in this case could be the entrepreneurs, site managers or project managers as seen in table 4. It could also be infer from table 10 that there is low number of substantive project managers. There is however appointment of high number of project leaders.

The problem here is that most of the project leaders lack modern project management experience or have low modern project management working knowledge to effectively deal with the risk facing their organisations.

Even more difficult is the lack of appointment of risk managers. It could be that the appointment of risk managers could help address most of the risk facing the organisations. Since the risk manager will have the sole responsibility to identify and assess risk on projects and the operations of the organisations in general, and effectively assign risk responsibilities and ownership. However though, considering the small size of the firms involved and their operating budget, it is an extra cost to appoint a substantive risk manager. Therefore, appointing or assigning project team members to take extra responsibilities of managing risks associated with projects undertaken is more economical and therefore the common method utilised by most of the organisations.

The data also shows majority of respondents agree that the success of their projects largely depends on both internal and external factors. Some of the external factors cited may be out of reach of control by the organisation. However, the extent of quality in the management system by the organisation is vital to minimize the overall risks effects on the projects.

4.5 Critical Success Factors

Factors considered as critical to rate the success of project were investigate. Five general factors surveyed from literature as generally applied to large firms were presented to respondents. Respondents selected three factors considered to be the most important with regards to project success. According to the results from respondents, meeting stakeholders expectation is the most important success factor and highest ranked. Meeting organisation's expectations is the lowest ranked. On the contrarily, White and Fortune (2000) in their research identified completion within

schedule as the most important critical success factor in large organisations. They further argue that organisations which view completing a project within schedule are more likely to achieve project success.

Table 11: Important project success criteria

Critical success factors	Frequency	Mean	Rank
Completing within time	17	0.20	3
Completing within budget	21	0.24	4
Meeting stakeholders expectation	28	0.32	5
Meeting functional or operability of the projects	14	0.16	2
Meeting the organisation's expectations	7	0.08	1

Table 12: Success criteria and overall project success within the SMEs

Extent to which project meet the following	High	Satisfactory	Low
Schedule	3	9	28
Budget	2	11	39
Project objectives	25	11	4
Client satisfaction	35	9	4

Murphy and Ledwith (2007) in their research also found out those organisations which are more concern of stakeholders' appreciation as the most important project success criteria are more likely to achieve project failure. The reality in Ghana, as indicated in table 12, is that most organisations rely on client satisfaction as project success. In other words, SMEs operating in the construction sector are more concern of satisfying clients as a way to gain confidence or good record with the clients. This is a way to keep good record with the clients and win support to bids for future projects. Organisations operating in this way are more likely to risk other important critical success factors such as budget and time to satisfy the client. It is evident from the data analysed above that there is low level of risk management among SMEs operating in the construction industry.

4.6 Currently Underlying Situations

It is clear that there are a number of issues facing SMEs among the construction sector of Ghana. Among the risk identified in table 7, there are numerous other risks that came up during the cause of this research. Issues such as health and safety, site organisation, availability of training proprietors, communications, responsibility assignment etc. affect SMEs in projects. This clearly underline the fact that the

industry is faced by many performance deficiency factors which needs to be address if the industry is to operate fully and efficient.

There are many tools and techniques as presented in table 8. However, few of these tools are utilised. Most firms rely on previous experience to manage risk. As good as this can be, it is also a potential pitfall as views of the more experience or expert will always be sort rather than a more systematic approach of risk management. It is clear however that majority of the firms do not have the financial capacity to employ some of the modern tools and techniques. The brighter side of it is that most respondents agree that project can be more successful with an identifiable project management process. As identified in table 8, checklist, benchmarking, brainstorming, customer satisfaction, responsibility assignment, cost and benefit analysis, risk prioritisation, training programmes and cause and effect analysis are ten topmost tools from the list utilised in project risk management. It is however interesting to know that the techniques such as risk prioritisation, and cause and effect analysis are all based on quality assessment from expert or prior project experience. It could be more accurate to back it with quantitative assessment such as risk simulations. However, as noted by Ahiadzie et al., (1995), problems such as availability of qualified staff, cash flow of firms, inadequate qualified trainers and technicians rather makes it difficult for SMEs to back their management style with a more modern management practice.

4.7 Managing Project Risk in SMEs

With the above underlying identified situation, we suggest a qualitative risk management plan based on the risk matrix plan. Qualitative risk management is already utilised to various extent in projects by the SMEs. The proposed risk matrix plan is intended to aid in risk identification, impact assessment, prioritization and monitoring. The plan is based on qualitative risk management which is already popular among SMEs, since they are not financially positioned to implement quantitative risk management tools which may require more investment.

As shown in **figure 7**, the proposed risk management plan consist of four (4) steps: risk identification and categorisation; risk impact assessment and prioritisation; risk response planning and mitigation; and risk response implementation and monitoring. The four (4) steps are iterative process which therefore ensures continuous improvement of the risk management process.
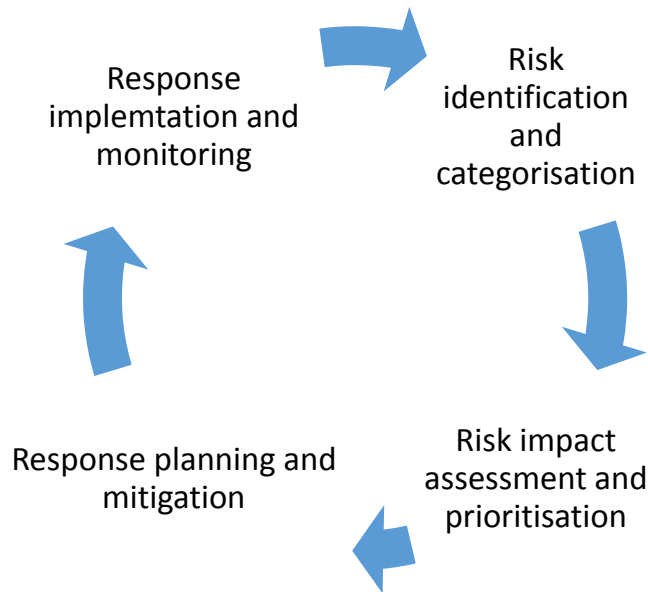
Figure 7: Four phase risk planning method

Risk identification and categorisation

There are different ways and methods to identify risks. However, to adapt to the present situation in SMEs, in Ghana and other developing economies, we propose two known methods – brainstorming and checklist which are already familiar tools in high use among the SMEs, and a third method scenario analysis. The identified risk will be categorised accordingly into groups e.g. technical and management risks; or external and internal risks; or into more groups such as management risks; operational risks; and resource risks, or design risks; environment risks; organisational risks; etc. The number of categories should be done to suite the management style of the organisation. Example of risk categories are shown in **table 13**. Table 13 illustrate simple risk categories. The likelihood of occurrence and impact are given magnitude on a scale of 1 to 5 where 1 is the lowest magnitude and 5 the highest magnitude. The last column shows the person in charge of each identified risk.

First is to use brainstorming to identify all possible risks. Meeting key stakeholders both internal and external is vital at this phase. It is important to sort and take into consideration the opinion of both experienced and inexperienced project members. A checklist of all possible identified risk should be sort and deliberate on with possible scenarios.

Table 13: Illustration of risk categorisation, likelihood and impact

Tag	Identified Risk	Likelihood 1 (rare) – 10 (very frequent	Impact 1 (very low) – 5 (very high)	Responsibility
Management risks				
M1	Changes and flaws in contract	1	4	CEO
M2	Delays in payment	4	4	
External Risks				
E1	Inflation	3	3	
E2	Price fluctuation	3	3	
Technical Risks				
T1	Design errors	3	2	Engineers
T2	Difficulties in construction methods	1	4	
T3	Accidents and injuries	2	4	Site Managers

Risk impact assessment and prioritisation

Here, qualitative method based on expert opinion is suggested. However, opinion of less experience project members should be taken into consideration. Magnitude of scale 1 to 5 will be assign to each risk according to its impact. As seen in table 8 above, risk prioritisation is identified as an already existing and top used technique among SMEs. However though, risk probability assessment and risk impact assessment were among the lowly ranked utilised tools. However, the frequency and impact of each identified risks should be taken into account during the prioritisation process. To ensure a more reliability and credibility in the scaling of the risk impact and probability assessment, Delphi technique should be used to seek expert opinion to assess the magnitude of impact and probability for each of the identified risks.

Response planning and mitigation

Planning for risk response for each of the identified risks could take a lot of time. Response plan for priority risks should therefore be deal with first.

Response implementation and monitoring

This is the last phase of the iterative process. Actions according the risk response plan should be taken. It is important to reassess the risks and the impact of the

response plan. Here, meetings among the project stakeholders should be organised and techniques such as analysis of trend and deviations could be used.

Risk matrix

The risk matrix is constructed once the likelihood and probability is determined in table 13. Table 14 illustrate simple risk matrix using the likelihood score and impact score on a scale of 1 to 5.

Table 144: Illustration of Risk Matrix

Likelihood						
		Rare	Occasional	Somewhat frequent	Frequent	Very frequent
Impact	Severe				M1	
	Major	T2			M2	
	Moderate			E1, E2		
	Minor			T1	T3	
	Insignificant					

4.8 Policy Reform – Educational level and Skills Acquisition

The data in figure 5 showed most SMEs contained low level of educated personnel. This result is in consistence with other studies. According to Tetteh et al., (2006), most entrepreneurs in Ghana have low educational level, with approximately 65% having basic education with 10% and 5% having secondary education and vocational education respectively. Only about 2% have tertiary education with approximately 69% of the labour engage in the activities of SMEs acquiring their skills through apprenticeship, which is not different from the case of this research. As shown in figure 5, about 43% of respondents acquired their skills through apprenticeship. Even though apprenticeship serves as a great source of skills acquisition in SMEs, the skills acquired are mostly limited to what the trainer already possesses. This is based on the premise that the trainers cannot give what they already possess.

The low educational level is a handicap since it restrict the knowledge base and the technical capabilities of both the trainers/entrepreneurs and the apprentices to learn and apply modern project risk management tools to enhance project success. For

example, good education will enable project teams to interpret very elementary and undeveloped engineering designs better, to adopt a fairly consistent construction approach.

It is very important therefore that SMEs owners or entrepreneurs have access to some level of formal or technical education to enable them understand and apply modern project management tools (Anderson and Michael, 2001), or rather engage in the service of consultants or qualified professionals which perhaps is too an expensive investment to venture regularly for most of the SMEs. This therefore creates the need for government to take a critical look at the apprenticeship scheme. This will ensure that there are mechanisms instituted for apprentices and entrepreneurs to upgrade their technical knowledge base to a level where the importance of basic principles and concept of project risk management and project management in general are showed. This will narrow the knowledge gap and increase productivity.

4.9 Quality Management of Internal and External Risks

Quality management system is vital to control some of the key issues identified with regards to projects risk faced by SMEs. Implementing a better quality management system can aid in controlling most internal and external risks factors and reduced the overall effect of risk on projects. Risk such as accidents and injuries can be reduced with quality in safety management system. This means provision of PPE, adherent to safety regulation, safety awareness at the workplace and due diligence of working methods. Other factors such as delays in payment could be minimised by ensuring quality supervision of projects to avoid rework which result in delays in certification and subsequent delays in payment for project work done. Effect of external risk variables, for example inflation which is one of the critical risk varied identified in this research and categorised as external risk, could be minimised by effective quality management system in fund allocation and budgeting of project. A project fund could be set aside to counter the effect of inflation and delays in payment in the course of the project.

4.10 Risk Allocation

Risk can be transferred or allocated to internal or external contract parties of the project. Therefore the responsibility of managing specific risk should fall to the stakeholder or contract parties best placed to manage the risks. This means that all

identified risk should be properly registered and assign to the stakeholders best placed to manage the risks. Understanding of the risk associated with each project will help to select the best form of contract agreement with regards to the risk suitable for the project.

For example, in a case of putting up a domestic residential apartment, the organisation can accept and manage technical and other project related risks which they are best placed to manage whiles the client sources and manages financial risks associated with the projects. In this case, the client makes funds available timely for each phase of the project. Therefore the effect of financial risk is transferred to the client.

Other methods such as effective procurement system can ensure stable purchasing power to minimise the effect of inflation and price fluctuation. The identification and assessment of risks associated with the projects and who should be allocated to should start at the earliest stage of the project contract through to the closure.

Chapter 5

5.0 Summary and Conclusion

This research sort to investigate tools and techniques deployed for project risk management among SMEs within the construction sector of Ghana. This involved a survey of questionnaire of personal involved with construction projects. Some common risk variables likely to occur in construction projects were identified and presented to respondents. Among top ranked risk variables include price fluctuation, delays in payment, inflation, low organisation satisfaction, design changes and accidents and injuries. These top ranked problems indicate a more of financial and management problems than technical problems. The financial problems crippling the SMEs means firms are unable to employ more educated professionals or augment their staff adequate professional training programmes.

Key finding in this research however, is the method which most utilised in risk management in projects. Frequency and ranking of pre-identified tools and techniques, from literature, by respondents indicate that most firms rely on qualitative assessment tools and techniques in risk management. Highly ranked tools include checklist, benchmarking, brainstorming and customer satisfaction with risk simulation, risk probability and impact assessment lowly ranked. To this, prior project experience and expert opinion are vital in PRM among SMEs. We find the lack of quantitative tools and techniques as the result of low financial capacity of SMEs and unavailability of qualified trained staffs employ by firms.

Quality management system is identified as a key component in improving risk management in projects undertaken by SMEs. As was stated earlier, quality in the project management system will ensures proper documentation and responsibility assignment of identified risks to various project team members or stakeholders in suitable position to manage the risk, without the appointment of substantive risk manager. It will also ensure, for instance, setting aside of risk mitigation funds to minimise effect of financial risk on projects.

The study suggest risk management plan for SMEs based on qualitative assessment techniques. This proposal is as result of the findings of the techniques already utilised by the firms. However, a long term solutions comprising both qualitative and quantitative technique should be sort for.

Finally, from the authors' point of view, the low level of education and mode of skill acquisition are major constrains to application of even basic project risk management tools. This is therefore a major restriction to the technical innovations, adoption, competitiveness and growth of SMEs in the construction sector. A reform on education and skills acquisition is therefore suggested to improve the technical capabilities of SMEs engage in the construction sector.

These findings contribute to the provision of decision making support for project personnel in SMEs within the construction sector of Ghana. It will also deepen the understanding of investors and interested stakeholders on how these firms management risk in project. Ultimately, it will aid decision and policy makers to identify the way forward in policy reform with regards to financial support and training programmes for firms and staffs.

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