

Assessment of Risk Management Techniques of Construction Companies in Ghana:
A Case Study of the Pokuase Interchange and Local Roads Project

by

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MASTER OF SCIENCE

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DECLARATION

I hereby declare that this submission is my own work towards the MSc. Project Management and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

Risk management (RM) has become an important part of the management processes for any project. Project risk management is one of the nine most critical parts of project commissioning. This indicates a strong relationship between managing risks and a project success. While RM is described as the most difficult area within construction management, its application is promoted in all projects in order to avoid negative consequences. The circumstances within the construction industry has led to the adoption of risk management and analysis. Risk is one of the key factors that can positively affect working effectively inside the firm if it was practiced in the proper way. By doing such, an organization can achieve capital value of rareness and capital value of limitability through which the firm can build stronger competitive advantage by developing, maintaining and retaining core competencies. By gathering relevant research data, this study aims to assess risk management techniques of construction companies in Ghana. Three objectives were set for which literature review was conducted. it includes: key risk factors involved in construction projects, the methods of mitigating occurrence of risk in the Ghanaian construction companies, and the significance of risk management on construction project performance. Quantitative method was adopted in which survey questionnaires were administered to respondents to gather primary data. The analysis was carried out using mean scores and standard deviation. The findings of the research indicated that risk management is of numerous relevance to construction projects success. It was recommended that project stakeholders should engage in more detail planning of projects and also plan alternative approaches to counter uncertainties. Moreover, project stakeholders should ensure that there is adequate and comprehensive training and skills enhancement of project participants. Also there must be effective and appropriate quality assurance in all project activities and preventive maintenance in all construction processes.

Keywords: Risk management, Construction companies, Risk techniques, Construction project.

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DEDICATION

This dissertation is dedicated to the Almighty God for his mercies, my mum who laid the foundation for my education, all my family members, friends and loved ones most especially my wife and kids.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Risk management (RM) is now of relevance to every project in its management process and it is utilized in every industry including the construction sector, pharmaceutical industry and businesses which are related to IT. According to Loosemore *et al.* (2006), in every industry, standards of risk management is to be established but all should conform to the general concepts irrespective of the industry. In commissioning project, managing risk forms one of the primary area among the nine project management practices (PMI, 2004). Therefore, there is a strong relation between the success of a project and its risk management. Though managing risk in construction project is known to be a difficult task, risk management incorporation is encouraged in every project to eliminate adverse outcomes (Winch, 2002). In the area of risk management, a widely utilized concept of risk management processes involves four main stages namely identification of risk, assessment of risk, taking action and risk monitoring. Each of these stages has a number of techniques and methods that enhance risk management (Cooper *et al.*, 2005).

The construction industry as a whole presents unfavorable circumstances due to changes in project and other factors and as a result, risk analysis and management implementation has been of major practice by concerned stakeholders. Risk can have a positive effect on the effectiveness of work carried out in an organization when it is practiced appropriately (Akintoye *et al.*, 2003). When risk is managed effectively and appropriately in an organization, it breeds the benefits of enhanced capital value and presents the organization with high competitiveness to stay in business, by means of development, maintenance and sustaining tenure of core competencies. Project management

techniques when effectively and appropriately incorporated such as managing risk and project value enhance project performance which results in successful project outcomes (Fewings, 2005).

Due to projects complexities in construction industry, its operations are carried out in uncertainties and in an environment where conditions are subject to changes. In every organization, there is the goal to succeed in its operations and risk management incorporation facilitates its success. It must be noted that, managing risk is not an instrument that enables success; instead, it is an instrument that enhances the probability of attaining successful outcomes. Managing risk can therefore be said to be proactive approach instead of reactive approach (Sanvido *et al.*, 1992).

1.2 PROBLEM STATEMENT

According to Kartam and Kartam (2001), in the construction industry there exist risk which are of high magnitude due to the characteristics and nature of activities carried out in the industry which is coupled with influences from external environment and the structure of the organizational firm. Uncertainties and risk are common phenomenon associated with projects carried out in the construction industry. Several negative issues, which are encountered in later phases of project life cycle are as a result of unmanaged risk from the conception stage (Chapman and Ward, 2003). Risk are with any project and must be identified so to escape any negative impacts on overall project performance. In the construction industry, numerous risk are associated with construction projects that are irrespective of the nature, characteristics, scope and size of the project undertaken. In the sector of the industry the most frequent risk encountered are changes in project completion periods, project scope and design changes (Shofoluwe and Bogale, 2010). Also, there are additional cost, resources and time incurred when projects undergo changes in design and scope (Abu Mousa, 2005).

For every project, there is an attribute of an amount of risk irrespective of the industry and therefore presents an urgent case which is of concern and interest to every manager. Due to the uniqueness of all projects, risk differs amongst them and especially found in construction projects. Nevertheless, incorporation of risk management has still not been at its peak and many practitioners to date are not aware of the relevance of engaging risk management in their project delivery operations. Some companies do not engage risk management although risk awareness and its consequences are being communicated (Smith *et al.*, 2006; Gould and Joyce, 2002).

A lot of studies have been undertaken in risk management (Lyons and Skitmore, 2002; Klemetti, 2006) although each presents a different approach to managing risk. In this master's thesis, the study will be focused on construction companies in Ghana and assess how the practices of risk management are carried out and its resultant impact on operational outcomes.

1.3 AIM OF THE STUDY

The study aims at assessing risk management techniques of construction companies in Ghana.

1.4 OBJECTIVES OF THE STUDY

The main objectives set up for the research conduct includes:

1. To identify key risk factors involved in construction project.
2. To investigate methods of mitigating occurrence of risk adopted by Ghanaian construction companies.
3. To assess the significance of risk management on construction project performance.

1.5 RESEARCH QUESTIONS

The study pursues to answer the questions as follows:

1. What are the key risk factors involved in construction projects?

2. What are the methods of mitigating occurrence of risk adopted by the Ghanaian construction companies?
3. What are the significance of risk management on construction project performance?

1.6 JUSTIFICATION OF THE STUDY

This study seeks to present knowledge on project risk management in the construction industry and effective ways of managing these risks for a successful project completion. Moreover, it provides awareness of the various risk factors and their negative impact on projects. It is believed that findings from the study will enhance construction project professionals and project managers to come to the awareness of incorporating appropriate measures during project planning and execution to avoid, minimize and mitigate possible risk that is associated to the project. Further practices engaged in managing risk that are effective were revealed and can be adopted and incorporated by the construction industry in Ghana to enhance project performance. Furthermore, this study will add to knowledge and serve as a basis for further research to be undertaken in the subject area of managing risk.

1.7 SCOPE OF THE STUDY

Although the conduct of this study is of interest to all construction project participants in Ghana, the study concentrates on project participants involved in the Pokuase Interchange and Local Roads Project that are concerned with risk management in the Greater Accra Region. Stakeholders concerned with project risk management and are currently involved in the ongoing project were engaged at the period the survey was conducted.

1.8 RESEARCH METHODOLOGY

The study methodology adopted to conduct the study is the quantitative research approach. The study was initiated with the conduct of a literature review by gathering data from previously researched works, retrieved information from the internet, available journals and textbooks which are related to the topic been studied. Structured questionnaires form the basis for gathering primary data from respondents. Statistical Package for Social Sciences (SPSS) was engaged to analyze retrieved data.

1.9 RESEARCH ORGANIZATION

The study was presented in five chapters as follows:

Chapter One: Presentation on the study's background, statement of problem, aim and objectives together with research questions as well as the study's scope, justification and methodology.

Chapter Two: Presentation of literature review on earlier works concerning the subject of risk management.

Chapter Three: Presentation on the methodology, population and sample size consideration, data collection procedures and instrumentation that will be utilized for the conduct of the study.

Chapter Four: Presentation of analysis on findings and the discussion on the findings of the study.

Chapter Five: Summarizes findings, provide conclusion and recommendations to stakeholders and for further study conduct.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, project risk management for purposes of improving the construction industry, development agenda is discussed. It begins by providing an overview of construction industry and inherent characteristics present in the industry. This is followed by a review of project management in construction and then delve into the main subject of risk management in construction.

2.2 OVERVIEW OF THE CONSTRUCTION INDUSTRY

In every country's economy, there is a great impact contributed from the construction industry. All developmental activities in every country implicate construction such as electricity, roads, telecom, hospitals, schools and factories. More so the neighborhood in which we dwell are all products of construction (Jekale, 2004). The role played by construction industry is of significance in developing countries.

In developing countries for instance most activities in the construction industry accounts for almost 80% of total capital asset, GDP of 10% and 50% more of wealth invested in fixed assets (Long *et al.*, 2004). Notwithstanding its significance in contribution, there is relatively low development and efficiency as compared with other industries (Long *et al.*, 2004). High attainment of successful project outcome and performance is very rare in construction especially in developing countries. In the industry, there is minimal level of complete management that results in low productivity. There is a mismatch of the low benefits derived from the industry as against the engagement of large sum of capital and huge scale scope of the industry. There is low engagement of technology

in construction as compares to other industries and it presents the lowest productivity in many countries (Guangshe *et al.*, 2008).

In a lot of aspect, the industry in developed countries are of much difference from the developing countries both in the characteristics and nature of projects undertaken in terms of it management and performance. For instance, in developing countries, there is much dependency on public developments and imported resources including material resources, tools and equipment and skilled workforce for specialized project requirements (Adams, 1997). More so, the construction industry in developing countries are conquered by firms from foreign countries due to their ability to exclusively engaged in complex and challenging projects. Ghana is no different where contractors from foreign countries engage almost every major project involving power construction and huge road development.

2.2.1 Characteristics and Nature of Projects in Construction Industry

Project management in construction exposes lots of differences from other project management in many industries. These differentiations are because of projects characteristics and nature in construction as compared to others (Gould and Joyce, 2003). However, the knowledge of the differences becomes relevant for successfully managing projects in construction. Construction projects are mostly executed outside the premise of the company thereby is exposed to variations including traffics and weather conditions (Gould and Joyce, 2003). Projects in construction are also mostly complex and involve huge capital investment which needs effective skills in managing operations throughout its lifecycle. It also engage and coordinate wide range of experts in the various areas of the project (Gould and Joyce, 2003; Chartered Institute of Building, 2002). More so, projects undertaken in the construction industry employs large labor force for its operations and consumes a huge amount of materials, tools and equipment's.

In addition, construction is subject to various regulations and laws, which is of the goal to guarantee safety of the public and reduce negative impact of the project on the environment. Further, in other for a project to be carried out in construction, there must be adequate investigation into the conditions and geographical area of the site where the project is to be put up (Bennett, 2003; PMI, 2007).

The Accra Urban Transport Project, Pokuase Interchange and Local Roads were in conception in the years 2014 by the Ministry of Roads and Transport with African Development Bank (ADB) as the funding agency of the project. Associated Consultants Ltd. and Zhongmei Engineering Group Ltd are the consultants and contractors involved with the project respectively. The start date for project execution was in April, 2018 and still in progress of 15% completion to date. The project life cycle to date has experienced the following risk factors which include: Delay in compensations of properties along the road corridor, relocation of service lines, delay in arrival of imported machines and equipment, traffic management and delay in performance of adequate soil investigation before tendering.

2.3 PROJECT MANAGEMENT IN CONSTRUCTION

Construction project management shares similarities with other types of project management in different industries. Irrespective of these similarities, there are some difference in managing projects from others. Managers are mostly changed in the various stages of a project in construction. They also have specialization in a particular project stage due to this differentiation; PMI made a guide available that will supplement management in construction.

Additional four knowledge areas have been included in the guide, which are; environmental management, safety management, claim management and financial management of construction projects (PMI, 2007). Construction project management has the primarily aim of coordinating professionals present in the team undertaking the project. This is to enhance their ability to give in the best contributions and commitment to attain an efficient and effective project performance (CIB, 2002). In addition, there is the need in managing construction projects to understand the process of construction and design of the project. More so, for a successful construction project management, there should be an effective communication and efficient management of team.

According to Chen *et al.* (2009), in construction, the functions of the project management can be summarized as follows;

- i. Project objectives and plans specification in terms of project scope definition, budget preparation and scheduling, participants of project selection and setting project required performance;
- ii. Project resource efficient utilization maximization by compliance with prescribed schedules and plans for materials, labor and equipment.
- iii. Execution of various project operations through appropriate planning, control and coordination throughout the project life cycle.
- iv. Effective communications development and appropriate mechanisms establishment to resolve conflicts amongst various project participants.

2.4 RISK MANAGEMENT IN CONSTRUCTION

Risk management is now a relevant area in the process of managing every project. The construction industry as a whole presents unfavorable circumstances due to changes in the project and other factors, and as a result, risk analysis and management implementation has been of major practice by concern stakeholders. Risk can have a positive effect on the effectiveness of work carried out in an organization when practiced appropriately (Akintoye *et al.*, 2003). When risk is managed effectively and appropriately in an organization, it breeds the benefits of enhanced capital value and presents the organization with high competitiveness to stay in business, by means of development, maintenance and sustenance of its core competencies. Project management techniques when effectively and appropriately incorporated such as managing risk and project value enhance project performance that results in successful project outcomes (Fewings, 2005).

The support of top-level management is required in risk management and the acknowledgment that risks are realities. Therefore, there should be commitment in identifying risk and setting appropriate and efficient measures to manage them. The engagement of managing risk to eliminate adverse problems, results in project success or the success of an organization in its operational works (Loosemore *et al.*, 2006). Effective projects anticipate problems and uncertainties while ineffective projects are forced to react to problems.

2.4.1 Risk Management in Project Life Cycle

According to Chapman and Ward (2003), several negative issues encountered during the executing stage is due to risk that were not appropriately managed when initially designed. In all projects there is a magnitude of risk. Identification of related risk ensures relief from impacts that are deteriorating to project progress. This signifies how essential it is to perform precise analysis of projects most especially in the conceptual project phase. Risk management starts with defining the

project scope which graduates through planning the project, executing the project and providing consistent controls of specifications and finally, project closure. In project management, the two main phases where risk management is mostly incorporated is the planning and executing phase (Lyons and Skitmore, 2002). In other words, it was established that the stage of project conceptualization is highly of relevance (Elkington and Sallman, 2002).

Risk management should be implemented in the whole life cycle of construction projects. At the initial phase of the project where feasibility studies are conducted, risk management should be undertaken. In the project feasibility studies, there are various identification of project solution that are further assessed. Studies can be undertaken to identify potential risks related to the project and assessed with a proposed solutions to avoid identified risk (Westland, 2006). In the project planning stage, plan to mitigate identified risk should be drawn up. Every project stakeholders involve should make contribution to draw the plan to ensure that all risks are identified and the appropriate action assigned to respond to the problem. According to Westland (2006), performing risk planning in the planning phase of a project is targeted to eliminate risk before project execution phase. At the execution phase of project any occurrence of risk incurs much cost if there is no action taken in advance.

At the start of a project there is high level of expectation of risk and uncertainty which declines as the project progress. Controlling and monitoring are conducted in execution phase of project life cycle to ensure that the processes are in accordance with the initial plan and that all risk identified are appropriately handled. Monitoring should be conducted throughout the whole process of the project, that's from the when risks were identified. The whole project is summarized at the closure of the project. At this phase there is evaluation of the objectives of the project, deliverables and benefits are also evaluated during this phase of the project (Westland, 2006). During the closure

phase of the project risks that were not managed could be subject to discussions and incorporate in other projects as a warning.

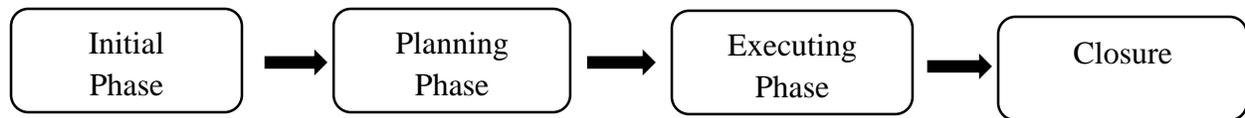


Figure 2.1: Project life cycle (Westland, 2006)

2.4.2 Risk Factors in Construction

Factors of risk have been defined worldwide by a number of studies. Risk factors can be external or internal in which internal factors can be controlled and external factors outside the control of management. External factors involves unforeseen circumstances; political and government controls; changes in global and economic environment; constraints from the environment; unfavorable socio-cultural issues; and issues on health and safety which is beyond the project team control.

In the construction industry, numerous risks are associated with construction project which are irrespective of the nature, characteristics, scope and size of the project undertaken. In the sector of the industry the most frequent risks encountered are changes in project completion time frames and project scope and design changes. Also there are additional cost, resources and time incurred when projects undergo changes in design and scope. However, when projects are completed ahead of scheduled time leads to problems due to insufficient project planning which results in final product of projects been of low and undesirable quality. More so, this result in the overall increased in the cost of the project. Moreover, according to Gould and Joyce (2002), when project are behind scheduled time it results in huge costs to both contractors and project investors which may be due to not complying with project specifications. Therefore as stated by Zhang and Xing (2010), is of

much relevance to maintain balance between project cost, time and quality, which is now being of importance in the construction industry. However, risk associated with project differs depending on the type and scope of the project.

Risk factors associated with construction projects can be grouped into risk associated with project finance; project political environment; project resources; project management; project characteristics and nature; project health and safety; project economic environment (Darnall and Preston, 2010; Lester, 2007; Bing, *et al.*, 2005). These factors can further be divided into the following risk; equipment failure during construction, inadequate project specification; incomplete project designs before construction begins; inappropriate time allocation for the various operations; frequent modifications on designs during project execution; actual project quantities differing from initial contract quantities; delay in payment of workers; excessive approval procedures in administrative government departments; improper project feasibility study, planning and budgeting; inadequate site investigation; late arrival of resources at the appropriate time scheduled; insufficient time to prepare bid; shortage of skilled labor, material and equipment; implementation of new technology; change of top management and poor relation among stakeholders; increased in labor, material and equipment price; project design plans incompatible with execution; low productive efficiency of workers; awarding project design and construction to unqualified designers and contractors; and quality variations by labors.

2.5 WAYS OF MANAGING RISK IN THE CONSTRUCTION INDUSTRY

Integration of an effective risk management is known to be an essential element and relevant for successful project outcomes. Projects in the construction industry are very complex and are bound to the presence of uncertainty from a number of situations. Therefore, risk management is

progressively becoming an essential component of managing projects in construction in the quest to appropriately and efficiently handle unexpected occasions and uncertainties (Banaitene and Banaitis, 2012). Managing risk in construction project is very essential due to its consequences of damage imposed on project performance.

The magnitude of risk associated with a project is in relation to its size and complexity. Projects with huge complexities and size have greater risk involved in the project. Numerous factors promotes the occurrence of risk, these may involve the location and surroundings of the project being engaged, project designs, project monetary matters, project quality and project time (Darnall and Preston, 2010). Further, Gould and Joyce (2002). stated that magnitude of usage of technology also have an influence on the occurrence of risk.

According to Cleland (2009), a factor which has an influence on project performance is its size and characteristics complexities. Many resources are needed to complete a project when it is bigger and have many complexities in its characteristics. More so, project participants must have in mind that there may be occurrence of other uncertainties and threats though every potential threats are identified. As a result, project participants must not only place attention on managing risk identified but also be attentive to new risk or uncertainties that may arise at the course of the project execution. Project managers must fully prepare to manage the occurrence of uncertainties that were not included to the risk management plan. Analyzing risk from previously failed projects and drawing conclusion to them is the easiest manner of risk identification. Cleland and Gareis (2006) stated that in order to assure that the objectives of project are accomplished, information on associated risk with every actors within the life cycle of the project must be considered.

2.5.1 Process of Managing Risk

In the construction industry, there are four stages in managing risk using the various methods of risk management. These processes involves risk identification and classifications of the sources of risk, undertaking analysis of risk assessment, developing responses to risk and ensuring monitoring and control of all risk identified. Dehdasht *et al.* (2015) stated that methods of managing risk enables observation and determination of potential risk associated with a project in hopes to make decisions to reduce and control the effect of risk and also the total probability of events which are undesirable. Further, Schieg (2006). asserted that through the management of potential risk, transparency of project execution results and can be ready for problems that are undesirable and unavoidable. Moreover, problems can be eliminated from the beginning through implementation of proactive measures.

2.5.1 (a) Identification of risk

The process of managing risk is mostly informal and depending on the project team and organization, it can be undertaken in many ways (Winch, 2002). The identification of risk depends mainly on previous experiences that are engaged in recent projects. Risk allocation needs to be considered to identify potential risk. Decisions can be made by organization on how to arrange for risk identification. Here the main aim is to determine project potential risk therefore; no method is superior to the other. It is much of ease to take action to control and minimize risk when they are identified even though risks are difficult to mitigate. There will be much effectiveness in managing risk when sources of potential risk are identified before the occurrence of challenges. There are several techniques in risk identification which involves: Information gathering methods by the use of interviews, past experiences, expert's consultation, and use of questionnaires. In addition, research can be conducted by stakeholder's analysis (Lester, 2007).

2.5.1 (b) Assessment of risk

The second stage in the process of managing risk is assessment of risk in which data gathered on possible risk goes through analysis. It can be referred to as breaking down potential risk involved within a project and sorting them according to their level of impact on project performance. Risk analysis is conducted in two methods with the identified risk that are qualitative assessment method and risk quantitative assessment method. Quantitative risk assessment method is engaged when the impact of possible risk identified needs to be measured numerically. The qualitative risk assessment method is engaged according to Winch (2002), when the magnitude of risk requires differentiation on high to low from a descriptive scale.

Lichtenstein (1996) stated that, since is of much convenience in describing risk than quantifying them, organizations tends to employ the qualitative approach as compare to quantitative risk assessment method. The appropriate selection of the desired approach to risk assessment mostly depends on experiences in the past, gaining expert in it usage and recently dependent on software availability (Perry, 1986). The following are some of the discovery made by Lichtenstein (1996) as factors which may influence the choice of a particular approach into risk assessment:

- i. The feasibility of the risk assessment method;
- ii. The desired credibility of the approach;
- iii. The ability of the method to adapt to the requirements of an organization;
- iv. The validity of the method which will ensure and enhance valid results;
- v. The cost related to the incorporation of the method;
- vi. Usability of the method: the method should be understandable to use; and
- vii. Complexity of the method: how limited and simple the method is.

2.5.1 (c) Response to risk

Responding to possible identified risk associated in a project life cycle is the third stage in the project risk management process. This stage is keen towards assessing appropriate actions that could be engaged to control identified risk. The magnitude and characteristics of risk in concern determines the appropriate approach and strategy to response to risk. Further, there is the need for a supervisor to be assigned to monitor risk and responses that would be developed to control risk. Lower risk impact on a project attain a better way to control possible identified risk.

Potts (2008). Mentions in construction the most common approach to responding to risk involves: risk reduction; retention of risk; risk avoidance and risk transfer.

2.5.1 (d) Monitoring of risk

In the process of managing risk, the final step is very essential, as every retrieved portfolio on the risk identified will be monitored. Regularly monitoring of risk keep track of risk identified, enables the discovery of new risks and mitigate previous risk from project. Further the objectives of controlling and monitoring risk according to the PMI (2004) is to make supervision on risk status and offer corrective action when deemed necessary.

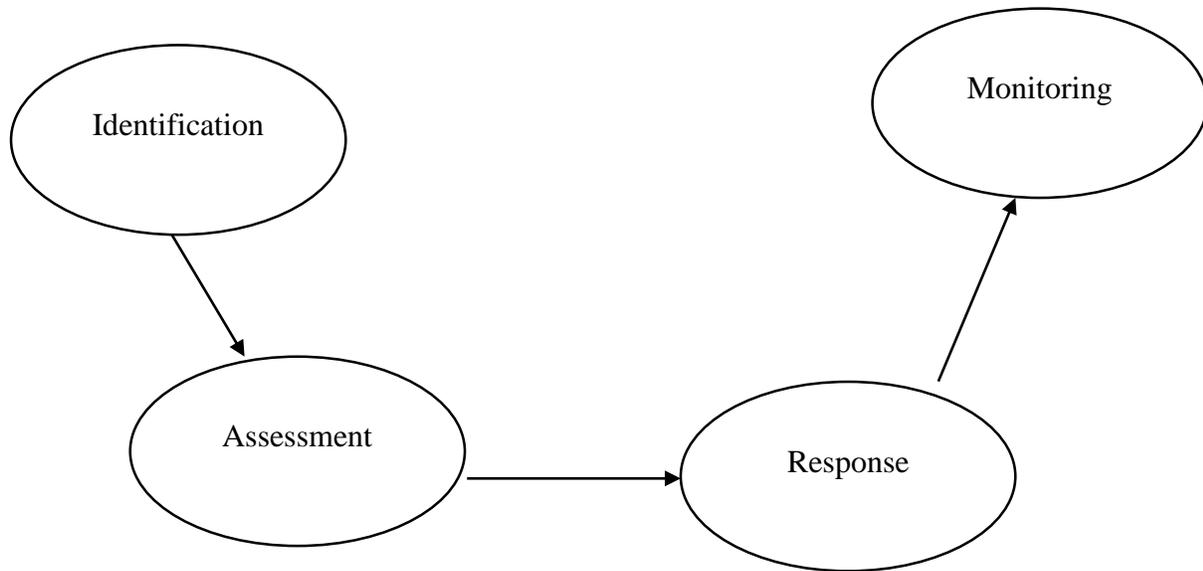


Figure 2.2: Processes involved in risk management

Source: Smith et al., 2006.

2.5.2 Ways to Mitigate Potential Risk

There are numerous possible risk that can influence the performance of a project and which have a great impact on project success (Potts, 2008). To these reasons, management of risk are very vital in project conception stage instead of having to deal with the challenges caused by risk occurrence (PMI, 2004). According to Cooper *et al.* (2005). the following are activities that helps to avoid potential risk; Regular inspection of project activities, project preventive maintenance, separation and scheduling of project resources and activities, engaging in more detailed project planning, quality assurance of project activities, implementation of protective and safety systems, abiding by project contract terms and conditions, training and skills enhancement of project team members, planning alternative approaches to project management, appropriately seeking permits to work, frequent operation reviews and contingency planning to counter uncertainties.

2.6 BENEFITS OF RISK MANAGEMENT IN THE CONSTRUCTION INDUSTRY

Risk management implementation serves as a tool to assist the facilitation of the process of decision making by an organization to mitigate, avoid and minimize potential risk which is associated with a particular project. Moreover, during the whole life cycle of a project, to ensure that there is an increased in the efficiency of risk management, there should be continuity in the process of managing risk identified and awareness of the possibility of uncertainties. Doing this allows the discovery of risk and managed in the various phases of the project. Benefits derived from managing project risk are not only for the performance of the project but also for the various stakeholders who are involve with the project. Thomas (2009) mentioned that with implementation of risk management, potential consequences due to risk not been managed are solved and provides ways in avoiding them. Cooper *et al.* (2005) stated that benefits derived from managing risk are the maximized level of controls on the entire project and an effective and efficient process of solving problem.

2.6.1 Importance of Managing Risk

Engaging in risk management improves the success of all project activities which will increase in company's profitability and also reduce the adverse impact of risk events and uncertainties which may hinder the objectives of the project to be attained. Risk are of many relevance to the effective performance of project and these may include: Eliminate the possible failure of the project from being executed with budgeted cost; Eliminate possibilities of failure in meeting scheduled time of all project activities; Prevent failure in meeting technical and quality standard required on project; Avoid unsafety project working environment (Flanagan and Norman, 1993).

Further, benefits of risk management implementation was stated as follow by the Association for Project Management (2000):

Through risk management a company is able to protect its reputation and credibility of project management;

1. Leads to the reduction of construction activities instability;
2. Through reflection on possible risk, the project team members are able to ascertain whether the project will be financially sound or not to take appropriate measures;
3. Helps to increase construction activities efficiency and safeguard the progress of operations;
4. Ensures appropriate, effective and better future project to be built as information retrieved from past risk experienced can be analyzed and monitored;
5. Through the awareness of risk consequences, response to risk can be planned well by properly allocating risk to the party that can effectively handle and manage the risk;
6. Results in an improved planning of project activities, decision making and appropriate prioritization of risky activities;
7. Enhance proper project cost estimation and work scheduling of activities involved in the project;
9. Enhance the selection of appropriate contract type and appropriate operations to the engaged in the management of the project.

In addition risk when not properly handled and managed results in unfavorable as stated by Sundararajan (2004). He mentioned the following as being results of unmanaged risk associated in a construction project:

- i. Increases the cost of financing the project;

- ii. Loss of regular inflow of cash;
- iii. Undesired quality of final product;
- iv. Results in claims of liquidated damages;
- v. Occurrence of reworking after project has been completed; and
- vi. Minimize the progress of work and results in time overrun of project.

As to these challenges that may be encounter when potential risk associated with a project are not been managed, is it of much relevance to implement regular and continuous monitoring and control of risk.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The present chapter is very vital to the study's conduct as it is the pivot around which all activities of the research revolve. It comprises of the key strategy adopted for the research and followed by the rationale for the adoption of such a strategy. The research design comprises of data sources, which involves desk survey that aided in the identification of key research variables such as, questionnaire development, distribution and statistical tools for data analysis.

The primary objectives of choosing a research methodology and design are to give instructions to plan and conduct the study in a manner which will promote the attainment of set goals. According to Burns and Grove (1998), research methodology is the guide for undertaking the study. In addition, it can be referred as strategies and procedures engaged to collect and conduct a data analysis when conducting a research (Hungler, 1999). According to Christou *et al.* (2008), research methodology is an approach to gaining knowledge of the world and discovering ways of engaging in a task to access what is believed to be the truth. Research methodology involves designing, sampling, collection of data and conducting analysis on data retrieved.

3.2 APPROACH TO THE RESEARCH STUDY

Research method selection is very crucial decision, which researchers require to study the various approaches to the research study and make judgment as to which satisfies the study's objectives and will be compatible with the available information with the required information. Various approaches to research conduct exist such as qualitative and quantitative methods to research

study. Inductive and deductive are also forms of approach to research conduct. Qualitative methods are engaged to make meanings from opinions, thoughts and create a basis to make decision. Quantitative on the other hand is utilized to predict and measure to attain the concluding course of action. Further, deductive method of research approach involves starting with a general concept or ideas and arriving at a specific concept, which is the other way round for inductive method of research approach that involves starting with a specific concept or ideas and arriving at a general concept or ideas (Burney, 2008).

Naoum (2002). stated that, the choice of engaging a particular research approach is dependent on the study's aim and type of information available for the conduct of the study. The study engaged a quantitative method of research approach by utilization of survey questionnaires to elicit data from respondents. The quantitative strategy is suitable for this research because of the desire of the researcher to measure the opinions of respondents using scientific basis (positivist) approach. By adopting the quantitative strategy, the researcher was entirely detached from the research phenomenon unlike the other strategies like the qualitative strategy. It is envisaged that risk management are phenomenon experienced by managers of construction firms.

3.3 RESEARCH DESIGN

The design of the research deals with the framework that will be used to collect data and analyze the retrieved data. It serves as guide to execute the technique to collect and analyze data. It further provides connections between data that are empirical and provides a logical sequence to make conclusions to the study's research questions. Case study, experimental, action research and survey are the forms of research design (Bryman, 2005). Survey as a form of research design was engaged in the conduct of the study. Due to the need to generalized research finding across the construction

industry, a survey questionnaire was adopted. Oppenheim (2003) stated that the utilization of a survey questionnaire improves replication and give reliability of observation due to its in-built uniform measurement and sampling techniques.

3.4 POPULATION OF THE STUDY

In every research, defining the population of the study is very essential. The population of the study defines the actual group the study is interested in. The population of target is the whole combination of respondents that meet the established research criteria (Burns and Groove, 1997). Population of a study may comprise of members in an organizations, villages, places or events selected due to their significance to the achievement of research set objectives. The study limits its target population to “stakeholders” involved with the Pokuase Interchange and Local Roads Project who are concerned with risk management in the Greater Accra. The population chosen was because of their frequent engagement in many developmental projects in Ghana. With this a more consistent and reliable information can be presented.

3.5 SAMPLING TECHQNIQUE AND SAMPLE SIZE

In the conduct of the research sampling technique utilized was purposive sampling technique because the researcher decided on the group of respondents required being involved in the study conduct. A sample size of fifty (50) was concluded to be retrieved from the population of the study. This is because the researcher believes the responses from the sampled respondents can be a representative of the entire population and more over is large enough to conduct analysis using statistical tools of data analysis. Key respondent namely project manager, civil engineer, geodetic engineer and quantity surveyor were identified using the purposive sampling technique. These

categories of respondents were engaged because of their various engagements in project management in the construction industry and it is believed that experiences in project risk management will enhance the reliability and validity of their responses giving.

3.6 DATA COLLECTION

3.6.1 Sources of Data

In research study, field and desk survey are the approaches to data collection. According to Fadhley (1991), desk survey involves the review of literatures and forms a relevant part of the conduct of the research as it provides the opportunity to gather data to develop questionnaires for dissemination to retrieve data from the field. Field survey is mainly collecting data from respondents using questionnaires developed from the desk survey. Desk survey culminated into the identification of key variables in risk management that was used in the development of questionnaires that were administered to respondents to collect data for analysis.

3.6.2 Questionnaire Development

According to Oppenheim (1996), for questions relevant to the study to be set, it is vital to initially establish the required information that needs to be gathered. In the development of the questionnaire, many considerations were made to ensure that respondents are able to easily read the questions and make meaning out of it to provide the required answers intended by the researcher. This in the end helped the researcher from wasting much time in data collection from the respondents. All the questions in the questionnaires were closed ended placed on a Likert scale of 1 to 5. The scale measures the intensity or strength of the opinion of respondents.

The diction of the questionnaire was simple as jargons and other technical terms were very minimal in the crafting of the questions. Similarly, the numbers of questions were kept minimal to encourage respondents to answer the questions. The questionnaire consisted of eight (8) questions: the purposes of the first five questions were to determine professional background, educational background, years of experience of respondents, highest cost of project undertaken and most frequent funding agency of their projects. The last three questions sought to ascertain respondents view on risk management under the research objectives.

3.6.3 Questionnaire Distribution

The 50 questionnaires were distributed among respondents. Out of these, 45 questionnaires representing 90% of the respondent gave response to the questionnaire administered. These retrieved questionnaires formed the basis for the conduct of the analysis. According to Coffey *et al.* (1996), the rate to the response of the questionnaire by respondents indicates the fraction of questionnaires completed by respondents. Moreover, he further stated that in literature a high rate of response from respondents indicates the study's validity of its findings.

From this statement, it can be concluded that, the response rate of 90% is deemed adequate for data analysis to be conducted on data retrieved from respondents. The entire field survey was completed in two weeks and the higher rate of response from respondents can be accredited to the researcher's constant follow-ups on questionnaires for collection and also the ease of reading and understanding the questions by the respondents.

3.7 DATA ANALYTICAL TOOL

After the questionnaires were retrieved, they were prepared by coding and fed into the Statistical Packages for Social Sciences (SPSS version 20.0) for data aggregation and subsequent analysis. The type of variables obtained influence the test that will be adopted in the analysis of retrieved data. The variables can be either categorical, ordinal or interval if distributed normally. In this research, both descriptive and inferential statistics were utilized in analyzing correlation between the various issues the literature identified. This study therefore employed percentages for the analysis of the background information while the mean scores as a measure of central tendency and the standard deviation as a measure of the dispersion were used in the measurement of the variables

3.8 ETHICAL CONSIDERATION

The study observes to the ethical consideration for the conduct of the research. Respondents were briefed on the purpose of the study and what will be done with their responses given. They were assured of given much confidentiality to responses provided by them and that their responses will only be engaged for the purpose of this research conducted.

In addition, they were given assurance of not being obliged to undertake the research process and that they are free to dismiss themselves from the data collection process. These information and assurances relayed to respondents encouraged them to be involved in the conduct of the study.

3.9 CHAPTER SUMMARY

The chapter three has dwelt extensively on the procedures that were adopted in conducting the research. The key methodological dimensions of this study include the usage of quantitative

research strategy; data collection instrument design in which survey questionnaire was utilized; the distribution of the survey questionnaire was solely by face-to-face using purposive sampling to locate respondents in Accra. The retrieved data was analyzed using SPSS which churned out interesting results in its output for analysis in chapter four below.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

In the preceding chapters, significant literatures in view of the study's objectives have been assessed and methodology adopted has been established. These were conducted to ensure that data gathered are of relevance to the study. This chapter presents analysis of gathered data and discussions into detail, which is linked to, reviewed literature to answer objectives of the study. The immediate part of the analysis was on respondent profile engaged in the conduct of the study. The profile of respondent influences the data retrieved therefore it was deemed necessary to analyze their profile to ascertain how these attributes of the respondent would influence the research. The specific objectives of the study were analyzed in the second section of this chapter of the research, which includes risk factors involved in construction; ways to mitigate risk occurrence in construction companies; and the significance of risk management in construction.

The 45 research questionnaires retrieved were engaged in the research analysis. From the retrieved data, respondents rated all the variables therefore there were no missing values. The researcher attributes the high rate of response to constant follow-ups on questionnaires for collection and the ease of reading and understanding the questions by the respondents.

4.2 ANALYSIS OF RESPONDENT PROFILE

In research conduct, knowledge of respondent background is vital to establish the reliability and confidence in responses given by respondents. The conduct of respondent profile analysis helps to provide appreciative of respondents involved in the process of data collect. The results on the respondent background analysis are presented in Table 4.1 to Table 4.5 below.

4.2.1 Educational Background of Respondents

Respondents were asked to indicate their educational background to be certain that the respondents who are erudite in managing risk completed the questionnaires involve in construction projects. The results of analysis on the educational background of respondents indicated that, 24 of the respondents were having master's educational background which represents a percentage of 53%. 13 of the respondents were having bachelor's educational background, which represents a percentage of 29%, and the remaining 8 of the respondents were having HND as their educational background which represents a percentage of 18%. Table 4.1 summarizes the educational background of respondents engaged in the conduct of the survey.

Table 4.1 Educational background of respondent

Type	MSc	BSc	HND	Total
% response	53	29	18	100
Number	24	13	8	45

4.2.2 Profession of Respondents

Respondents were asked to indicate their profession to be certain that the respondents who were actually targeted completed the questionnaires. The targeted respondents were of only four professions that is the project manager, civil engineer, geodetic engineer and quantity surveyor. The results of the analysis indicated that, 3 of the respondents were project managers which represents a percentage of 7%, 22 of the respondents were civil engineers which represents a percentage of 49%, 16 of the respondents were geodetic engineers which represents a percentage of 35% and the remaining 4 respondents were quantity surveyors which represents a percentage of 9%. Table 4.2 summarizes the profession of respondents engaged in the conduct of the survey.

Table 4.2 Profession of respondents

Type	Project manager	Civil engineer	Geodetic engineer	Quantity surveyor	Total
% response	7	49	35	9	100
Number	3	22	16	4	45

4.2.3 Years of Experience of Respondents

Respondents were asked to indicate their years of experience to be certain that the questionnaires were completed by the respondents who have gained enough experience in project management. The results of the analysis of years of experience of respondents indicated that, 7 of the respondents' years of experience were between 1 -5 years which represents a percentage of 16%. 13 of the respondents' years of experience were between 6 -10 years which represents a percentage of 28% and the remaining 25 of the respondents' years of experience were over 10 years which represents a percentage of 56%. Table 4.3 summarizes the years of respondents' experience engaged in survey conduct.

Table 4.3 Years of experience of respondent

Type	1-5years	6-10years	Over 10years	Total
% response	16	28	56	100
Number	7	13	25	45

4.2.4 Most Frequent Funding Agency of Projects Undertaken

Respondents were asked to indicate the most frequent funding agency of projects undertaken. The results of the analysis indicated that, 19 of the respondents' which represents a percentage of 42% has most of their projects funded by Government of Ghana, 26 of the respondents' which

represents a percentage of 58% has most of their projects funded by African development/World bank. None of the respondents indicated the private sector as being source of most of their projects funding. Table 4.4 summarizes the most frequent funding agency of projects undertaken by respondents.

Table 4.4: Most frequent funding agency of projects undertaken

Type	Government of Ghana	African development /World bank	Private sector	Total
% response	42	58	-	100
Number	19	26	-	45

4.2.5 Highest Cost of Project Undertaken

Respondents were asked to indicate the highest cost of project undertaken. The results of the analysis indicated that, 14 of the respondent's which represents a percentage of 31% has their highest cost of project undertaken to be between 10,000,000 to 30,000,000\$, 31 of the respondent's which represents a percentage of 69% has their highest cost of project undertaken to be between 40,000,000 to 60,000,000\$. None of the respondents indicated has their highest cost of project undertaken to be 70,000,000 to 100,000,000\$ and above 100,000,000\$. Table 4.5 summarizes the highest cost of project undertaken by respondents.

Table 4.5: Highest cost of project undertaken

Type	10,000,000 to 30,000,000	40,000,000 to 60,000,000	70,000,000 to 100,000,000	Above 100,000,000	Total
% response	31	69	-	-	100
Number	14	31	-	-	45

4.3 RISK FACTORS INVOLVED IN CONSTRUCTION PROJECTS

Analysis on risk factors involved in construction projects was conducted from the responses of respondents. Also it was considered that gaining insight from the results of the analysis will help confirm the credibility of the identified variables and those respondents also shares similar views on risk factors involved in construction projects. Subsequently, respondents were questioned to rate the variables identified in terms of their agreement as risk factors involved in construction projects. The Likert scale was rated from 1 to 5; and 1 signifies Disagree; 2 signifies Slightly disagree; 3 Moderately disagree; 4 signifies Agree; and 5 signifies Strongly agree. Table 4.6 below present the summary of descriptive statistics conducted to evaluate the identified variables from the responses of respondents based on their mean and standard deviation.

From Table 4.6 below it can be ascertained from the analysis that there were no missing numbers and that respondents rated all the variables thereby having a total number of 45 each in Table 4.6 below. More so, in terms of the rating from the Likert scale of 1 to 5, the minimum rating by respondents which represents Agree was 4 and the maximum rating by respondents which represents Strongly agree was 5. Also all the variables were deemed to be risk factors involved in construction by respondents thereby all having a maximum rating of 5. This can be concluded that

the various respondents in one way or the other strongly agree with the identified variable based on their experience.

Table 4.7: Descriptive statistics of the risk factors involved in construction projects

Risk factors involved	N	Mini. Rating	Maxi. Rating	Mean Score	Std. Deviation	Ranking
Improper project feasibility study, planning and budgeting	45	4	5	4.733	0.4472	1st
Change of top management and poor relation among stakeholders	45	4	5	4.711	0.4584	2nd
Quality variations by labors	45	4	5	4.689	0.4682	3rd
Insufficient time to prepare bid	45	4	5	4.644	0.4841	4th
Low productive efficiency of workers	45	4	5	4.622	0.4903	5th
Late arrival of resources at the appropriate time scheduled	45	4	5	4.556	0.5025	6th
Inadequate site investigation	45	4	5	4.533	0.5045	7th
Incomplete design	45	4	5	4.511	0.5055	8 th
Delay in payment of workers	45	4	5	4.489	0.5055	9th
Equipment failure	45	4	5	4.467	0.5045	10 th
Inappropriate time allocation	45	4	5	4.444	0.5025	11th
Project design plans incompatible with execution	45	4	5	4.422	0.4995	12th
Inadequate specification	45	4	5	4.400	0.4954	13th
Many modifications on designs during project execution	45	4	5	4.356	0.4841	14th
Excessive approval procedures in administrative government departments	45	4	5	4.333	0.4767	15th
Increased in labor, material and equipment price	45	4	5	4.289	0.4584	16th
New technology implemented	45	4	5	4.267	0.4472	17th
Actual quantities differ from contract quantities	45	4	5	4.222	0.4204	18th
Awarding project design and construction to unqualified designers and contractors	45	4	5	4.200	0.4045	19th
Shortage of skilled labor, material and equipment	45	4	5	4.156	0.3665	20th

In addition from the rating there were no rating of 1, 2 and 3 which represents Disagree, Slightly disagree and moderately disagree respectively by respondents. This can be said that, respondents at least agree to the fact that variables identified are risk factors involved in construction. Further, in terms of their mean scores all the variables scored above the average mean score of 2.5 which indicates that variables identified are rated above the level of agreement (4) based on the minimum mean of “4.156” and a maximum mean of “4.733”. This may also be considered that respondents are in agreement with the variables identified as been a source of their past experience in project management. More so, the standard deviation of a minimum value of “0.3665” and a maximum of “0.5055” indicates their closeness to zero and to each other and therefore are not too dispersed or deviated from each other which makes the respondents homogenous group, thereby shares similar ideas on the risk factors involved in construction.

However, from the ranking in Table 4.7 above, it can be concluded that, “Improper project feasibility study, planning and budgeting” has the most significant risk factor involved in construction with the highest mean of “4.733” and “Shortage of skilled labor, material and equipment” which was ranked 20th has the least significant risk factor involved in construction with the lowest mean of “4.156”.

4.4 WAYS TO MITIGATE RISK OCCURRENCE ON CONSTRUCTION PROJECTS

As part of data collection, it was deemed necessary to establish from respondents ways to mitigate risk occurrence in construction projects. Also it was considered that knowledge of this area will provide some basis to gain insight into how to control risk in construction. Subsequently, respondents were questioned to rate the variables identified in terms of their agreement as risk factors involved in construction. The Likert scale was rated from 1 to 5; and 1 signifies Disagree; 2 signifies Slightly disagree; 3 Moderately disagree; 4 signifies Agree; and 5 signifies Strongly

agree. Table 4.8 below shows a summary of descriptive statistics conducted to evaluate the identified variables from the responses of respondents based on their mean and standard deviation.

Table 4.8: Descriptive statistics of ways to mitigate risk occurrence in construction

Risk mitigation measures	N	Mini. Rating	Maxi. Rating	Mean Score	Std. Deviation	Ranking
Training and skills enhancement	45	4	5	4.844	0.3665	1st
Protection and safety systems	45	4	5	4.800	0.4045	2nd
Contingency planning	45	4	5	4.756	0.4346	3rd
Permits to work	45	4	5	4.689	0.4682	4th
Preventive maintenance	45	4	5	4.644	0.4841	5th
More detailed planning	45	4	5	4.578	0.4995	6th
Operation reviews	45	4	5	4.467	0.5045	7th
Separation or scheduling of activities and resources	45	4	5	4.356	0.4841	8th
Quality assurance	45	4	5	4.267	0.4472	9th
Regular inspections	45	4	5	4.222	0.4204	10th
Abiding by Contract terms and conditions	45	4	5	4.178	0.3866	11th
Planning alternative approaches	45	4	5	4.111	0.3178	12th
Crisis management and disaster recovery plans	45	4	5	4.089	0.2878	13th

From Table 4.8 above it can be ascertained from the analysis that there were no missing numbers and that respondents rated all the variables thereby having a total number of 45 each in Table 4.8 above. More so, in terms of the rating from the Likert scale of 1 to 5, the minimum rating by respondents which represents Agree was 4 and the maximum rating by respondents which represents Strongly agree was 5. Also all the variables were deemed ways to mitigate risk occurrence in construction projects by respondents thereby all having a maximum rating of 5. This can be concluded that, the various respondents in one way or the other strongly agree with the identified variable based on their experience.

In addition from the rating there were no rating of 1, 2 and 3 which represents Disagree, Slightly disagree and moderately disagree respectively by respondents. This can be said that, respondents at least agree to the fact that variables identified are ways to mitigate risk occurrence.

Further, in terms of their mean scores all the variables scored above the average mean score of 2.5 which indicates that variables identified are rated above the level of agreement (4) based on the minimum mean of “4.089” and a maximum mean of “4.844”. This may also be considered that respondents are in agreement with the variables identified as been a source of their past experience in project management.

More so, the standard deviation of a minimum value of “0.2878” and a maximum of “0.5045” indicates their closeness to zero and to each other and therefore are not too dispersed or deviated from each other which makes the respondents homogenous group, thereby shares similar ideas on the ways to mitigate risk occurrence in construction projects.

However, from the ranking in Table 4.8 above it can be concluded that “Training and skills enhancement” has the most significant way to mitigate risk occurrence in construction projects with the highest mean of “4.844” and “Crisis management and disaster recovery plans” which was ranked 13th has the least significant way to mitigate risk occurrence in construction projects with the lowest mean of “4.089”.

4.5 SIGNIFICANCE OF RISK MANAGEMENT IN CONSTRUCTION

As part of data collection, it was also deemed necessary to establish from respondents the significance of risk management in construction. Also it was considered that knowledge of this area will provide some basis to gain insight into why risk management is necessary in construction.

Subsequently, respondents were questioned to rate the variables identified in terms of their agreement as the significance of risk management from a Likert scale of 1 to 5, where 1 represents Disagree, 2 represents Slightly disagree, 3 represents Moderately disagree, 4 represents Agree and 5 represents Strongly agree. Table 4.9 below shows a summary of descriptive statistics conducted to evaluate the identified variables from the responses of respondents based on their mean and standard deviation.

Table 4.9: Descriptive statistics of the significance of risk management in construction

Significance of risk management	N	Mini. Rating	Maxi. Rating	Mean Score	Std. Deviation	Ranking
Helps formulate proper cost estimation and work of schedule through the better perceptiveness of the project	45	4	5	4.911	0.2878	1st
Maximize efficiency of construction activities and protect the continuity of operation	45	4	5	4.867	0.3438	2nd
Avoid unsatisfactory projects and enhance margins	45	4	5	4.822	0.3866	3rd
Enable project to be kept within time stipulated for approvals, design, construction and occupancy	45	4	5	4.756	0.4346	4th
Able to meet the required technical standards for quality, function, fitness for purpose, safety and environment protection	45	4	5	4.711	0.4584	5th
It helps in appropriate allocation of risk to the compatible party to handle	45	4	5	4.644	0.4841	6th
Keep project within cost budget/forecast/estimate/tender	45	4	5	4.533	0.5045	7th
By reflecting the risks in a contract, contractor can decide whether the project is financially sound or unsound	45	4	5	4.422	0.4995	8th
Improve decision making, planning and prioritization of construction activities	45	4	5	4.333	0.4767	9th
Protect credibility and reputation of company	45	4	5	4.289	0.4584	10th
Through the structured information of previous project risks, better modeling of future project can be built up	45	4	5	4.244	0.4346	11th
It helps to select the suitable type of contract	45	4	5	4.178	0.3866	12th

From Table 4.5 above it can be ascertained from the analysis that there were no missing numbers and that respondents rated all the variables thereby having a total number of 45 each in Table 4.9 above. More so, in terms of the rating from the Likert scale of 1 to 5, the minimum rating by respondents which represents Agree was 4 and the maximum rating by respondents which represents Strongly agree was 5. Also all the variables were deemed to be the significance of risk management in construction by respondents thereby all having a maximum rating of 5. This can be concluded that, the various respondents in one way or the other strongly agree with the identified variable based on their experience.

In addition from the rating there were no rating of 1, 2 and 3 which represents Disagree, Slightly disagree and moderately disagree respectively by respondents. This can be said that, respondents at least agree to the fact that variables identified are significance of risk management.

Further, in terms of their mean scores all the variables scored above the average mean score of 2.5 which indicates that variables identified are rated above the level of agreement (4) based on the minimum mean of “4.178” and a maximum mean of “4.911”. This may also be considered that respondents are in agreement with the variables identified as been a source of their past experience in project management.

More so, the standard deviation of a minimum value of “0.3438” and a maximum of “0.5045” indicates their closeness to zero and to each other and therefore are not too dispersed or deviated from each other which makes the respondents homogenous group, thereby shares similar ideas on the significance of risk management in construction.

However, from the ranking in Table 4.9 above it can be concluded that “Helps formulate proper cost estimation and work of schedule through the better perceptive of the project” has the most

influential significance of risk management with the highest mean of “4.911” and “It helps to select the suitable type of contract” which was ranked 12th has the least influential significance of risk management with the lowest mean of “4.178”.

4.6 CHAPTER SUMMARY

This chapter was keen to the analysis and discussion of obtained results from field survey. It first introduced a brief discussion on the survey questionnaire and evaluation of descriptive statistics of results which were obtained through field survey. The chapter concluded with descriptive analysis of the significance of risk management in construction.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The study has explored risk management techniques of construction companies in Ghana. Also, determine risk factors involved in construction projects and the significance of risk management in construction project performance. The preceding chapters have explored the theoretical, procedural and practical approaches to address the aim and objectives of the research study. This chapter represents the final chapter of the study which provides summary of the whole work and suggests recommendations for policy making in Ghana to enhance project risk management in the construction industry.

5.2 REVIEW OF OBJECTIVES

The study was undertaken with the principal aim to assess risk management techniques of construction companies in Ghana. Three objectives were set to attain the research aim stated and through reviews of literature to obtained secondary data which were further undertaken through field survey with the use of questionnaire to solicit primary data. The objectives are further been discussed below.

1. To identify key risk factors involved in construction projects

The first objective was attained by reviewing literatures on project risk management which covered a number of relevant issues. Questionnaires were administered to project managers, quantity surveyors and engineers to solicit their views on the variables identified from the literature review as risk factors involved in construction projects. Their responses were analyzed using descriptive statistics based on their mean and standard deviation. From the analysis, “Improper project

feasibility study, planning and budgeting” were the most significant risk factors involved in construction projects while “shortage of skilled labor, material and equipment” which was ranked last and were the least significant key risk factor involved in construction projects.

2. To investigate the methods of mitigating occurrence of risk in the Ghanaian construction companies

The second objective was attained by reviewing literatures on project risk management which covered a number of relevant issues. Questionnaires were administered to project managers, quantity surveyors and engineers to solicit their views on the variables identified from literature review as ways of mitigating risk occurrence in the Ghanaian construction. Their responses were analyzed using descriptive statistics based on their mean and standard deviation. From the analysis “Training and skills enhancement” obtained the most significant way of mitigating risk occurrence in construction and “Crisis management and disaster recovery plans” which was ranked last and obtained the least significant way of mitigating risk occurrence in construction.

3. To assess the significance of risk management on construction project performance

The third objective was attained by reviewing literatures on project risk management which covered a number of relevant issues. Questionnaires were administered to project managers, quantity surveyors and engineers to solicit their views on the variables identified from the literature review as significance of risk management in construction. Their responses were analyzed using descriptive statistics based on their mean and standard deviation. From the analysis “Helps formulate proper cost estimation and work of schedule through the better perceptive of the project” obtained the most influential significance of risk management in construction and “It helps to

select the suitable type of contract” which was ranked last obtained the least influential significance of risk management in construction.

5.3 RECOMMENDATIONS

The following are recommendations to ensure effective project risk management in construction companies in Ghana.

- Project stakeholders are to engage in more detail planning of the project and also plan alternative approaches to counter uncertainties.
- Project stakeholders should ensure that there is adequate and comprehensive training and skills enhancement of project participants.
- Also there must be effective and appropriate quality assurance in all project activities and preventive maintenance in all construction process.
- Project operations should be in accordance with contract terms and conditions of project and engaging in crisis management and disaster recovery plans throughout the project life cycle.

5.4 LIMITATIONS OF THE RESEARCH

The study was bound to some limitations likewise other study’s conducted. The limitation in this study is anticipated to give foundation for research work that may be conducted in the future. The study limits its scope to stakeholders involve with the pokuase interchange and local roads project that are concern with risk management in the Greater Accra region. More so, the engagement of a relatively small sample size for the research could have been enhanced on sample size which is huge say, hundred and over, for the deployed statistical tools to be robust. However, this would

not invalidate conclusions that were drawn, given that relevant preliminary test which is associated with adequacy of the sample size proved favorable to precede the analysis.

Further, only published literatures were used in the study's analysis and conclusions drawn to this study were based on data and results retrieved from respondents using questionnaires.

5.5 DIRECTION FOR FUTURE RESEARCH

The study exposed a number of areas which requires research attention. Recommendations made for future research are as follows:

- Strategies that affect project cost estimate in construction industry.
- Risk management formulation and contractor performance.
- The effect of risk management on construction project delivery.

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APPENDIX
QUESTIONNAIRE DESIGN

Topic:

ASSESSMENT OF RISK MANAGEMENT TECHNIQUES OF CONSTRUCTION
COMPANIES IN GHANA: A CASE STUDY OF THE POKUASE INTERCHANGE AND
LOCAL ROADS PROJECT

This study aims to assess risk management techniques of construction companies in Ghana. Also determine risk factors involved in construction projects and the significance of risk management in construction. Please kindly respond to the questions by ticking the appropriate box for each item. Please note that all information provided will be strictly confidential.

Thank you for your assistance.

BY
DESMOND YAW HODANU BEDI

SECTION A: RESPONDENTS INFORMATION

1. Please indicate your educational background:
 - a. MSc
 - b. BSc
 - c. HND

2. Professional background
 - a. Project manager
 - b. Civil engineer
 - c. Geodetic engineer
 - d. Quantity Surveyor

3. Please indicate your years of experience:
 - a. 0 – 5 years
 - b. 6 – 10 years
 - c. Over 10 years

4. Most frequent funding agency of your projects:
 - a. Government of Ghana
 - b. African development/World bank
 - c. Private sector

5. Highest cost of project undertaken:
 - a. 10,000,000 – 30,000,000\$
 - b. 40,000,000 – 60,000,000\$
 - c. 70,000,000 – 100,000,000\$
 - d. Above 100,000,000\$

SECTION B: RISKS IN CONSTRUCTION PROJECTS

6. Please rate the following variables in terms of your agreement as risk factors involved in construction projects on a scale of 1 – 5 where 1 = disagree; 2; Slightly disagree; 3= Moderately disagree; 4= Agree; and 5 = strongly agree.

Risk Factors	1	2	3	4	5
Incomplete design					
Equipment failure					
Inadequate specification					
Many modifications on designs during project execution					
Inappropriate time allocation					
Actual quantities differ from contract quantities					
Delay in payment of workers					
Excessive approval procedures in administrative government departments					
Inadequate site investigation					
Insufficient time to prepare bid					
Project design plans incompatible with execution					
Improper project feasibility study, planning and budgeting					
Shortage of skilled labor, material and equipment					
Late arrival of resources at the appropriate time scheduled					
Quality variations by labors					
New technology implemented					
Increased in labor, material and equipment price					
Low productive efficiency of workers					
Change of top management and poor relation among stakeholders					
Awarding project design and construction to unqualified designers and contractors					

SECTION C: RISK MITIGATION MEASURES

7. Please rate the following factors in terms of your agreement as ways to mitigate risk occurrence in construction companies in Ghana on a scale of 1 – 5 where 1 = disagree; 2; Slightly disagree; 3= Moderately disagree; 4= Agree; and 5 = strongly agree.

Ways to mitigate risk occurrence	1	2	3	4	5
More detailed planning					
Planning alternative approaches					
Protection and safety systems					
Operation reviews					
Regular inspections					
Training and skills enhancement					
Separation or scheduling of activities and resources					
Preventive maintenance					
Quality assurance					
Contingency planning					
Abiding by Contract terms and conditions					
Crisis management and disaster recovery plans					
Permits to work					

SECTION D: SIGNIFICANCE OF RISK MANAGEMENT IN CONSTRUCTION

8. Please rate the following factors, which in your opinion are significance of risk management in construction, on a scale of 1 – 5 where 1 = disagree; 2; Slightly disagree; 3= Moderately disagree; 4= Agree; and 5 = strongly agree.

Significant of risk management in construction	1	2	3	4	5
It helps in appropriate allocation of risk to the compatible party to handle					
It helps to select the suitable type of contract					
Maximize efficiency of construction activities and protect the continuity of operation					
Keep project within cost budget/forecast/estimate/tender					
Protect credibility and reputation of company					
Helps formulate proper cost estimation and work of schedule through the better perceptive of the project					
Enable project to be kept within time stipulated for approvals, design, construction and occupancy					
Able to meet the required technical standards for quality, function, fitness for purpose, safety and environment protection					
Avoid unsatisfactory projects and enhance margins					
Through the structured information of previous project risks, better modelling of future project can be built up					
By reflecting the risks in a contract, contractor can decide whether the project is financially sound or unsound					
Improve decision making, planning and prioritization of construction activities					