

**DETERMINATION OF SKILLS REQUIRED BY PROJECT MANAGERS
FOR**

MANAGING RISKS IN CONSTRUCTION PROJECTS

KNUST

By

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgment is made in the thesis.

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ABSTRACT

Every project has risks as soon as it initiated, and how well the project manager succeeds with work associated with risks, can make or break, the whole project. The aim of this research was to determine skills required by project managers for managing risks in construction projects. In order to achieve the aim, the following objectives were set: to evaluate the various types of risks inherent in the construction industry; to assess the

effects of risks in the construction industry, and to evaluate the skills required by project managers for managing risks in construction projects. A critical review of literature was conducted. The quantitative research strategy was adopted. Questionnaires were used to gather data from contractors as well as consultants in Kumasi metropolis. Purposive sampling technique was adopted. Statistical Package for Social Sciences (SPSS) software was used for the analysis. Descriptive statistics, mean score ranking, one sample t-test and Cronbach Alpha were the analytical tools. From the findings, *Variations; Unrealistic contract duration; Unforeseen general conditions; Delay in payment to contractor for work done; Damages and delays during construction* were ranked as the five most severe risk factors that affect construction projects. Furthermore, *Loss to the economy; Time overrun; Cost overrun; Conflicts between stakeholders; Late site hand over* were the most severe effects of risks in the construction industry. Lastly, *Ability to identify risks; Monitoring and evaluation of project; Risk Analysis; Contract administration; Team Leadership* were the most important skills required by project managers for managing risks in construction projects. It is recommended that top management should be strongly committed to the risk management process.

Keywords: roles, risk, management, projects

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DEDICATION

I dedicate this piece of work to Jehovah God for his protection. This thesis is also dedicated to my wife and children.



CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

One significant industry that plays a crucial role in the economy of Ghana is the sector of construction. This industry engages a huge chunk of the working force and also is a great contributor to the GDP (Gross Domestic Product) of the nation. Kamara (2012) posits that the construction industry serves as a stimulus and catalyst for expansion and growth in the economic development of Ghana. Nevertheless, the construction industry has been bedevilled with several barriers and challenges which include the delivery of projects on time and within cost allocated and in the best of quality in order to please clients (Medina and Medina, 2014; Baloi and Price, 2003). Project management has therefore gained ascendancy and prominence due to this phenomenon and the project manager is seen and deemed to be very critical in a project attaining its core objectives (Kamaara, 2012; Azanim and Edum-Fotwe, 2006; Oluwaseyi, 2012).

According to Tonnquist (2010), a project is a temporary endeavour with clearly defined goals and specific target. Projects have a clearly spelt out starting and finishing points and are restricted by budgets (Loosemore, 2008). Projects are normally apportioned into phases and stages as well as defined milestones to mark the beginning and ending of phases. These phases are useful in making it more convenient to get a better structured work and also to have focus on the most important tasks (Taroun *et al.*, 2011). A research carried out by Project Management Institute (PMI) (2008) posited that project risk management is one of the areas out of the nine areas that is crucial for the success of a project. Each and every project has its inherent risks as soon as it starts and the role of the project manager is important in determining the success or failure of the project (Conforto *et al.*, 2014). A study by Jha (2013) established that the major task of a project

manager is seen in the pre contract and pre construction stage where a lot of planning takes place. At these stages, the project manager is involved in responsibilities such as: preparing the preliminary schedule for construction works, drawing a schedule to delivered in time according to client's specifications, delineation of project requirements, allocating of new resources, review planning as well as setting goals (Laryea and Hughes, 2008). Contrasting views were however presented by Hopp and Spearman (2011) as well as Jekale (2004) who posited that the major role of project managers is in administering projects. In this instance, project manager has the responsibility of managing project client, communicating issues, co-ordination of activities and managing of information flows (Butler, 1995; Simu, 2006). Egan (2012) proposed that the major role of a project manager is to make acquisitions that are needed for the construction project which includes consistently refining scope of project, identifying items that due for delivery and that have an effect on the procurement, scheduling and purchase of materials (PMI, 2008; Cervone and Pervin, 2008; Conforto *et al.*, 2014).

Due to risks in projects, project managers are always challenged to have to deal with various forms of issues in accomplishing set project goals within restricted budgetary and time constraints (El-Sabaa, 2001). Furthermore, project managers are required to assist in coordinating works of people from varying backgrounds so as to help attain set tasks at the same time having to cope with uncertainties, constraints and complexities associated with the project (Chapman and Ward, 2003; Chapman and Ward, 2004).

1.2 PROBLEM STATEMENT

A study conducted by Antvik and Sjöholm (2008) indicated that projects are often inherent with risks and uncertainties and the ability of project managers to succeed with these risks can be the failure or success of the project endeavour. Project risks are normally classified as future events and they are occurrences or events that occur in the

future and have an effect on at least one project objective (Khazanchi, 2005). This objective affected can be on the time, scope, budget, quality or even safety (Fisher, 2011). Circumstances are assumptions, limitations, needs and requirements, or even imposed conditions such as permit to carry out environmental works (Yang *et al.*, 2011). Internal circumstances and environments of organizations and projects can cause risks to occur. Examples include: the lack of culture for managing projects, system for management or even dependencies on external stakeholders (PMI, 2008)

According to Hyvari (2006), conflicts and disputes are likely to occur in certain portions of managing projects like conflicts in personality, administrative steps, project tendency priorities, cost and schedule objectives. These disputes are often the cause of problems in project management like insufficient resources, attainment of deadlines which are not realistic, goals that are unclear, team members who are not committed, lack of adequate planning, poor communication structure, modification in goals and objectives as well as inconsistencies in the functions of departments (Pinto, 2007).

This study therefore had the purpose of evaluating the roles and skills required of project managers in managing risks inherent in the construction industry.

1.3 RESEARCH QUESTIONS

- What are the various types of risks inherent in the construction industry?
- What are the effects of risks in the construction industry?
- What are the roles of project managers in risk management in the construction industry?

1.4 AIM AND OBJECTIVES

1.4.1 Aim

The aim of this research was to determine skills required by project managers for managing risks in construction projects.

1.4.2 Objectives

In a bid to achieve the aim, the following objectives were articulately set:

- To evaluate the various types of risks inherent in the construction industry,
- To assess the effects of risks in the construction industry, and
- To evaluate the skills required by project managers for managing risks in construction projects.

1.5 SCOPE OF STUDY

The geographical scope of this study was the Kumasi metropolis in the Ashanti region of Ghana. The contextual scope consisted of construction project managers of DIK1 construction firms as well as consultants of these projects. Kumasi metropolis abounds with many construction activities and its related risk management activities. It was also chosen because of its proximity to the researcher.

1.6 METHODOLOGY

Quantitative research strategy was employed in this research. This approach built upon previous works which have developed principles that helped to decide the data requirements of this study. The methodology adopted for this study consisted of a critical review of pertinent literature. This review of literature was useful in identifying past works, assessing their contributions, identifying their limitations and how they can be applied. Review of literature also led to the development of a research questionnaire

which addressed the study's aim and objectives. This questionnaire served as the research instrument to collect data from respondents. The questionnaire survey involved contractors and consultants. Respondents were asked to rate each variable on a Likert scale. The sample size for the study was determined using the Kish formula. The tools for analysing the data collected consisted of descriptive statistics, mean score ranking and one sample t-test for ranking the various phenomena identified. Cronbach Alpha was used for testing internal reliability.

1.7 RELEVANCE OF STUDY

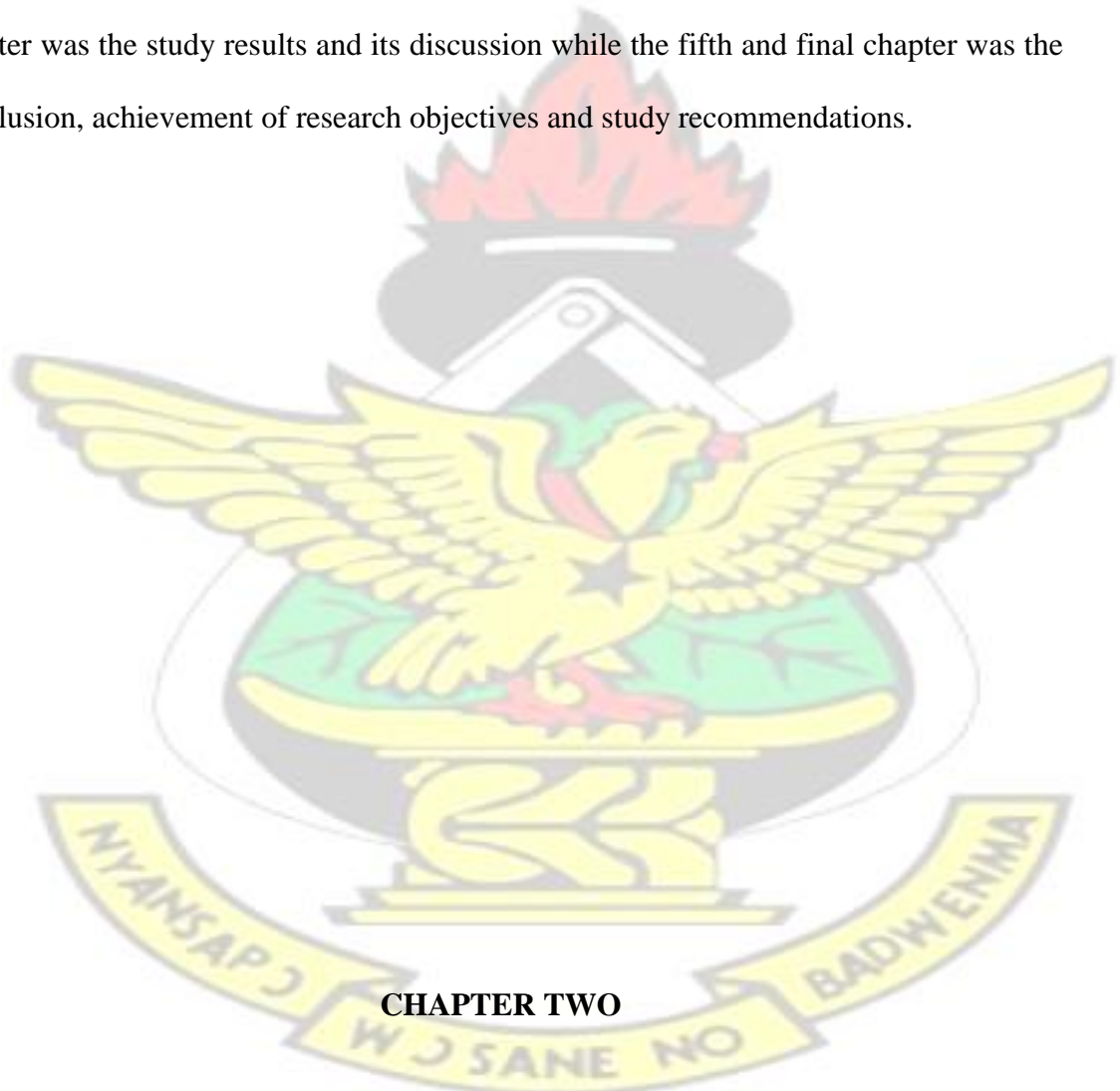
This research is of much significance to the construction industry as it will serve as a reminder of the roles of project managers in risk management in the construction industry. The findings of this study will identify ways of addressing risk challenges. Furthermore, the Government of Ghana will be one of the vital beneficiaries of the findings of this study. This research work on project management risks is useful to the body of academia as it will encourage and motivate other researchers to conduct further and more detailed study on the subject matter and refer to this work as a guide.

1.8 LIMITATIONS

Like any other similar research conducted, this research faced unavoidable limitations. These included getting access to data and human errors while analysing responses obtained from research instrument. Inadequate financial resources and inadequate time due to the short duration of the semesters also posed as limitations. However, these study limitations are useful in serving as a guide for future research works to follow in reducing their limitations.

1.9 ORGANIZATION OF STUDY

Regarding the organization of this thesis, the chapters were five and inter related. The first chapter was titled the introduction and had subtitles such as the study background, problem statement, purpose and specific questions, scope of study, significance as well as the limitations. Second chapter served as the review of key literature related to project managers' roles in risk management in the construction industry. The next chapter was the methodology and elucidated on the methods used to achieve the research. Fourth chapter was the study results and its discussion while the fifth and final chapter was the conclusion, achievement of research objectives and study recommendations.



CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Chapter one served as the introduction of this study. In this next section of the study, critical review of literatures on the risk management and the skills required by project managers are examined. The concepts of risk and risk management are also be explained in detail. This chapter culminates with a summary.

2.2 PROJECT MANAGEMENT

According to Tonnquist (2010), a project is a temporary endeavour with clearly defined goals and specific target. Projects have a clearly spelt out starting and finishing points and are restricted by budgets (Khazanchi, 2005; Mousa, 2005). Projects are normally apportioned into phases and stages as well as defined milestones to mark the beginning and ending of phases (Djebani, 1996). These phases are useful in making it more convenient to get a better structured work and also to have focus on the most important tasks (Koskela and Howell, 2008). A research carried out by Project Management Institute (PMI) (2008) posited that project risk management is one of the areas out of the nine areas that is crucial for the success of a project. Each and every project has its inherent risks as soon as it starts and the role of the project manager is important in determining the success or failure of the project (Ashleigh, 2012). A study by Jha (2013) established that the major task of a project manager is seen in the pre contract and pre construction stage where a lot of planning takes place. At these stages, the project manager is involved in responsibilities such as: preparing the preliminary schedule for construction works, drawing a schedule to be delivered in time according to client's specifications, delineation of project requirements, allocating of new resources, review planning as well as setting goals (Lianying *et al.*, 2012). Contrasting views were however presented by Hopp and Spearman (2011) as well as Burdge and Robertson (2009) who posited that the major role of project managers is in administering projects. In this instance,

project manager has the responsibility of managing project client, communicating issues, co-ordination of activities and managing of information flows. Egan (2012) proposed that the major role of a project manager is to make acquisitions that are needed for the construction project which includes consistently refining scope of project, identifying items that due for delivery and that have an effect on the procurement, scheduling and purchase of materials (PMI, 2008).

2.3 RISK DEFINED

Risk is said to be an event or a situation that might have a positive or a negative consequence on some project objectives in circumstance it transpires. Risks are disruptions in route or gap in knowledge which donates to project threat (Webb, 2003).

The Project Management Institute (PMI, 2008) defines risks as the chance of an event happening and the impact on the objectives of the project.

Risks must consider both the positive and negative sides on the objectives of the project. Risk measures future uncertainties in attaining the project performance aim and objectives. Risks are associated with different aspects like design maturation, threats, supplier capability since these relate to WBS (Work Breakdown Structure) and IMS (Integrated Master Schedule). Risks are responsible for addressing variance for planned approach and outcome expected. Variation could either be negative or positive.

2.3.1 Risk components

According to Laryea and Hughes (2009), risks are made up of three components:

1. Future cause that has not happened yet; 2.

Likelihood or probability of risk happening;

3. Impact or consequence of the occurrence.

2.3.2 Risk classification

Unpredictable (External)

These types of risks go beyond individual's control scope. They cannot be predicted.

They occur from third parties eg. acts of God (Josephson and Hammarlund, 1999; Mills, 2001).

Predictable but uncertain (External)

These risks go beyond individuals and organizations. They are expected but to an extent.

An average is set and the impact could either go below or above this average eg. bad weather (Fernie *et al.*, 2006).

Technical (Internal)

Risks that arise from technology used on project, design, construction process and how facility is operated (Kahneman and Tversky, 1979).

Non-technical (Internal)

Risks within control of operators. They arise from project failures and unmet targets of project teams. This results in time and cost overruns, delays in schedules and cash flow interruptions.

Civil and Criminal (Legal)

These are risks which come from contract arrangements and patent rights. These can arise under statutes like Health and Safety Acts

2.3.3 Major areas of risks

According to Laryea and Hughes, (2009), these are the major risk areas:

1. Risks arising from contracts
2. Risks arising from performance
3. Technical risks
4. Geographical
5. Operator
6. Political risks
7. Political risks

Risks arising from contracts

1. Personnel and operator group
2. Pollution risks
3. Risks from third parties
4. Momentous/Consequential losses
5. Suspensions and force majeure
6. Delays
7. Variation and change orders
8. Free access provision to the site
9. Intellectual rights of properties
10. Termination of operators
11. Works involved in the projects (supplied items and operators)
12. Obligations of warranties
13. Unlimited liabilities
14. Insurance covers
15. Obligation of operator to pay contractor (Laryea and Hughes, 2009).

Risks regarding performance

1. Nature, duration and scope of works
2. Environmental and safety performance
3. Weather conditions
4. Foundation and soil conditions
5. Influences occurring externally
6. Interactions of schedules
7. Sizes
8. Bid and operator influences (Laryea and Hughes, 2009).

2.3.4.3 Risks associated with finances

1. Level of profitability
2. Exposure level
3. Exposure to foreign currency
4. Payment terms
5. Credit worthiness of operator
6. Size of contract
7. Debt of balance sheet
8. Debt on off balance sheet
9. Insurances (Laryea and Hughes, 2009).

2.3.4.4 Risks that are political

1. Riots and disturbances
2. Privacy
3. Intrusions and interferences
4. Licenses and permits (Laryea and Hughes, 2009).

2.3.4.5 Risks that are technical

1. Novel and new technologies
2. Weather conditions
3. Quality of FEED
4. Foundation conditions (Laryea and Hughes, 2009).

2.3.4.6 Risks that are geographical

1. Work location

2.3.4.7 Risks associated with operator

1. Influence of operator
2. Insurance cover
3. Problems that impact contractor and (Laryea and Hughes, 2009).

2.4 MANAGEMENT OF RISKS

Risk management falls within the nine knowledge scopes and it is within these scopes that construction risk management becomes a comprehensive and a calculated way of identifying, analyzing and retorting to risks to accomplish the project central objects (Tipili and Ilyasu, 2014). The paybacks of the risk management route include identifying and analyzing risks, and improvement of construction project management processes and effective use of resources. Flanagan *et al.* (2006) stated that, construction projects can be extremely complex and burdened with a whole lot of uncertainty. They further noted that risk and uncertainty can possibly have severe negative consequences on the construction during the project level. Kpodo (2016) in his published articles also concluded that, increasing frequent disasters call for the need to acquire the requisite knowledge, adopt preventive measures, develop coping strategies and acquire the needed adequate insurance to become more resilient. He further argued that, the effective way of managing

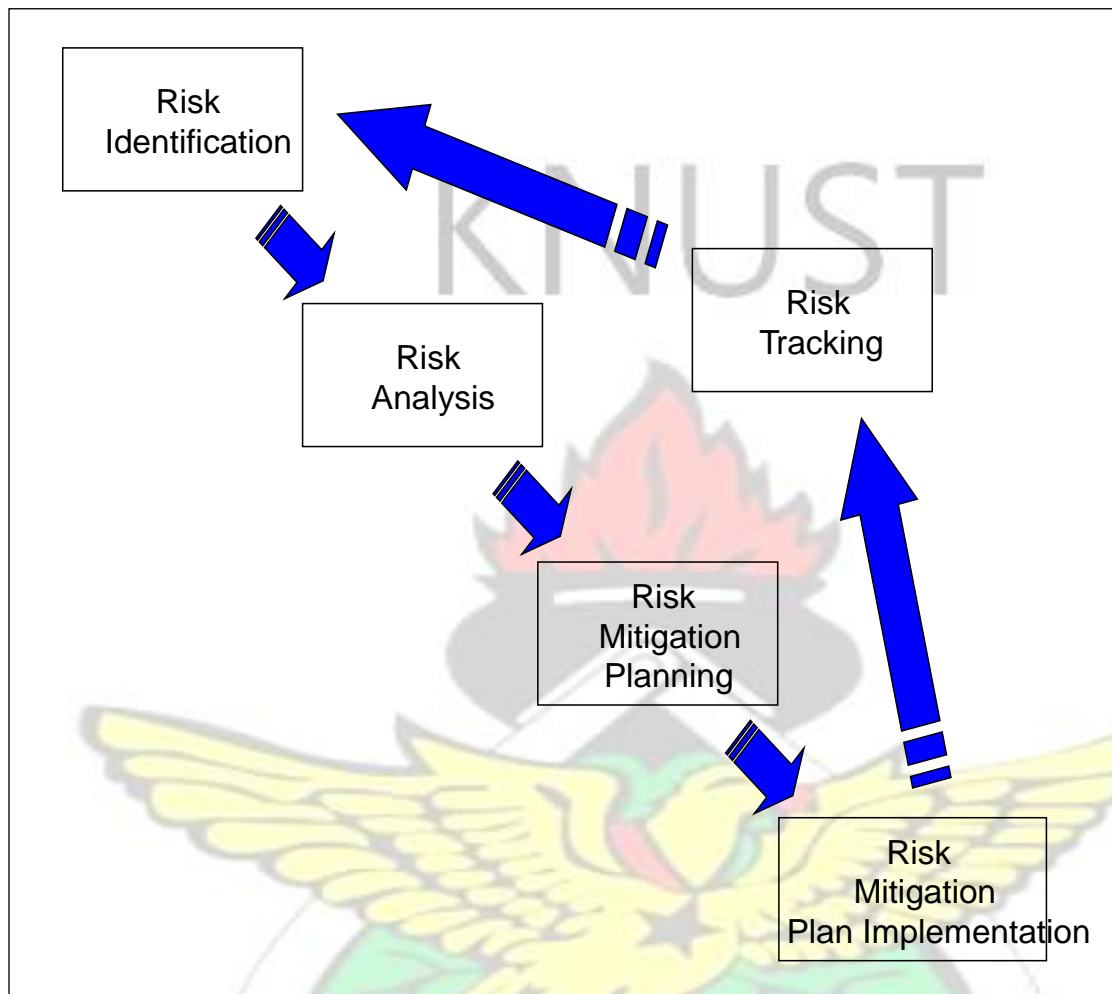
risk can either provide a sure way of both resilience to withstand negative events and the ability to take advantage of the opportunities for developments that are locked up in them. In his assessment, further, he realized that proactive risk management is a critical ingredient in the fight to end any challenges and the incapability to manage risk correctly positions important difficulties to finish deficiency and furthering mutual wealth. According to Kpodo (2016), risk management is a powerful instrument for development, building better and more secure future.

According to Aven (2003), risk management refers to the process whereby the probability of risk happening or its consequence on the project is reduced. It is a continual process which goes on the through the cycle of the project. It refers to an organized system that identifies and measures unknowns. It also develops mitigation plan and options. There is also the monitoring and tracking of implementation in ensuring risk is reduced satisfactorily. Effectual reduction of risk is dependent on early planning of risk management, identifying and analyzing risks early, implementing corrections early, continual monitoring and reassessment, communicating, documenting and coordinating (Laryea and Hughes, 2009).

The planning of good programs of risk management makes sure that risks are appropriately handled (Aven, 2003). Risk management involves five steps. These are:

1. Identifying the likely sources of the project risks
2. Assessing overall consequence of risks
3. Determining ways of reducing the likelihood and impact of risks
4. Assessing the impact and selecting the ones with significant impact in order to fully analyze them
5. Implementing and developing plan to control risks and achieve reductions

(Laryea and Hughes, 2009).



Source: Verzuh (2005)

2.4.1 Identification of risks

This involves the determination of the risks that are likely to have a major effect on the project and then documenting them (Vezuh, 2005). Identifying risks is not done once but continually and is undertaken as a regular occurrence throughout the project.

Identification of risks are responsible for addressing external and internal risks. Project team has control on internal risks including cost estimates. Project team does not have control on external risks like government actions. Risks entail the likelihood of having

losses or harm. Risk identification is concerned with both negative outcomes and positive outcomes (Laryea and Hughes, 2009).

Aim

The purpose of risk identification is to assess the things that can go wrong. It looks at the current and proposed staff, design, process, supplier and monitoring tests, analysis of trends that are negative. Risk identification examines every element of program to aid in identifying major causes, work on their documentation and successfully manage them. Identification of risks should proceed as early as possible and be continued throughout the program.

Tasks and activities

Risks are associated with various aspects of programs like constraints, operation needs and attributes. It also includes Key Performance Parameters (KPMs), WBS, technology, threats. It is essential to note that identifying risks is not just the project manager's responsibility but that of everyone (Laryea and Hughes, 2009).

Program examination is attained by way of breaking it down into significant areas and elements. The decomposition must be focused on technical baselines, requirements, processes, acquisition phases and functional areas. WBS should also be created for decompositions that are product oriented (Laryea and Hughes, 2009).

2.4.1.1 Techniques and tools used in risk identification

According to Tonnquist (2010), these are some ways of identifying risks:

- Survey questionnaires
- Feedback arising from similar projects
- Brainstorming
- Past experiences

- Interviews
- Workshops
- Using specialists

2.4.2 Quantification of risks

The quantification of risks entails the assessment and examination of risks and their interactions in order to assess their likely outcomes (Laryea and Hughes, 2009). It is mainly associated with assessing which of the risk schedule simulation is appropriate. A lot of schedules are adapted from the Monte Carlo analysis

Schedule simulations are basically utilized on complex and large projects. This is because the conventional analysis methods like PERT and CPM (Critical Path Method) do not take into account convergence thereby underestimating durations.

- Decision trees. This is a diagram which shows key relationships and interactions among decisions taken and their associated events. Tree branches imply decisions or events.
- Expert judgement. This is often applied together with the techniques of mathematics. Events of risks could be described as being high, low or medium in terms of probability. They could also be described as severe, limited or moderate in terms of impact (Laryea and Hughes, 2009).

2.4.3 Response and control of risks

This process involves the execution of risk management plan to help in responding to risk events when a project is being undertaken (Laryea and Hughes, 2009). When changes do occur, a cycle of identification, quantification and response is activated (Verzuh, 2005).

2.4.4.1 Techniques and tools used for risk response control

- Workarounds. These are unplanned responses to risk events that are negative. They are only unplanned because their response was undefined before risk happening.
- Additional development of risk response. If risk is unanticipated or when effects of risks are more than was anticipated, there is the necessity of repeating response process and quantification process

2.4.5 Features of Risk management approaches that are successful

A study by Laryea and Hughes (2009) showed the following characteristics of successful programs:

- Clearly understood user requirements
- Feasibility and Stability
- A closer level of relationship among project stakeholders, the final users and industry
- A risk management process that is planned and integrated to aid in the process of acquisition
- Continual reviews to help fine tune programme that satisfies needs of users within acceptable risk
- Completed risk analysis
- Support and acquisition strategies
- Success criteria related to cost, time, schedule and performance
- Formal risk management process

2.5 ANALYSIS OF RISKS

Aim

Risk analysis seeks to assess the magnitude of risks. It does so by:

- Assessing the probability of occurrence;
- Assessing the likely impact regarding cost, schedule, performance
- Identification of risk level by utilizing risk reporting matrix

Risk Reporting Matrix

Every event that is deemed undesirable and could have an effect on the project success must be identified and further assessed to check its probability of occurring and the impact after occurring (Laryea and Hughes, 2009). Ideally, there must exist a template that is standard to evaluate and report the findings emanating from assessment of risks. The matrix shown below is normally used for identifying risk levels seen in a programme. Level of risks are characterized for colour green for low, yellow for moderate and red for high (Verzuh, 2005).

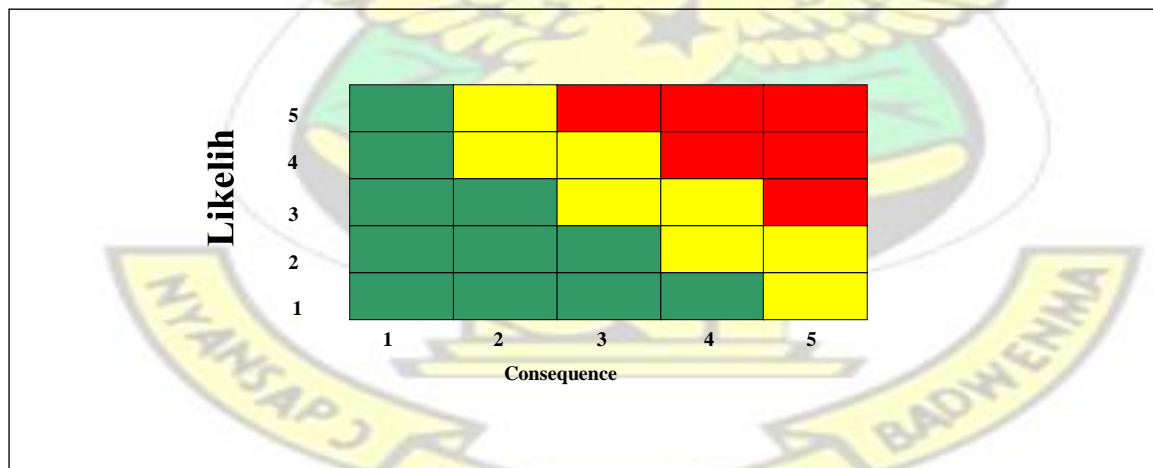


Figure 2.3 Matrix for risk reporting

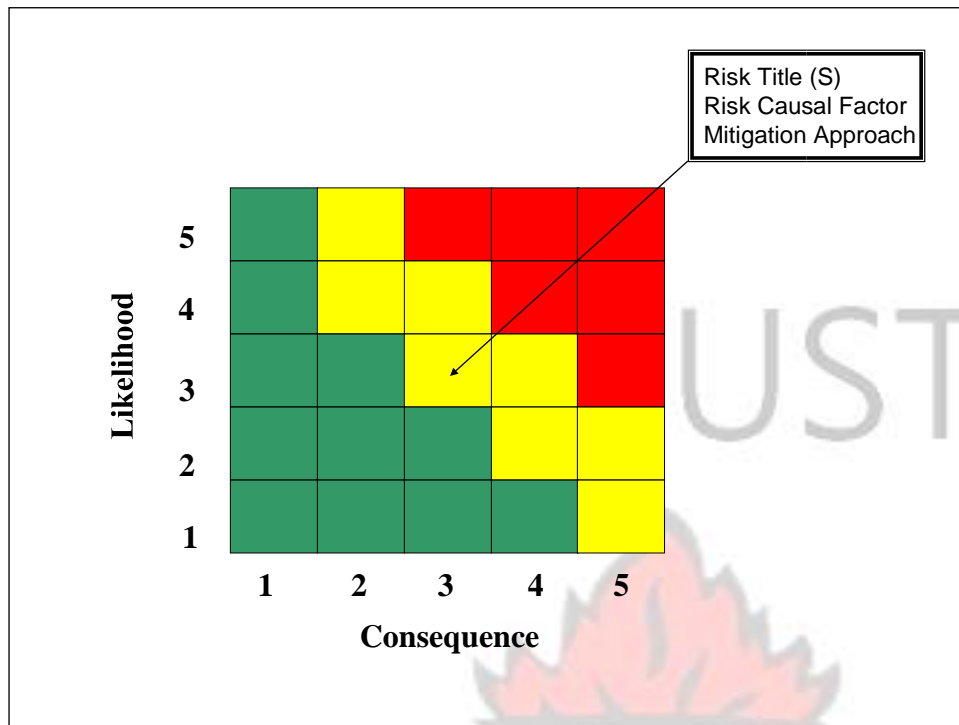
Source: Verzuh (2005)

Probability levels are established by utilizing some specific criteria set. From the figure below, if the cause has its percentage probability estimated to be 70, then its likelihood is Level 4.

Likelihood	Level	Likelihood	Probability of Occurrence
	1	Not Likely	~10%
	2	Low Likelihood	~30%
	3	Likely	~50%
	4	Highly Likely	~70%
	5	Near Certainty	~90%

Figure 2.4. Levels of Likelihood Criteria Source: Verzuh (2005)

The types and levels of the risk consequences are calculated by using set criteria. It is not advisable however to use scales of single scale for all the programs. With the previous example of a risk having 70 percent probability of occurrence, if this will not have any consequence on time or cost, then it may not impact a milestone. It is rather termed as a *schedule* because the major cause of the risk is linked to schedules.



Risk analysis

Source: Verzuh (2005)

Task and activities

Risk analysis involves the examination of every identified risk and refining how it is described in terms of effects, cause and mitigation (Laryea and Hughes, 2009). It helps to refine every risk regarding its probability, impact and links with other risk processes.

Risk analysis involves a thorough study of risks identified. The intent is to help in gathering adequate information regarding risks that would occur in the future, their impact when they occur as well as their probability of occurring. Risk assessment involves activities of risk analysis and risk identification (Verzuh, 2005).

Risk analysis and its tasks involve:

- Developing likelihood and impact scales through the allocation of consequence thresholds as compared to the Work Breakdown Structure;
- Assessing probabilities to every risk

- Determining performance, cost and schedule consequences
- Documenting findings and results in database of risks

Risk analysis should be re-examined regularly and from time to time to help in ensuring analysis is current (Verzuh, 2005).

2.6 EFFECTIVE METHODS OF CONTROLLING CONSTRUCTION RISKS

According to Verzuh (2005), there are five ways of responding to risks.

1. Acceptance of risk

This implies understanding the risk including the probability and consequences involved yet deciding not to do anything concerning it. There will be a reaction by the project team when the risk happens. This is often employed when it is realized the risks therein are very small and the resulting consequences will be less costly than curing it.

2. Avoidance of Risk

When risk is avoided, this is done by deciding not to partake in a portion of a project. According to Laryea and Hughes (2009), the deleted portion of the project may have great effect on the project and increases other risks. When the scope of the project is changed, the business case will also change. This is because products which have been scaled down may have reduced revenues and opportunities to save cost. When risks are avoided on projects, there may be lower returns.

3. Monitoring risks

Risks are monitored by taking some indicators for prediction which project gets closer to point of risk. By becoming part of the test team, the risks can be monitored. Contingency plans refer to alternate actions prepared beforehand to cater for the risk. Most common contingency used is putting down some money referred to as contingency fund from

which money can be taken from when cost overruns occur which were not anticipated for. Contingencies are similar to insurance and they could be very expensive (Verzuh, 2005).

4. Transferring risk

According to Laryea and Hughes (2009), a number of complex projects buy insurances for different risks that can occur like fires or thefts. When this is done, risks have been effectually transferred to risk companies and hence when disasters happen, the insurance firms are responsible for paying for it. Buying insurance is the most common form of risk transfer. However, others exist. An example is to hire a professional to undertake the work since risk can be transferred to the professional. Having a fixed price contract ensures the work is executed for a set amount even before work proceeds. There may also be addition of fixed schedules to the contract and the setting of penalties for overruns that occur. When there are fixed price contracts, the project directors are very sure of how much that part of the project will eventually cost hence they effectually transfer schedule and cost to the sub-contractor. When any overruns do occur, the sub-contractor will be responsible for dealing with it. The only shortfall to this type of the contract is that the sub-contractor will price the bid very high to cater for the risks involved in the contract. A further form of contract exists called cost plus or reimbursable contract. In this contract, the sub-contractors are paid depending on the materials, equipment and the labour they use for the project (Laryea and Hughes, 2009). Schedule overrun and cost overrun risks are completely borne by projects having these types of contracts. Project is unable to make transfers of risks with this contract form. However, when completed work is poorly done, the contractor will only sign reimbursable contract.

5. Mitigation of risk

Mitigation refers to responding to risks only after it has had effects on the project. Mitigation includes all actions taken by project team to cater for risks occurring as a result of the environment of the project (Laryea and Hughes, 2009).

Aim and Purpose

The goal mitigating risks is to assess the approach that can be used in catering for or addressing the unfavourable risk. Some approaches for mitigating include:

- Trying to avoid the risk through the elimination of the major cause
- Having control on the consequence and cause of the risk
- Risk transfers
- Predicting risk level and then continuing current plan being undertaken. The planning of risk mitigation includes the identification, evaluation, and selection of options to help set risks at adequate levels when project objectives and constraints are involved. Risk mitigation plans are aimed at ensuring project success. It involves the details of what is involved, time for accomplishing it, persons responsible for accomplishing it, amount of money involved for the implementation of the plan. The most suitable choice is selected from the options in the plan. The intensity and details rely on the nature and life cycle of the program. According to Laryea and Hughes (2009), the presence of adequate details is required to make room for estimates to cater for effort needed and technology required.

Tasks

For every underlying factor for a risk, mitigation type must be identified and the full details provided (Laryea and Hughes, 2009).

When the alternatives involved have undergone analysis, the mitigated option selected must be incorporated for the plan. This is done either for current plans or is done separately. Risk mitigation plans must be attainable, documented, quantifiable, assessable and should be accurate. It should have the following components:

- A detailed title for risk which has been identified
- Date plan was prepared
- Person tasked with dealing with major cause of risk
- A summary of the risk
- Reasons for the risk existing (major causes)
- Mitigation options
- Defining activities and events that can minimize the risk
- Status of risk
- Date expected to start implementation
- The recommendation of management on whether time or budget must be allocated.
- The suitable approval levels
- Resource needs that have been identified

2.7 RISK MANAGEMENT AND ITS APPLICATION IN THE INDUSTRY OF CONSTRUCTION

A study by Laryea and Hughes (2009) showed that management of risk in the construction industry has varying focus in firms and organizations. At the top management level, risk management involves finances. The focus is on how certain business deliveries and risk management caters on ensuring the best business portfolio is had and has varying products in the various markets. Risks encountered at this stage involve the presence of a strong economy having sound outflow of cash and investments that yield results (Laryea and Hughes, 2008).

The management of construction firms have the responsibility of ensuring that project risk management is applied in organizations and then finding systems for controlling them. Bigger construction firms possess their own recommendations regarding insurance for projects and they also have units dedicated to handling insurance issues.

In order to safeguard the economy when large insurance situations happen, bigger organizations undertake re-insurance. Small companies are however fully dependent on outside insurance agencies. Premiums mainly depend on the ability of the company to manage business well in spite of the involvement of external insurance agencies or internal insurance firms. When firms have their own insurance in the organization, it is important to determine the rate of using this internal insurance. When less insurance is utilized, it cases more profits to be retained in the organization. When the construction firm has a good performance and experiences limited losses, this also reduces external premiums and is ultimately beneficial at the end.

2.8 DETERMINATION OF SKILLS AND ROLES REQUIRED OF PROJECT MANAGERS IN RISK MANAGEMENT

There have been debates and ambiguities regarding the roles and skills that are needed by project managers in order to control and mitigate the risks that arise in the construction sector. A study by Jha (2013) established that the major task of a project manager is seen in the pre contract and pre construction stage where a lot of planning takes place. At these stages, the project manager is involved in responsibilities such as: preparing the preliminary schedule for construction works, drawing a schedule to delivered in time according to client's specifications, delineation of project requirements, allocating of new resources, review planning as well as setting goals (Lianying *et al.*, 2012).

Contrasting views were however presented by Hopp and Spearman (2011) as well as Burdge and Robertson (2009) who posited that the major role of project managers is in administering projects. In this instance, project manager has the responsibility of managing project client, communicating issues, co-ordination of activities and managing of information flows. Egan (2012) proposed that the major role of a project manager is to make acquisitions that are needed for the construction project which includes consistently refining scope of project, identifying items that due for delivery and that have an effect on the procurement, scheduling and purchase of materials (PMI, 2008).

Due to risks in projects, project managers are always challenged to have to deal with various forms of issues in accomplishing set project goals within restricted budgetary and time constraints (El-Sabaa, 2001). Furthermore, project managers are required to assist in coordinating works of people from varying backgrounds so as to help attain set tasks at the same time having to cope with uncertainties, constraints and complexities associated with the project (Anantatmula, 2010). De-Ridder and Vrijhoef (2013) have pointed out that managers of projects must be concerned mainly with managing and the schedule of projects which include: understanding how manpower operates, applying materials to work, issuing of building codes and management of site logistics (CIRIA, 2013). According to Youn-Hoon (2005), project managers are the best professionals required to manage projects. Their tasks include drawing project plan and ensuring its execution as well as controlling the project till its final closure. Projects exist in varying areas like in engineering of design, engineering of production and engineering of industry and these all need project managers on board (Jha, 2013).

Harold (2003) also quipped that project managers are important and are responsible for achieving the set targets of the project. Very significant project management roles include

the development of realistic and attainable project goals that will help the requirements needed for the project. Project managers also have the additional responsibility of having to manage the triple constant which are cost, time, scope and nowadays includes safety (Harold, 2003).

There exist different roles which project managers need to have in order to manage risks. The first and ultimate skill required is management of time effectively. By becoming a project manager, time control is very important. When construction works are finished on time, this leads to a reduction in wasting of finance and other resources. Efforts are also minimized. Time management is acknowledged to have a positive bearing with the cost involved in undertaking a project. When managers are unable to finish their stipulated tasks within the right time, it will cause a delay in the time the project commences and will definitely have a negative impact on the finances and process of budgeting. Time management aids project managers to be increasingly effective when they allot the specific portion of time to every and each activity undertaken (Curran, 2009). Tasks and completed projects are divided into sub activities and are accomplished definitely within the set time. Management of time is a personal trait and good characteristic too. Signs of good time management include ability to be disciplined and punctual to achieve all set tasks within set period of time allocated. Project managers are required to focus upon developing good habits like being punctual so as to align effective professional and personal behaviour in the right manner (Jha, 2013). Benefits of time management is the skill to plan to undertake every tasks in the right way and other stakeholders involved in the construction project. Time management also aids in making effective decisions as determined by the situation and task at hand. Hence, time management is a personality skill and trait that affects how effective project managers are (Jha, 2013).

Management of resources is another crucial skill that has a bearing with how effective managers are and in their ability to reduce risks. Resource management involves managing resources such as the collection, processing and acquisition of raw materials at the right time as need (Schwalbe, 2013). It also involves inventory management, preventing over stocking as well as under stocking; attaining quality standards and effective price management. It must be noted that resource management needs technical acumen and knowledge. Project managers must focus on the tendency of effectively utilizing resources in the best manner to reduce costs and increase profits. Resource management also requires significant knowledge regarding different techniques and tactics that are used in project management to bring massive improvements in how projects work (Schwalbe, 2013). These tactics and strategies are useful for allocating resources to different departments in the most efficient ways and more significantly make available the resources. Resource management is treated as an area of expertise and field knowledge that relates to a specific field of knowledge. It is also a skill that is beneficial to both individuals and organizations. The major advantage of developing skills and expertise like resource management is that it leads to the maintaining of the quality of raw materials (Schwalbe, 2013). Project managers do provide preference in allocation of financial resources as requirements. Wastes are also greatly reduced since project managers are dedicated to controlling how resources are used in the project life cycle. Furthermore, project managers become better effective when they possess knowledge of novel techniques that are introduced in managing the project's resources. Curran (2009) argues that resource management is the second most important skill that is needed in becoming an efficient project manager. With the aid of these techniques and skills, projects become more effective and their usefulness is increased on a large scale. Construction projects require very effective and good leadership in summary (Simu,

2006).

KNUST

The logo of Kenya Methodist University (KNUST) is centered in the background. It features a red flame above a white cross, which is set against a yellow shield. The shield is flanked by two yellow wings. Below the shield is a yellow banner with the text 'WISDOM BEGETH VIRTUE' in black capital letters.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter is the third out of five for the research. It starts with the research design and is followed by the research design, population, sample size, sampling technique, research instrument, procedures for data collection and data analytical tools. Research methodology serves as the guide and blueprint for undertaking the research study. It is concerned with the operations of scientific methods and strategies that lead to valid knowledge that is vital and significant. Methodology describes the way and manner of acquiring knowledge as well as knowing ways of discovering what is truth. This chapter therefore sought to establish that.

3.2 RESEARCH STRATEGY

A research strategy may be confirmatory or exploratory. Research strategy is said to be confirmatory when it affirms outcomes or predictions that have been made before the

measurement phase of the research begins, that is, confirmatory research tests priori hypotheses (Ary *et al.*, 2018). An exploratory research tests or examines data-set to find any potential relations between variables, thus an exploratory research generates a posteriori hypothesis (Ary *et al.*, 2018). Research method is conventionally categorised into qualitative and quantitative. Qualitative research method uses data elicited from discussions, interviews, observations and focus groups to seek answers or get evidence (Flick, 2014). Data for qualitative research can also be collected by video or audio tape recording. Qualitative research method emphasizes details, making the use of small sample advisable (Lewis, 2015; Myers, 2000). Quantitative research method resorts to the use of mathematical, statistical and numerical analyses to seek answers or describe a phenomenon (Ercikan and Roth, 2006). Data for quantitative research are usually collected using surveys, polls and questionnaires. In using the quantitative research approach, large sample that is representative of a population is advisable (Denscombe, 2014; Davies and Hughes, 2014). A study is said to be descriptive when the subject of the study is closely observed and characterized without manipulating and controlling the data obtained (Kothari, 2004). The purpose of a descriptive study is to describe, explain or validate a finding (Nardi, 2018).

Research that is quantitative involves the systemic and scientific investigating of the properties that are quantitative and their relationships. Quantitative works are focused on behaviours that consist of measures and scales of observations or even both of them since they explain the causal relationship (cause and effect) among variables (Creswell, 2005). Quantitative study deals with numbers, their extent of impact, the quantity that needs counting as well as the analysis of the data. The aim of quantitative study is to come up with and test mathematical theories, frameworks, models as well as hypotheses that relate to natural phenomenon.

According to Ercikan and Roth (2006), measurement process is important and critical in quantitative research works since they serve as the bases for connecting empirical observations and expressions of mathematical relationships. Quantitative research normally uses significant methods like generating theories, models, hypotheses, as well as the developing of research instruments and measurements of experiments under control as well as the modification and manipulating of variables and the process of collecting data that is empirical, its modelling and analysis. Quantitative research study involving objectivism, positivism, and realism approaches are useful in investigating and explaining how a variable has an effect on another variable (Ercikan and Roth, 2006). Creswell (2005) explained that variables refer to the characteristics and attributes being studied by the researcher. Quantitative strategy is underpinned on the approaches of objectivism, positivism and realism. These are made up of various criteria such as using empirical approaches and objectives with a clarified design as well as relying on procedures and methods. Quantitative research establishes a distance between research participants and the researcher, quantification and measurement constructs; reliability and validity as well as precision and accuracy together with ethical considerations (Gall *et al.*, 2003).

There exist four research paradigms. These are constructivism, positivism, critical theory and post positivism. According to Flick (2014), paradigms refer to collection of beliefs and thoughts that guide actions. Paradigms are sub divided three groups called: ontology, epistemology and methodology. Epistemology refers to how the world is known.

Ontology is how real nature is while methodology is the knowledge gained in the world. Epistemology is a branch of research philosophy that is responsible for controlling the research process and structure (Ary *et al.*, 2018). Epistemology are the methodologies that inform about the state of knowledge or determining what qualifies to be a fact as

well as the place to seek knowledge. In other words, epistemology refers to the study of knowledge acquisition process and how it is validated (Gall *et al.*, 2003).

Quantitative research is the right way in research approach method allows researchers to freely make the choice of what to research most especially area of interest as well as enquiring specific and straight-to-the-point questions, goes ahead to gather numerical data from respondents as well as analysing data using statistics in unbiased and objective manners (Ary *et al.*, 2018).

The research strategy adopted for the study is a descriptive research design that comprised quantitative research approach.

3.3 RESEARCH APPROACH

There are two types of research approach. These are deductive and inductive approaches. The deductive research approach normally utilizes significant approaches like model generation, theory and hypothesis development, controlled and manipulated experiments, empirical data collection, analysing study results.

This means that deductive research results can be generalized to a larger population within acceptable error limits (Ary *et al.*, 2018). Inductive approach is geared towards the generation of theory from specific instances (Ary *et al.*, 2018).

This study adopted the deductive approach.

3.4 RESEARCH DESIGN

This is the systematic approach or strategy used to identify, investigate and analyse information on a research question or on a particular subject (Berg, 2004). The research design outlines the procedures used to collect data in finding answers to the ‘why’,

‘when’ and ‘how’ of a research questions or phenomenon (Johnson and Turner, 2003).

Data for quantitative research are usually collected using surveys and polls. This study adopted the survey design using questionnaire survey (Ary *et al.*, 2018).

Research survey is a platform used to answer questions raised as well as solve research questions and problems that arise. Surveys help in establishing baselines for making comparisons with the future and to analyse trends for the future as well as describing what exists and in its quantities and context. Survey research quantitatively describes definite aspects of given populations that have relationships among the variables. Survey also helps in the generalization of research from sample to cover data population. Both dependent and independent variables are determinants of defining survey research scope and before research starts, the researcher should establish a model of the relationship that exists among variables (Berg, 2004).

Johnson and Turner (2003) further establish that survey design comprises of two steps which are the sample plan development and getting the population estimate from the data sample. Sampling plan comprises selecting samples, determining adequate sample size as well as the media choice where the survey will be administered to respondents including face interviews, mails and phone interviews (Berg, 2004).

The purpose of using survey process is underpinned in the research philosophy and this enables data to be collected from several respondents to allow generalization of results (Johnson and Turner, 2003). Survey process was also chosen for this study since it allows for aggregating attitudes and opinions of respondents on the different elements being investigated (Johnson and Turner, 2003). Surveys are useful because they have the intention of investigating the relationship among key variables in the study. They also provide valid basis for rating and ranking of study variables as well as for testing significance using one sample t-test.

3.5 POPULATION AND SAMPLE SIZE

3.3.1 Population

The target population for the study consisted of D1K1 construction firms in Kumasi as well as consultancy firms. They should have been working for at least five years. From the website of the Ministry of Works and Housing, the population of 90 was obtained as the list of D1K1 contractors and consultants in good standing in Kumasi.

3.3.2 Sampling Technique

Sampling technique refers to the clear-cut plan adopted by the researcher to sample the target respondents who would participate in providing primary data for the study. It outlines the predetermined blueprint used in selecting respondents for the study and also entails how the respondents were selected. Sampling technique is also referred to as respondent recruitment strategy.

Purposive sampling coupled with snowball sampling techniques will be adopted in reaching the respondents. These strategies are adopted to help the researchers target professionals who have in-depth knowledge. Purposive sampling is when a researcher seeks to gain information from a particular place due to the experience and expertise of those targeted people. Snowball sampling led to one organization leading the researcher to other organizations with similar characteristics being sought for (Naoum, 2002).

3.3.3 Sample size

The population of 90 was obtained from the website of the Ministry of Works and Housing, as the list of D1K1 contractors and consultants in good standing in Kumasi.

Kish formula was used to determine the sample size (Kish, 1965).

$$n = n^1 (1 + \frac{n^1}{N}) \dots\dots\dots (1)$$

Where, n = the sample size, N = the total population size

$$n^1 = S^2/V_2 \dots\dots\dots (2)$$

V= the standard error of sampling distribution assumed to be 0.05

S= the maximum standard deviation of the population size (Total error of 0.05 @ 95% confidence level)

$$S^2 = P (1-P) \dots\dots\dots (3)$$

Where, P = the proportion of the population elements that belong to the defined class assumed to be 0.85

From eqn (3), $S^2 = P (1-P) = 0.85 (1- 0.85) = 0.1275$

From eqn (2), $n^1 = S^2/V_2 = 0.0979/0.05_2 = 51$

From eqn (1), $n= n^1 (1 + n^1/N) = 51 (1 + 51/90) = 79$ questionnaires

The sample size for the study is therefore 79 respondents from a population of 90 respondents.

3.6 TYPE OF DATA AND SOURCES

Both primary and secondary data sources were used for the study. Primary data encompass the information originally collected by a researcher for the particular purpose (Wahyuni, 2012). The primary data for the study comprised the information collected from the respondents using the questionnaires that were structured based on the objectives of the study. Secondary data are the information used by any person apart from the researcher who originally gathered that information (Wahyuni, 2012). For the study, the secondary data used included articles, journals and information from online sources and newspapers.

3.7 DATA COLLECTION TECHNIQUES

Data basically refers to statistics or facts of quantitative or qualitative variable that have been collated for the purpose of analysis or reference (Ary *et al.*, 2018). Instruments of data collection are the tools used for eliciting and recording or documenting the primary data for the study. Instruments of data collection comprised questionnaires, interviews, audio tape and video recorder among others (Ary *et al.*, 2018). For the purpose of our study, questionnaires are the instrument of data collection.

According to Ary *et al.* (2018), the purpose of survey questionnaires is to target a person or group of persons and seek their views and opinions regarding a phenomena being studied. Survey questionnaires are advantageous since they have the potential of being accessible to large number of people as well as to population that is geographically dispersed and data gathered by way of participation that is voluntary and devoid of both force and compulsion. There should also be reduced bias by the researcher and time for filling the questionnaire or partaking in the research should not be too much. Good questionnaires are made up of questions that consist of varying information types obtained from respondents (Wahyuni, 2012). Questionnaires are normally kept brief and questions well organized in an orderly manner without ambiguity thereby not being double barreled.

Quantitative researchers use interval and ordinal scales and among these two, interval scales are the ones that give the most varying choices in terms of responses and are more analysed with rigorous statistical tools (Wahyuni, 2012). Likert scales are useful for measuring attitudes and the use of Likert scales give study researchers the opportunity of building differences, measuring differences, measuring attitudes and generating hard data from respondents as it offers data like frequencies with responses that are flexible and have a link between quantity and opinion. According to Nardi (2018), Likert scale is a

response form of scale useful for measuring responses to sets of questions and statements. It is also used to measure level of differences. Over the years in research works, perceptions as well as attitudes have been measured on five point Likert scales and their variants.

There are four major considerations while designing questionnaires. These include: wording of questions, variable coding, categorization and general level of acceptance. Research instruments are normally preceded by clearly defined objectives which contribute to the research focus. Good research question is one that produces valid and reliable measure of something being described. Survey questionnaires have questions that match the level of education of respondents (Nardi, 2018). Both response and question options must not be ambiguous to the one undertaking the research and the one answering it. Wordings must avoid alternate interpretations and should not be incomplete statements that can easily be misinterpreted. Questions must not be combined such that a part would have a negative response and the other part positive response.

The questionnaire for this study was designed having four parts, namely A, B, C and D. Part A is the respondents' profile and it contained questions on the demographic background of respondents. Parts B, C and D related to the specific objectives of the study.

3.8 DATA ANALYSIS

The software that aided in the analysis was Statistical Package for Social Sciences (SPSS) version 23. The main analytical tool adopted was descriptive statistics. Descriptive statistics involves the methods that are used to summarize and interpret data. Descriptive statistics during data analysis aids to easily comprehend huge data sets and also provides the opportunity to disseminate the results of the research to many people (Nardi, 2018).

Mean score ranking was also used in ranking the factors in order of significance by way of the mean and standard deviation figures. One sample t-test was used in testing the relative significance of the effects. According to Nardi (2018), one sample t-test is useful in establishing significance of research variables. This helps to ascertain if a sample's mean is different statistically from a hypothesized mean.

A single sample one sample t-test has the hypothesis as:

$H_0: U = U_0$;

$H_a: U <, > U_0$

H_0 stands for the null hypothesis; H_a stands for the alternate hypothesis. U_0 stands for the mean that has been hypothesized. From past literature, Df (degree of freedom, which is an approximate of sample); mean of test group, strength value (t-value) and probability value (p-value) are often reported. Analytical tests on mean are conducted to ascertain whether population considers variables to be significant or not. Mean score ranking was used to express and rank the level of agreement by the respondents. Corresponding standard deviation and standard error means are also presented (Nardi, 2018). For every variable, null hypothesis was premised on the fact that the variable was not significant ($H_0: U = U_0$).

U_0 is the critical rating that sets the limit deemed to be acceptable and significant. For this study, the rates of 4 and 5 were deemed to be important on the Likert scale. 3.5 was set as the significant value.

3.9 CHAPTER SUMMARY

This chapter provided a description of the research design used for the study. It identified the type of research and the techniques available for use. It also described the means of

selecting the sample for the study and the types of respondents for the research. It identified the use of questionnaires as the research tool and went on to give the structure of questionnaires used and described the methods used for the analysis of the different types of questions used.

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CHAPTER FOUR

ANALYSIS OF RESULTS AND DISCUSSION

4.1 INTRODUCTION

This fourth chapter of this research work is the analysis of data obtained from distributing questionnaires to respondents. Softwares that were used for the analysis were Excel and Statistical Package for Social Sciences (SPSS). Four statistical tools were employed namely: simple frequencies (descriptive statistics), one sample t-test, mean score ranking and Cronbach Alpha. Seventy nine questionnaires were distributed and seventy retrieved. Response rate was therefore eighty-eight percent.

4.2 DEMOGRAPHY OF RESPONDENTS

Demographic background in any research work is important. It helps to know the profile of those partaking in the study as well as repose confidence in the findings arising from the work.

4.2.1 Gender of respondents

In this section, respondents for the study were asked to indicate their gender. Figure 4.1 below documents their responses. 40 respondents representing 57 percent of the respondents were males. The remaining 30 respondents representing 43 percent of respondents were females. The study has a fusion of male and female respondents which is good for the study. It can also be inferred that majority of respondents for the study are males.

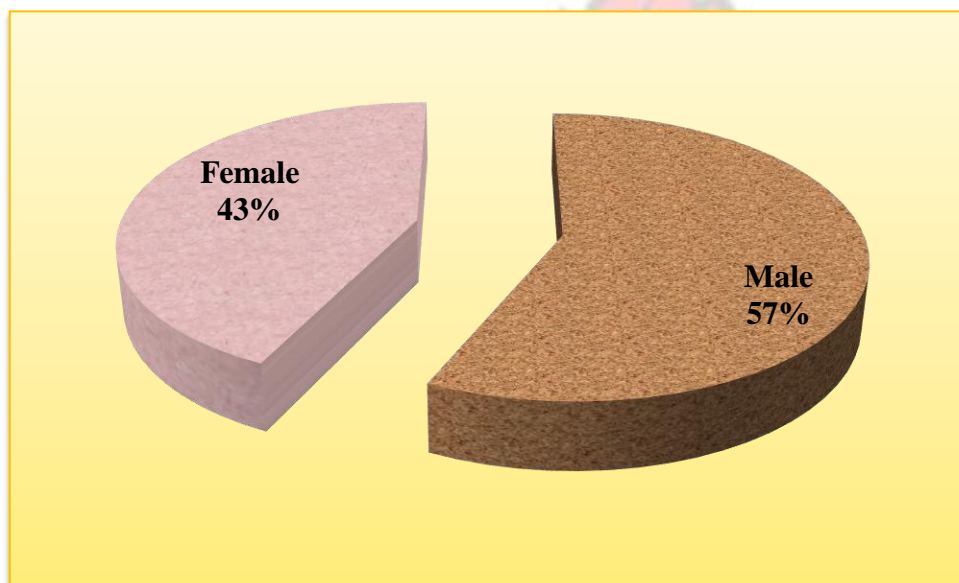


Figure 4.1 Gender of respondents

Source: Author's field study (2019)

4.2.2 Age of respondents

This part of the study sought to know from the respondents their ages. From Figure 4.1 below, 8 respondents representing 12 percent are 21-25 years. 19 respondents representing 27 percent are 26-30 years. 13 respondents representing 19 percent are 31-35 years. 11 respondents representing 15 percent are 36-40 years. 6 respondents representing 9 percent are 40-45 years. 4 respondents representing 6 percent are 46-50 years. The

remaining 8 respondents representing 12 percent are 51 years and above. It can be seen that the study is made up of different age groups and the highest age group range is 26-30 years.

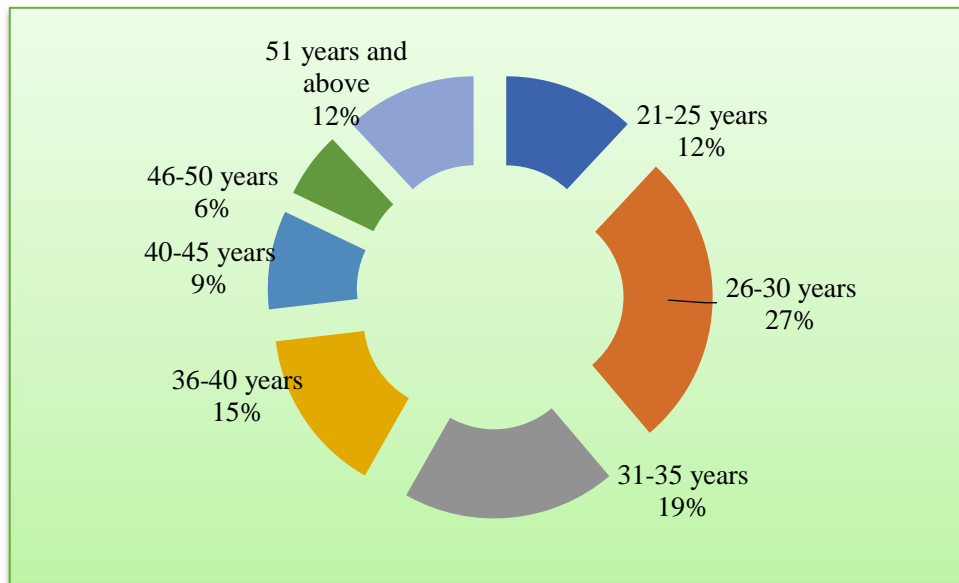


Figure 4.2 Age of respondents

Source: Author's field study (2019)

4.2.3 Highest level of education

Respondents for the study were asked to state their highest educational level. From Figure 4.3 below, 8 respondents representing 12 percent have Diploma. 50 respondents representing 72 percent have first degree while the remaining 11 respondents representing 16 percent have MBA/Masters. All the respondents for the study are well educated and their responses can be trusted. It can also be inferred that majority of respondents for this study have first degree.

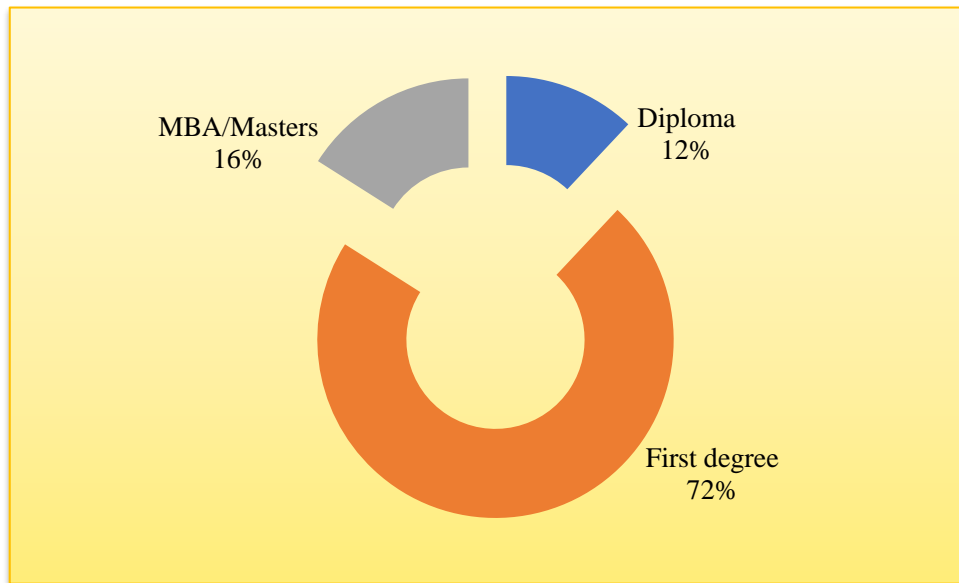


Figure 4.3 Highest level of education

Source: Author's field study (2019)

4.2.4 Years of experience in the insurance industry

The respondents were asked in this section to state their years of experience in the insurance industry. From Figure 4.4 below, 26 respondents representing 37 percent have less than 5 years of experience. 17 respondents representing 24 percent have 5-10 years of experience. 9 respondents representing 30 percent have 11-16 years of experience. The remaining 6 respondents representing 9 percent have 16 years and above experience. All the respondents for the study have enough and adequate experience in the insurance industry. Confidence can therefore be reposed in their responses.

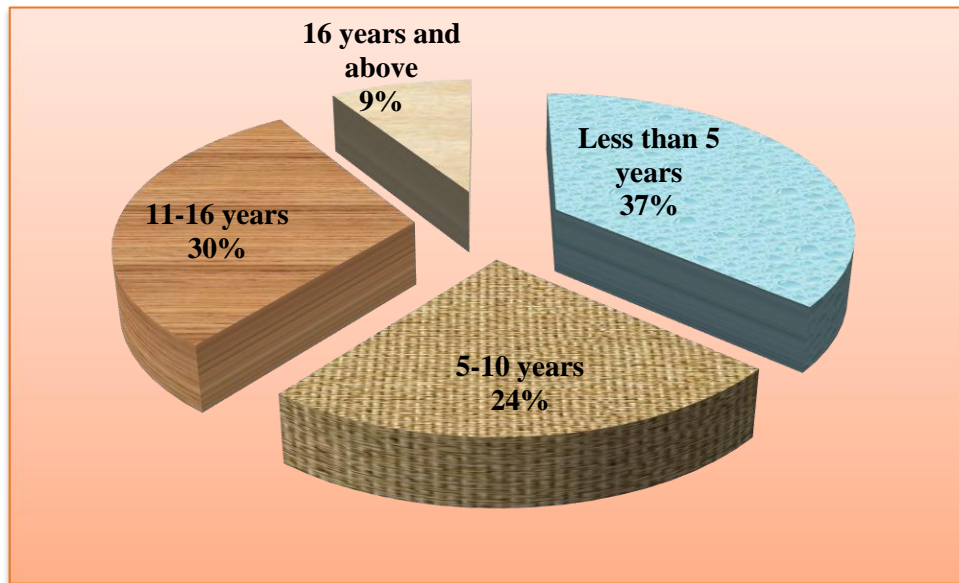


Figure 4.4 Years of experience

Source: Author's field study (2019)

4.3 RISK FACTORS THAT AFFECT CONSTRUCTION PROJECTS

This section of the study ranked the risk factors that affect construction projects. From Table 4.1 below, *Variations* was the firstly ranked variable having a mean of 4.58 and standard deviation value of 0.745. *Unrealistic contract duration* was the secondly ranked variable having a mean of 4.25 and standard deviation value of 0.903. *Unforeseen general conditions* was the thirdly ranked variable having a mean of 4.20 and standard deviation value of 1.021. *Delay in payment to contractor for work done* was the fourthly ranked variable having a mean of 4.18 and standard deviation value of 0.876. *Damages and delays during construction* was the fifthly ranked variable having a mean of 4.18 and standard deviation value of 1.102.

Risk is said to be an event or a situation that might have a positive or a negative consequence on some project objectives in circumstance it transpires. Risks are disruptions in route or gap in knowledge which donates to project threat (Webb, 2003).

The Project Management Institute (PMI, 2000) defines risks as the chance of an event happening and the impact on the objectives of the project. Risks are associated with various aspects of programs like constraints, operation needs and attributes. It also includes Key Performance Parameters (KPMs), WBS, technology, threats. It is essential to note that identifying risks is not just the project manager's responsibility but that of everyone (Laryea and Hughes, 2009).

Table 4.1 Risk factors that affect construction projects

RISK FACTORS	Mean	Std. Dev	Rank
Variations	4.58	0.745	1 st
Unrealistic contract duration	4.52	1.123	2 nd
Unforeseen general conditions	4.48	0.883	3 rd
Delay in payment to contractor for work done	4.47	0.868	4 th
Damages and delays during construction	4.47	1.037	5 th
Fluctuations (changes in cost)	4.42	0.956	6 th
Ineffective communication between consultants and contractors	4.39	1.130	7 th
Inadequate contractor experience	4.38	0.694	8 th
Labour shortage	4.37	1.003	9 th
Location and project restriction	4.35	0.566	10 th
Poor site management and supervision	4.35	1.045	11 th
Inaccurate materials estimating	4.31	0.879	12 th
Mistakes and discrepancies in design documents	4.26	0.943	13 th
Inadequate design team experience	4.26	1.209	14 th
Contractor failure to enter into contract	4.20	0.564	15 th
Errors in drawings	4.17	1.093	16 th

Low productivity	4.11	0.767	17 th
Injury to persons	3.98	0.972	18 th
Strikes and labour disputes	3.80	0.546	19 th
Shortage of materials in market	3.79	0.579	20 th
Injury to property	3.77	1.018	21 st
Ineffective communication between client and consultants	3.74	0.723	22 nd
Labour relations	3.69	0.656	23 rd
Long waiting time for approval of test samples	3.62	0.811	24 th
Long waiting time for approval of drawings	3.56	0.745	25 th

Source: Author's fieldwork (2019)

4.4 EFFECTS OF RISKS IN THE CONSTRUCTION INDUSTRY

This section of the study ranked effects of risks in the construction industry. From Table 4.2 below, *Loss to the economy* was the firstly ranked variable having a mean of 4.41 and standard deviation value of 0.845. *Time overrun* was the secondly ranked variable having a mean of 4.37 and standard deviation value of 0.785. *Cost overrun* was the thirdly ranked variable having a mean of 4.35 and standard deviation value of 0.685. *Conflicts between stakeholders* was the fourthly ranked variable having a mean of 4.29 and standard deviation value of 0.648. *Late site hand over* was the fifthly ranked variable having a mean of 4.28 and standard deviation value of 0.563.

Project risks exist in the future, and can be an event or a circumstance, that if it occurs affect at least one project goal. The affected goal can be scope, time, cost or quality for example (Fisher, 2011). A circumstance can be requirements, assumptions, restriction or condition where an example can be an environmental permit to carry out work (Yang *et al.*, 2011). The internal environment of a project or organization can lead to that risky

situations arise, where lack of project management culture, management system and dependencies on external participants are examples (Project Management Institute, 2008).

Conflicts are more likely to emerge in certain aspects of project management such as manpower resources (staffing), personality conflicts, administrative procedures, project priorities, technical conflicts, schedules, and cost objectives (Hyväri, 2006). These conflicts can cause major project management problems such as inadequate resources, meeting unrealistic deadlines, unclear goals, uncommitted team members, insufficient planning, breakdowns in communications, changes in goals and resources, and inconsistency between departments or functions (Pinto, 2007).

The findings of this study agree with past literature.

Table 4.2 Effects of risks in the construction industry

EFFECTS	Mean	Std. Dev	Rank
Loss to the economy	4.41	0.845	1 st
Time overrun	4.37	0.785	2 nd
Cost overrun	4.35	0.685	3 rd
Conflicts between stakeholders	4.29	0.648	4 th
Late site hand over	4.28	0.563	5 th
Inability to occupy building project on time by end users	4.20	0.897	6 th
Reduction of employment opportunities	4.16	0.765	7 th
Wastage of resources	4.15	1.034	8 th
Decrease in revenue accruing from project	4.12	1.009	9 th
Disputes	4.10	0.945	10 th
Disappointment of end users of project	4.06	0.867	11 th

Arbitration	4.02	0.768	12 th
Decrease in economic activities	3.95	0.894	13 th
Litigation	3.93	0.743	14 th
Lowering of living standards	3.89	1.012	15 th

Source: Author's fieldwork (2019)

4.4.1 One Sample T-test on effects

All the factors had t-values (the strength of the test) that were positive indicating that their means were above the hypothesized mean of 3.5 and this is confirmed in Table 4.2 where all factors had means of above 3.5. Almost all of the factors had a p-value (significance of the test) less than 0.05 and this implies that the means of these variables are not significantly different from the hypothesized mean of 3.5.

However, the factors *Late site hand over* and *Decrease in revenue accruing from project* had p-values of 0.611 and 0.701 which are greater than 0.05 indicating that their means are significantly different from 3.5.

Table 4.3 One-Sample Test of effects

Test Value = 3.5						
	<i>t</i>	<i>Df</i>	<i>Sig. (2-tailed)</i>	<i>Mean Difference</i>	<i>95% Confidence Interval of the Difference</i>	
					<i>Lower</i>	<i>Upper</i>
Loss to the economy	8.537	69	.000	.67647	.3731	.9798
Time overrun	3.600	69	.171	.26471	.6494	.1200
Cost overrun	6.093	69	.000	.79412	.5290	1.0593
Conflicts between stakeholders	2.022	69	.314	.17647	.5277	.1748

Late site hand over	.417	69	.611	.08824	.5187	.3423
Inability to occupy building project on time by end users	4.616	69	.116	.26471	.0686	.5980
Reduction of employment opportunities	3.463	69	.000	.61111	.3946	.8276
Wastage of resources	1.237	69	.225	.20588	.5444	.1326
Decrease in revenue accruing from project	.148	69	.701	.02941	.3756	.4345
Disputes	3.196	69	.000	.22222	.0009	.4435
Disappointment of end users of project	2.839	69	.006	.25926	.0761	.4424
Arbitration	1.616	69	.116	.26471	.0686	.5980
Decrease in economic activities	1.400	69	.171	.26471	.6494	.1200
Litigation	1.022	69	.314	.17647	.5277	.1748
Lowering of living standards	.000	69	1.000	.00000	.3568	.3568

4.5 SKILLS REQUIRED BY PROJECT MANAGERS FOR MANAGING RISKS IN CONSTRUCTION PROJECTS

This section of the study ranked the skills required by project managers for managing risks in construction projects. From Table 4.4 below, *Ability to identify risks* was the firstly ranked variable having a mean of 4.39 and standard deviation value of 0.594. *Monitoring and evaluation of project* was the secondly ranked variable having a mean of 4.35 and standard deviation value of 0.665. *Risk Analysis* was the thirdly ranked variable having a mean of 4.34 and standard deviation value of 0.796. *Contract administration*

was the fourthly ranked variable having a mean of 4.32 and standard deviation value of 0.696. *Team leadership* was the fifthly ranked variable having a mean of 4.30 and standard deviation value of 0.668.

According to Tonnquist (2010), a project is a temporary endeavour with clearly defined goals and specific target. Projects have a clearly spelt out starting and finishing points and are restricted by budgets. Projects are normally apportioned into phases and stages as well as defined milestones to mark the beginning and ending of phases. These phases are useful in making it more convenient to get a better structured work and also to have focus on the most important tasks (Koskela and Howell, 2008). A research carried out by Project Management Institute (PMI) (2008) posited that project risk management is one of the areas out of the nine areas that is crucial for the success of a project. Each and every project has its inherent risks as soon as it starts and the role of the project manager is important in determining the success or failure of the project (Ashleigh, 2012). A study by Jha (2013) established that the major task of a project manager is seen in the pre contract and pre construction stage where a lot of planning takes place. At these stages, the project manager is involved in responsibilities such as: preparing the preliminary schedule for construction works, drawing a schedule to be delivered in time according to client's specifications, delineation of project requirements, allocating of new resources, review planning as well as setting goals (Lianying *et al.*, 2012). Contrasting views were however presented by Hopp and Spearman (2011) as well as Burdge and Robertson (2009) who posited that the major role of project managers is in administering projects. In this instance, project manager has the responsibility of managing project client, communicating issues, co-ordination of activities and managing of information flows. Egan (2012) proposed that the major role of a project manager is to make acquisitions that are needed for the construction project which includes consistently refining scope of

project, identifying items that due for delivery and that have an effect on the procurement, scheduling and purchase of materials (PMI, 2008).

There exist different roles which project managers need to have in order to manage risks. The first and ultimate skill required is management of time effectively. By becoming a project manager, time control is very important. When construction works are finished on time, this leads to a reduction in wasting of finance and other resources. Efforts are also minimized. Time management is acknowledged to have a positive bearing with the cost involved in undertaking a project. When managers are unable to finish their stipulated tasks within the right time, it will cause a delay in the time the project commences and will definitely have a negative impact on the finances and process of budgeting. Time management aids project managers to be increasingly effective when they allot the specific portion of time to every and each activity undertaken (Curran, 2009). Tasks and completed projects are divided into sub activities and are accomplished definitely within the set time. Management of time is a personal trait and good characteristic too. Signs of good time management include ability to be disciplined and punctual to achieve all set tasks within set period of time allocated. Project managers are required to focus upon developing good habits like being punctual so as to align effective professional and personal behaviour in the right manner (Gharebaghi and McManus, 2003). Benefits of time management is the skill to plan to undertake every tasks in the right way and other stakeholders involved in the construction project. Time management also aids in making effective decisions as determined by the situation and task at hand. Hence, time management is a personality skill and trait that affects how effective project managers are (Gharebaghi and McManus, 2003).

Management of resources is another crucial skill that has a bearing with how effective managers are and in their ability to reduce risks. Resource management involves managing resources such as the collection, processing and acquisition of raw materials at the right time as need (Schwalbe, 2013).

The findings of this study agree with past literature.

Table 4.4 Skills required by project managers for managing risks in construction projects

SKILLS	Mean	Std. Dev	Rank
Ability to identify risks	4.39	0.594	1 st
Monitoring and evaluation of project	4.35	0.665	2 nd
Risk Analysis	4.34	0.796	3 rd
Contract administration	4.32	0.696	4 th
Team Leadership	4.30	0.668	5 th
Strategic Influencing	4.28	0.589	6 th
Cost Estimating	4.26	0.413	7 th
Activity Planning and Sequencing	4.24	1.003	8 th
Monitoring and Reporting Progress	4.20	1.090	9 th
Developing Schedules	4.17	0.987	10 th
Developing a Budget	4.13	0.932	11 th
Managing Risks and Issues	4.11	1.023	12 th
Time Estimating	4.10	0.984	13 th
Documentation	4.05	0.756	14 th
Planning and Defining Scope	4.01	0.611	15 th
Creating Charts and Schedules	3.98	0.654	16 th
Business Partnering	3.92	0.768	17 th
Resource Planning	3.89	1.102	18 th

Controlling Quality	3.77	0.895	19 th
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Source: Author's fieldwork (2019)

4.6 RELIABILITY OF THE RESPONSES RECEIVED

This section sought to check the internal consistency of the responses of this study by conducting a reliability analysis. From the Cronbach's Alpha coefficient value from the variables as shown in Table 4.5, the value was 0.812. This is above the cut-off limit of 0.700 thereby implying that all the responses are reliable.

Table 4.5 Reliability Statistics

	Number of Items	Cronbach's Alpha Coefficient
Variables	48	0.812

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The previous chapters of this study were the introduction, literature review, methodology and findings respectively. Chapter five presents the summary of findings of the study based on the data collected from the field. Furthermore, it concludes the study and makes

recommendations on the roles of project managers in risk management in the construction industry of Ghana.

5.2 ACHIEVEMENT OF RESEARCH OBJECTIVES

5.2.1 Risk factors that affect construction projects

Analysis was by mean score ranking. This was the order of importance: Variations; Unrealistic contract duration; Unforeseen general conditions; Delay in payment to contractor for work done; Damages and delays during construction

5.2.2 Effects of risks in the construction industry

The analysis was done using mean score ranking. The following were the most important findings: Loss to the economy; Time overrun; Cost overrun; Conflicts between stakeholders; Late site hand over.

5.2.3 Skills required by project managers for managing risks in construction projects

The analysis was done using mean score ranking. The following were the most important findings: Ability to identify risks; Monitoring and evaluation of project; Risk Analysis; Contract administration; Team Leadership.

5.3 CONCLUSION

Projects are often inherent with risks and uncertainties and the ability of project managers to succeed with these risks can be the failure or success of the project endeavour. Management of resources is a crucial skill that has a bearing with how effective managers are and in their ability to reduce risks. Resource management involves managing resources such as the collection, processing and acquisition of raw materials at the right time as need.

5.4 RECOMMENDATIONS

- There should be increased education on the need for construction firms to formalize risk management.
- Risk management procedures should be fully documented and adhered to in construction companies.
- A common risk framework must be adopted and implemented across the organization
- Regular audits of risk management policies and standards should be carried out for compliance with regulatory standards
- Top management should be strongly committed to the risk management process

5.5 DIRECTION FOR FURTHER RESEARCH

This study was conducted in Kumasi. Future studies should be conducted in other parts of Ghana in order to lead to generalization.

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APPENDIX

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY DEPARTMENT OF CONSTRUCTION TECHNOLOGY MSC PROJECT MANAGEMENT

QUESTIONNAIRE

**TOPIC: DETERMINATION OF SKILLS REQUIRED BY PROJECT MANAGERS
FOR MANAGING RISKS IN CONSTRUCTION PROJECTS**

I am an MSc Project Management student of the Kwame Nkrumah University of Science and Technology (KNUST) conducting a research determination of skills required by project managers for managing risks in construction projects.

This is purely for academic purposes. All information will be treated with strict confidentiality and your response would be highly appreciated for the success of the research. Kindly respond to the question by ticking the appropriate box for each item.

PART ONE: RESPONDENT PROFILE

1. Which of the categories do you belong to?

- ☐ Contractor
☐ Consultant

2. What is your highest level of education?

- ☐ HND
☐ First degree (BA/BSc) ☐ Masters (MSc/MPhil) ☐
☐ PhD ☐ Other (specify)

.....

3. How many years of experience do you have in the construction industry?

- ☐ Less than 5 years
☐ 5 - 10 years
☐ 10 – 15 years
☐ 16 years and above

4. How many projects have you undertaken within the last five years?

- ☐ Less than 5
☐ 5 - 10
☐ 10 – 15
☐ 16 and above

5. Do you have any experience in risk management?

- ☐ Yes
☐ No

RISK FACTORS THAT AFFECT CONSTRUCTION PROJECTS

Below are some risk factors that affect construction projects. Please indicate the level of severity using the following Likert scale. [1=Not severe; 2=Less severe; 3=Moderately severe; 4= Severe; 5=Very severe]. Please tick (✓) in the space provided.

Nr	RISKS	1	2	3	4	5
1	Damages and delays during construction					
2	Contractor failure to enter into contract					
3	Poor site management and supervision					
4	Inadequate contractor experience					
5	Inadequate design team experience					
6	Long waiting time for approval of test samples					
7	Labour shortage					
8	Strikes and labour disputes					

9	Labour relations					
10	Delay in payment to contractor for work done					
11	Unforeseen general conditions					
12	Injury to persons					
13	Injury to property					
14	Variations					
15	Fluctuations (changes in cost)					
16	Shortage of materials in market					
17	Inaccurate materials estimating					
18	Mistakes and discrepancies in design documents					
19	Errors in drawings					
20	Ineffective communication between consultants and contractors					
21	Long waiting time for approval of drawings					
22	Unrealistic contract duration					
23	Low productivity					
24	Ineffective communication between client and consultants					
25	Location and project restriction					
	Any other, please state and rank					

EFFECTS OF RISKS IN THE CONSTRUCTION INDUSTRY

Below are some effects of risks in the construction industry. Please indicate the level of severity using the following Likert scale. [1=Not severe; 2=Less severe; 3=Moderately severe; 4= Severe; 5=Very severe]. Please tick (√) in the space provided.

No.	EFFECTS	1	2	3	4	5
1	Time overrun					
2	Conflicts between stakeholders					
3	Cost overrun					
4	Disappointment of end users of project					
5	Disputes					

6	Reduction of employment opportunities					
7	Decrease in revenue accruing from project					
8	Arbitration					
9	Loss to the economy					
10	Wastage of resources					
11	Lowering of living standards					
12	Late site hand over					
13	Inability to occupy building project on time by end users					
14	Litigation					
15	Decrease in economic activities					
	Any other, please state and rank					

SKILLS REQUIRED BY PROJECT MANAGERS FOR MANAGING RISKS IN CONSTRUCTION PROJECTS

Rank on a Likert scale skills required by project managers for managing risks in construction projects. *Please answer by ticking (✓) the corresponding boxes.*

1- Not important, **2-** Less important, **3-** Moderately important, **4-** Important, **5-** Very important

SKILLS					
	1	2	3	4	5
Ability to identify risks					

Developing a Budget						
Monitoring and Reporting Progress						
Team Leadership						
Developing Schedules						
Strategic Influencing						
Cost Estimating						
Time Estimating						
Managing Risks and Issues						
Planning and Defining Scope						
Contract administration						
Creating Charts and Schedules						
Monitoring and evaluation of project						
Business Partnering						
Controlling Quality						
Activity Planning and Sequencing						
Documentation						
Resource Planning						
Risk Analysis						
Any other please state and rank						