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EVALUATION OF RISK MANAGEMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

by
UGWU MOSES CHUKWUEBUKA

A DISSERTATION
Submitted in fulfilment of the requirements for the degree

MAGISTER TECHNOLOGIAE

in

CONSTRUCTION MANAGEMENT

in the

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

at the

UNIVERSITY OF JOHANNESBURG

SUPERVISOR: PROF. C.O. AIGBAVBOA
EVALUATION OF RISK MANAGEMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

UGWU MOSES CHUKWUEBUKA

SUPERVISOR: PROF. C.O AIGBAVBOA

A DISSERTATION submitted in partial fulfilment of the award of the degree Magister Technologiae in Construction Management in the Faculty of Engineering and the Built Environment, Department of Construction Management and Quantity Surveying at the University of Johannesburg, Republic of South Africa.

JOHANNESBURG, SEPTEMBER 2018
DECLARATION

I, UGWU MOSES CHUKWUEBUKA, do hereby declare that this dissertation is the result of my own investigation and research, except to the extent indicated in the references and by comments included in the body of the report and that it has not been presented elsewhere for a similar purpose. It was submitted to the University of Johannesburg (Department of Quantity Surveying and Construction Management), as a requirement to obtain a MAGISTER TECHNOLOGIAE degree in Construction Management.

________________________
Signature

_____________________
Date

University of Johannesburg
Doornfontein
ACKNOWLEDGEMENTS

First and foremost, I would like to expression my gratitude to Almighty God. I am forever grateful for the ability to visualize, plan, and implement anything I put my mind to through the power of dominion that He has vested in me. Furthermore, my expressions of gratitude are directed to God once more for His omnipresent Holy Spirit which has protected and guided me all of my life, giving me strength and wisdom, and which has brought me this far.

I wish to express my sincere thanks and appreciation to the following people for their assistance, guidance and contribution to this study:

- My supervisor, Prof. Clinton Aigbavboa, for his professional and expert guidance throughout the course of this study;
- Statkon for data input and analysis. My special thanks go to Juliana Van Staden for the countless hours spent working with me;
- All the respondents for their time in completing the questionnaire;
- My brother and sisters for their support and encouragement (Ugwu Christopher.O., Ugwu Euphemia.N., Ugwu Victor.C., Ugwu Stanley.A., and Ugwu Njideka, A.);
- Rev. Father Cyril Eze for his expert guidance;
- My friends: Charles Arum, Olufemi Adetayo Ogunlowo, Ugwu Francis Chukwudi, Ozougwu Onyedika, Ugwu Onyedika; and
- My employer, Surv.Ozoude Chidiebere, for the support and encouragement to always work hard.

Finally, I would like to express my profound gratitude to the Department of Construction Management and Quantity Surveying, University of Johannesburg, South Africa for giving me the opportunity to study with them.
DEDICATION

I dedicate this Dissertation to my parents, Ikanga Moses Ugwu Ozoani and Mrs Philomena Ozoani.
ABSTRACT

The construction industry is characterized by an array of risks that can hinder construction managers in the fulfilment of the objectives of a construction project. If these risks are not properly evaluated before the commencement of a construction project, they could lead to project abandonment. This has been one of the major problems of the developing nations’ construction industry. Nigeria is one such nation. Hence, this study was focused on the Nigerian construction industry and how the industry players have been able to respond to risks that occur during construction projects.

This study evaluated the factors that affect the management of construction risks in the Nigerian construction industry, the methods of risk management adopted by the industry players in the management of construction risks in Nigeria, the effectiveness of these methods and the extent to which the factors that influence risk management affect the Nigeria construction industry. This study adopted a questionnaire approach in collecting primary data. These questionnaires were distributed to construction professionals located in Lagos, Port Harcourt and the Federal Capital Territory (FCT) which happen to be cities in Nigeria where construction work is prominent. A total of 200 questionnaires were administered through Google Forms. Out of the total, 150 completed questionnaires were validated as sufficient to answer the research questions and test whether the research objectives had been met. This represents a 75% response rate. So as to ensure the reliability of the data gathered through the questionnaire, a Cronbach’s alpha coefficient reliability test was carried out. Data obtained were analysed using descriptive statistics and exploratory factor analysis (EFA).

Further analysis carried out on the data using exploratory factor analysis analysis to determine the correlation and reliability of the factors revealed that construction project managers should ensure that the history, team size, delivery time, management stability, experience and availability of resources are checked before the commencement of any project as this reduces the occurrence of risk. Factor analysis was also carried out on the remaining research questions and a general conclusion was reached, namely that the Nigerian construction industry is seen to adopt industry best practices in construction risk management through the use of identifying, assessing, responding, and control processes. The study recommends that practitioners in the industry need to increase the awareness of risks related to construction projects and to ensure its members are trained and updated with evolving construction risks and their management. Also, a certifying body should be put in place that regulates the activities of construction practitioners in the country so to ensure proper conformance to the laid down standards.
**Keywords:** Risk management, Construction risk, Nigerian construction industry, Risk assessment, Risk control planning, Risk identification
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<tr>
<td>AECFM</td>
<td>Architecture, Engineering, Construction and Facility Management</td>
</tr>
<tr>
<td>AECOM</td>
<td>Asian Construction Outlook</td>
</tr>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>ANC</td>
<td>African National Congress</td>
</tr>
<tr>
<td>APC</td>
<td>All Progressive Congress</td>
</tr>
<tr>
<td>BBC</td>
<td>British Broadcasting Corporation</td>
</tr>
<tr>
<td>BN</td>
<td>Barisan Nasional</td>
</tr>
<tr>
<td>CCP</td>
<td>Chinese Community Party</td>
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<tr>
<td>CFA</td>
<td>Confirmatory factor analysis</td>
</tr>
<tr>
<td>CIB</td>
<td>International Council for Building</td>
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<tr>
<td>CIDB</td>
<td>Construction Industry Development Board</td>
</tr>
<tr>
<td>CITP</td>
<td>Construction Industry Transformation Programme</td>
</tr>
<tr>
<td>DAF</td>
<td>Do-and-fix</td>
</tr>
<tr>
<td>EFA</td>
<td>Exploratory factor analysis</td>
</tr>
<tr>
<td>ERP</td>
<td>Economic Recovery Programme</td>
</tr>
<tr>
<td>FCT</td>
<td>Federal Capital Territory</td>
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<tr>
<td>FDI</td>
<td>Foreign direct investment</td>
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<tr>
<td>FET</td>
<td>Further Education and Training</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GhIS</td>
<td>Ghana Institution of Surveyors</td>
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<tr>
<td>GIA</td>
<td>Ghana Institute of Architects</td>
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<tr>
<td>GIE</td>
<td>Ghana Institution of Engineers</td>
</tr>
<tr>
<td>GIOC</td>
<td>Ghana Institute of Construction</td>
</tr>
<tr>
<td>GNU</td>
<td>Government of National Unity</td>
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<tr>
<td>GoG</td>
<td>Government of Ghana</td>
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<td>GSS</td>
<td>Ghana Statistical Service</td>
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<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>HIPC</td>
<td>Heavily indebted poor countries</td>
</tr>
<tr>
<td>HIV</td>
<td>Human immunodeficiency virus</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and communication technology</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>KMO</td>
<td>Kaiser-Meyer-Olkin</td>
</tr>
<tr>
<td>MCA</td>
<td>Malaysian Chinese Association</td>
</tr>
<tr>
<td>MDGs</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>MIC</td>
<td>Malaysian Indian Congress</td>
</tr>
<tr>
<td>MMDAs</td>
<td>Metropolitan, Municipals and District Assemblies</td>
</tr>
<tr>
<td>NBS</td>
<td>National Bureau of Statistics</td>
</tr>
<tr>
<td>NDP</td>
<td>National Development Plan</td>
</tr>
<tr>
<td>NNC</td>
<td>Native National Congress</td>
</tr>
<tr>
<td>NP</td>
<td>National Party</td>
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<tr>
<td>PMIP</td>
<td>Pan Malaysian Islamic Party</td>
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<tr>
<td>PPP</td>
<td>Public-private partnerships</td>
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<tr>
<td>PVC</td>
<td>Polyvinyl chloride</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Science</td>
</tr>
<tr>
<td>TRC</td>
<td>Truth and Reconciliation Commission</td>
</tr>
<tr>
<td>UMNO</td>
<td>United Malaysian National Organization</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNIDO</td>
<td>United Nations Industrial Development Organization</td>
</tr>
<tr>
<td>WTO</td>
<td>World Trade Organization</td>
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CHAPTER ONE

1.0 INTRODUCTION

One of the major important factors in a country’s development is the construction industry. This is because the provision of infrastructures which a country requires as necessity e.g. roads, power plants, mega projects and many other projects cannot be established without construction as a part of it (Yimam, 2011). Some authors opined that construction projects are laden with risks when compared to other projects due to the very nature of the activities that are involved in construction projects (Akintoye and Macloed, 1997; Dey, 2001). Smith et al. (2006), posited that risk is an unforeseen event which occurs in the course of construction activities.

Hiley and Paliokostas (2001) affirmed that the construction sector is a risky industry characterised with uncertainty when related with other industries. This is because of the complexity of construction activities, the processes involved, environment or location as well as organization (Khodeir and Mohammed, 2015). According to Ameh et al., (2010) and Mahamid (2013), the project within the construction industry is tainted with overruns. The authors related the overruns experience within the industry to risk surrounding construction projects. In fact, Abderisak and Lindahl, (2015), reported that the initial budgets of many construction projects have been exceeded with an increase in the cost up to the range of 50 - 100% and sometimes beyond 100% in some cases. The inability to achieve the desired objectives of the construction projects is usually an aftermath of the occurrence of risks in construction works. The consequences of poor management of risks could be financial loss, reputation damage as well as loss of future business hence a systematic risk management must be effected to address the risk associated with construction projects (Abdul-Rahman, 2015).

The major factors that grow risks in construction projects include various stakeholders, long period of construction and the interactions between internal and external parts of a project (BSI, 2006). Nevertheless, several approaches exist in literature in relation to the factors and features of projects that makes risk to be more prominent in the construction industry. According to Dey, (2001), the complexity of planning and design, environmental changes, economic and political instability, availability of resources, the presence of various interest groups and
climate change. Zou et al., (2007), highlighted complicated process, a dynamic organization structure, the complexity of technology and organization, and various interests of stakeholders, complicated environment and the need for investment as factors that make risk to be prominent in the construction industry. Ghani, (2009), posited that high life cycle design, size, complexity, location, those involved in the construction work and the level of familiarity with the performer’s work to be executed are the reasons and main features of projects that make the industry to be exposed to more risks. In addition, the unpredictability in the performance, objectives of cost, time and quality, the uncertainty linked with different aspects which include lack of clarity as a result of the behaviour of actors and lack of data as well as information are the main factors listed by Chapman and Ward, (2003) in their study.

Project Management Book Of Knowledge (2013), avowed that the management of risk is a wide concept and it entails the process of assessing uncertain factors that could hinder the objectives of the project. Towards achieving optimum risk management, the project manager or main contractor should utilize previous occurrence for assessing the risk. The main principle behind risk management is not the elimination of the whole risks but having a proper control over the whole risks. Many predictable and unpredictable risks are inherent in construction project as a result of the different sources of uncertainty which can be attributed to the nature of industry. The main goal of risk management in a construction project includes project completion within the estimated time and cost within the stipulated quality (Abd El-Karim et al., 2015).

The strategies utilized for managing risk in Nigerian construction sector is at the infancy stage in comparison to other developed countries. Odeyinka et al., (2007), affirmed that construction project in Nigeria is branded with cost overruns and delays. Consequently, this study seeks to evaluate the present level of risk management practice in Nigeria. The findings of Odunsami et al., (2002), asserted that improving the practice for managing risk of construction projects in Nigeria is crucial for improving the performance of the industry.

It is obvious that lessons from researches conducted on risk management assessment in the developed countries will be of benefit to the management of risk in Nigerian construction industry hence; this will be reviewed in subsequent chapters. Nevertheless, the peculiarity and uniqueness of the Nigerian construction industry with regards to its economic environment, political make-up and culture calls for a detailed analysis of risk management in the Nigerian construction industry, therefore this study will focus on this as well. According to Winegard
and Warhoe, (2003), risk management involves risk identification, evaluation and analysis of risk, risk reduction development and response to threats, risk management plan implementation and risk assessment review. This research will also offer recommendations towards improving risk management practice after assessing the factors that will increase risk management practice.

1.2 RESEARCH PROBLEM STATEMENT

The construction industry in Nigeria is highly troubled with avoidable risks due to several factors. Poor project performance or outright failure in some cases is due to dependence on the budget of the government and are also prone to red tapes and bureaucracies, complicated processes, long periods, corruption, unfavorable environments, unrealistic time schedule, inadequate budget, failure to meet required quality standards etc. It is quite saddening that rather than engage in risk management, most project managers do not take precautionary measures against these risks until they arise and result in project failure.

There is however a very strong correlation between risk management and successful project completion but, there are very few research work on risk management in the Nigerian space despite the obvious need for research in the field. Thus the problem considered in this study is appraising factors affecting risk management practices and strategies of construction projects using Nigeria as a case study.

1.3 RESEARCH QUESTIONS

This research is conducted with the intention of answering the following cogent questions:

1. What are the factors affecting the management of construction risk in the Nigerian construction industry?

2. What risk management methods are utilized for the management of construction risk in the Nigeria construction industry?

3. How effective are these methods in the management of construction risk in the Nigeria construction industry?

4. To what extent does the factor that influence risk management affect the Nigeria construction industry?
1.4 RESEARCH OBJECTIVES

Towards achieving the aim of this study, the following objectives were selected:

1. To examine the factors affecting the management of construction risk in the Nigerian construction industry.

2. To appraise the risk management methods utilized for construction project in Nigeria.

3. To evaluate how effective these methods are in the management of construction risk in the Nigeria construction industry.

4. To establish the extent to which risk management factors influences the Nigeria construction industry.

1.5 AIM OF THE STUDY

The purpose of this thesis is to appraise the practices adopted for managing risk of construction projects in Nigeria and determine how it affects risk management in the industry and the most used method by construction professionals in the industry.

1.6 SIGNIFICANCE OF THE RESEARCH

The importance of this thesis originates from the essence of risk management itself, which is the success of any project. The implementation of risk management involves the organizational effort to put together risk policies, practices and procedures that will address all the potential risks peculiar to the project. Management of risk have been identified to be one of the most important tool for ensuring the success of any construction work, however, few researches examine the nature of this relationship (Fewings, 2005).

The significance of this research is therefore in the identification of factors that affects and influences the use of risk management in the Nigerian construction industry. Also as a result of the dynamic and constant changing environment, changing circumstances and uncertainty factors are surrounding the firm, adopting changes suggested by risk management is very essential for a project’s success. Finally, this research will point the attention of project managers to the benefits that can be derived from having a high level of awareness on risk management problems as well as help managers on how to evaluate risk management systems.
1.7 RESEARCH METHODOLOGY

The process and steps for retrieving and collecting data needed for solving a problem is referred to as research methodology. Thus, this section presents the means employed for assessing the information required to meet this thesis aim. The method adopted for research design, the study population were also presented in this chapter.

1.7.1 RESEARCH APPROACH AND DESIGN

This study utilized primary and secondary data to achieve the objectives of the study. Questionnaires were used for collecting primary data. A research tool which is composed of chains of questions designed in a way to collect information as well as harness the perceptions of the respondents is referred to as questionnaire. Questionnaires permits for the concentration and the depth of the opinion of an individual in respondent responses (Babbie, 1998). According to Andersen et al., (2004), the application of questionnaires is suitable because they are easily analysed and are equally cost effective. In addition, secondary source data was derived from review of literatures, textbooks and articles published in specialised international journals.

1.7.2 RESEARCH AREA AND TARGETED RESPONDENTS

This research was carried out in three commercial cities in Nigeria which are Abuja, Lagos and Port Harcourt. The focus was on construction companies’ presently on site or has completed project work. The targeted respondents of this study are participants in construction project such as project managers and construction managers responsible for the management of construction projects in those chosen cities.

1.7.3 SAMPLE AND DATA COLLECTION

Random sampling method was adopted in this research and this will afford participants to have an equal chance of selection without being biased. The ideal tool for data collection for this study is structured questionnaire.

1.8 LIMITATIONS

Although, construction risks management is a problem that cuts across the nation of Nigeria, but the research will only focus on four cities in the country, to ensure easy interpretation of the data. Also, the study focused only on participants in construction projects such as project
managers and construction managers responsible for the management of construction projects in those chosen cities.

1.9 ETHICAL CONSIDERATION

Ethical considerations are critical in research; norms or standards for conduct that differentiate between right and wrong are regarded as ethics (CIRT, 2017). The consent of the respondents was duly obtained before they proceeded to filling the questionnaires. They were properly informed of their rights either to give their consent to filling the questionnaire or refuse to take part, or even to pull out from taking part at any time without facing any consequences. Also, the confidentiality of the respondents was kept throughout the course of carrying out this research and beyond.

1.10 OVERVIEW OF CHAPTERS

This study was divided into nine separate chapters which are titled as;

**Chapter One: Introduction**

The outline of the whole study is presented in this chapter. It highlights the research problem statement, research objectives, research methodology, limitations as well as ethical consideration.

**Chapter Two: Literature review: Theoretical overview of construction risk management**

This chapter reviewed other published books, journals, thesis, and articles amongst others on the same topic or similar ones to those of other researchers and renowned scholars. This chapter focused on providing a theoretical overview of construction risk management. It presents the readers with information, knowledge as well as ideas that have been developed in the past by various analysts and researchers on the subject under consideration.

**Chapter Three: Literature review: International construction industry**

This chapter also reviewed literature as in Chapter Two; however, the literature reviewed here is that which is considered international. The international countries investigated are China and Malaysia. This is done with the aim of collecting information on the lessons learnt by the selected countries in relation to their construction risk management problems in a bid to find a way out for the risk management challenges faced in the construction sector of Nigeria.
Chapter Four: Literature review: African construction industry

Literature review continues as in Chapter Two and Three but the chapter reviewed literature which is considered local i.e. within the African continent. The two African countries investigated are Ghana and South Africa because they have experienced the same or similar construction project performance problems. The essence of this review is to gather information on the lessons learnt by the countries selected with regards to their construction risk management problems in a bid to seek a solution for the risk management challenges faced in the construction sector of Nigeria.

Chapter Five: Literature review: Nigerian construction industry

This chapter continues to review related literature in published sources such as books, journals, reports, articles, white papers, and so forth by other researchers. However, this chapter focuses particularly on the Nigerian construction industry as well as the factors affecting construction risk management in Nigeria. Furthermore, the literature review in this chapter also reviews proposed solutions offered to the reviewed factors.

Chapter Six: Research methodology

The research method employed in this study to achieve the stated research aim and objectives will be presented by this chapter. In this research, the researcher focused on both literature review and questionnaire survey concentrated on construction professionals in Nigeria.

Chapter Seven: Findings and analysis

Having identified and adopted a well-structured design and suitable method of measuring relevant variables, the findings are then analysed using a proper procedure. This is achieved by employing some statistical techniques as well as drawing up findings. The analysed findings then offer responses to the research questions that were initially defined.

Chapter Eight: Discussion of findings

In this chapter, the result that were analysed in Chapter Seven are discussed and connected to the literature reviewed in a bid to confirm whether the research questions were answered as well as if the objectives of the research have actually been met.

Chapter Nine: Conclusions and recommendations
This chapter is a reflection of the study as a whole as it concludes the whole research. The researcher offers responses to the research questions and also establishes that the objectives of the research have been met and also provides recommendations on the findings of the study. In addition, this chapter also contains recommendations with regards to the progress of this study by any interested researcher.

1.11 CONCLUSION

The introduction into construction risk management was presented by this chapter it also highlight some other important factors such as; methodology that was applied in achieving the objectives of the research not excluding the general overview of all the chapters to be added in this research project. The next chapter will review the literature concerned with the management of risk for construction projects.
CHAPTER TWO
CONSTRUCTION RISK MANAGEMENT

2.0 INTRODUCTION

The concept of risk varies among individuals and it is dependent on their understanding, experience, approach as well as attitude. The complexity of construction activities made the industry to be more susceptible to risk in comparison to other industries (Belel and Mahmood, 2012). According to Barkley, (2004), uncertainty with recognized probability distribution could be regarded to as risk. In other words, risk is the probability of a problem to emerge in the future but there is no guarantee that the problem will come into being (Holmes, 2002). Augie and Kreiner, (2000), posited that risk is the outcome of uncertainty on the focus and could either be positive or negative.

In a project work, there is always some kind of modifications or changes to bring about a new invention. This change has to do with uncertainty which lead to the possibility of having projects being blown off by a future event that could occur. In all the activities of a construction, there are uncertainties and risk (Odeyinka, 2000). At this juncture, it is necessary to distinguish between uncertainty and risk. Hilson and Hullet, (2004), opined that uncertainty that is measurable is risk while immeasurable risk is uncertainty. A state of being which has to do with lack or shortage of information and results or insufficient knowledge or understanding is known as uncertainty (Carpenter and Frederickson, 2001). Risk could result from financial market doubts, projects failures, legal liabilities and loans, accidents, which is unpredictable (Akintoye and Macloed, 1997). Cleden, (2009) states that risk are gaps in knowledge and it may institute threat to the project, in other words, it could be an offshoot of the lack of knowledge. In addition, Winch, (2002), opined that risk arises as a result of lack of information. Risk concerns a situation where a probability can be assigned to a possible result which arises from a decision while uncertainty has to do with situations where the possibility of the outcome is indefinite; therefore there is no measure of probability (Enever and Isaac, 2002). In the same vein, risk involves situations that have considerable data and clearly marked boundaries for its use while uncertainty arises due to poor information or lack of knowledge (SRA, 2015).

According to ISO, (2009), risk management is a set of coordinated activities which are effected in a bid to direct and regulate an organization with relation to risk. On the other hand, it is an organized process which ensures that individual risk events and total project risk is properly understood and managed thereby boosting achieving the success of a project work by reducing
threats as well as maximising opportunities (APM, 2006). In addition, it is a process through which organisations face the risks inherent in their activities systematically thereby focusing on realising the sustained benefit embedded in each activity as well as the collection of all activities (IRM, 2002). Through it all, the general objective of risk management remains unaltered which has to do with integrating information and methods from the different parts of the project on a specific side of uncertainty. Thus, risk management has to do with the identification of previous challenges that resulted in complications, current problems and major tendencies which could hinder the successful implementation of the project.

The rapid growth being experienced in construction industries across the globe is a function of the need for infrastructural development. One of the major drivers of business around the world is the construction industry because it brings about an increase in a country’s gross domestic product (Odeyinka et al., 2007). Consequently, nations have embraced the growth of infrastructure this reflects in how much is allotted to it in their budget leading to new challenges with regards to the risks inherent in design and production. The nature of construction projects involves many problems with regards to the environment as well as the socio-political scene (Deviprasad, 2007). This implies problems revolve around the activities surrounding the project. In support of these assertions, Odeyinka, et al., (2007) affirmed that a construction project with an enormous capital outlay has the probability to be affected with cost overruns.

The construction industry requires the input of diverse firms, contractors, architects, engineers as well as professionals from the built environment. Okuwoga, (1998) perceive the construction industry has as an economic booster by virtue of its ability to improve the economic condition of a country. The industry is able to achieve this function because their functions is not hindered by a country boundary has they are able to function globally.

Chapman and Ward, (1997), opined that project risk can be regarded as the effects of the occurrence of uncertainty concerning the state of performance of the project that is realisable. Construction management society widely believes that event or chains of events that could hinder the aim of a construction project or its performance can be referred to as construction risk. Construction projects are however often complex and thus easily affected by other factors of the economy which leads to uncertainty and thus inefficiencies that could have damaging consequences (Mills, 2001). Risks in the construction industry could occur in different format. Deviprasad, (2007), posited that risks and uncertainties are more prominent in the construction industry when compared to any other industry because they are imminent right from design to
completion. It is easy to identify some risks yet still unexpected (Odeyinka et al., 2007). If risks are not addressed immediately, it could have a detrimental effect on the project regarding its quality and expenditures. According to Zainab and Mahmood, (2012), project risks are undertaken with experience of the past, assumption and human judgment.

Akindele and Macloed (1997) avowed that in the construction industry managing risk focus on identifying of project risks, ways to tackle the identified risks as well as how to minimize it’s effect on project performance. The process of risk management depends on the contract structure or contract sum (Awodele et al., 2009). The commonly applied techniques for identification of risks are team analysis and brainstorming and cost. Awodele et al. (2009) submitted that the perception of construction stakeholders hinders the management of risk. In some cases, there is usually shortage of personnel in charge of the risk management procedure as only few people have adequate mastery of the procedure.

2.2 RISK ANALYSIS TECHNIQUES

Alfredo and Pillar, (2002) and Banaitiene and Banaitis, (2012) separated risk analysis techniques into qualitative and quantitative and both can function as a tool for identifying risk. The qualitative permits the identification of the major risk factors achieved thru conducting interviews, brainstorming and checklists. It is regarded as a subjective assessment procedure describing the risk in form of labels (high or low) with regards to the possibility of occurring (Zou et al., 2007). The labels are converted into a prioritised list of the most and less significant likelihood of occurrence. The risk are prioritised based on past experience of the risk estimator and is updated in the risk register. The risk register is a document containing possible risk and is grouped according to the stage of the project it is likely to occur. The qualitative risk analysis is a bedrock for the quantitative risk analysis technique.

The quantitative risk analysis technique utilizes mathematical methods for determining the degree of risk in a construction project (Galway, 2004). PMI (2013) asserted that it functions through quantifying the possibility of risk occurring on a project adopting different mathematical formulas. In comparison to the qualitative method the quantitative risk analysis is less subjective however, it cannot be conducted without adequate interviews in form of a qualitative study (De Marco and Thaheem, 2014). Galway (2004) submitted that quantitative risk analysis is more grounded and well-articulated in the management of risk using different techniques like “decision trees, sensitivity analysis and monte carlo simulation”. Touran (2006)
provided another tool for measuring risk under quantitative analysis which includes “expert judgement, fuzzy logic, sensitivity analysis and probability distribution”

2.3 RISK MANAGEMENT PROCESS

Risk management process is a fundamental principle that is attached to understanding as well as managing risks in a project work. An efficient implementation of the process in a project requires the involvement of all the phases in the process of managing risks. The risk management process consists of the main stages (Smith et al., 2006; Giannakis and Louis, 2011; Ubani et al., 2015).

2.3.1 Risk Identification

This stage entails capturing all the risks that have the tendency of occurring in the course of the project (Tchankova, 2002). This first stage lays the foundation for the next stages of risk analysis and control as it is an eye opener for organizations to learn about areas that are risk inherent. When risk identification is done accurately, it guarantees successful risk management as it exposes hidden sources of losses that could escalate into incidences that could not be managed with unforeseen consequences (Kuang, 2011).

Kuang (2011) asserted that identifying risk has to do with the identification of all possible risks and situations that may have a negative impact on the organisation including the circumstances that gave rise to the risks as well as opportunities. Therefore, the process of risk identification affords the opportunity to effectively study the areas and activities where the resources of the organization is at risk hence hindering them from attaining their business goals despite having the ability to do so (Kuang, 2011). In conducting an effective risk identification process, the primary project documentation must be available. In addition, the project charter, scope statement as well as the project management plan which must include the work breakdown structure must be in place in order to build an exhaustive list of risks. If those elements are not available as a frame of reference, then an effective analysis of the risks on a project becomes cumbersome.

Furthermore, the organisational atmosphere and the risk management plan must be understood properly to carry out risk identification as they form the environment for risk evaluation. Also, the risk management plan may have to recognise the culture of the construction firms. Thoughts on several risk matters and concerns can be stirred up when assessed by utilising the tools and risk identification methods. The tools and technology differs with regards to the projects they
serve but the commonly used types include brainstorming, interviews, questionnaires, Delphi technique, expert systems among others (DEAT, 2006).

2.3.2 Risk assessment/analysis

According to Cooper et al., (2005); Nguyen and Li, (2012), the subsequent stage for the management of risk is the risk assessment. Is a technique in which available information is used in the determination of frequency of occurrence as well as the level of consequences in risk management (Olamiwale, 2014). Having identified all the risks in a project, the next thing to embark on is qualitative risk assessment which calls for additional analysis via investigating and estimation of the tendency of risk occurrence and its effect on each of the identified risk (Schatteman, 2008). This stage give a proper understanding of each risk and facilitate a better response to each risk. Qualitative and quantitative methods are the two methods developed for analysing risk (Chapman and Ward, 1997; Tchankova, 2002). In a situation whereby risks can be placed on a descriptive scale i.e. from low to high level, then the qualitative methods can be utilised. Conversely, the qualitative methods are applied in the determination of the probability as well as the effects of the identified risks and are based on statistics, arithmetic’s estimations (El-Dash, 2008).

2.3.3 Risk responses

The central component of the risk management process which determines whether any action will be taken with respect to the risks analysed in the course of identification, qualification and quantification stages is referred to as risk response (Tchankova, 2002). Olamiwale, 2014), opined that actions that are embarked upon in order to eliminate, decrease or transfer risk or its outcome can be described as risk responses. In addition, it involves embarking on planned action when it is required and pursuing the outcome of these actions that were taken so that the risk plan results in the expected outcome. Risk responses are arrived at by suggesting many options for the eradication or moderation of an anticipated risk and allocate the best substitute as a response (Lisa Tumbough, 2005).

Wang and Chou, (2003), argued that risk response is the process of identifying or fashioning out risk response alternatives and the determination of activities for handling the risk, focusing opportunities and reducing pressures to achieving the objectives of the project. Thus, it has to do with choosing an appropriate policy to reduce the negative effect of a risk. Considering the distinct nature of construction projects, the risks attached are enormous and are not static in
nature. Therefore, it is necessary to design appropriate responses to the risks having passed through the preliminary stages of identification of risk, assessment and allocation. According to PMI, (2008), risk response is the planned documents procedure for risk management applied towards the management of risks throughout the project. This phase encompasses taking proper actions in order to make sure that the project’s objectives are accomplished. Some researchers recommend varied response techniques with regards to risks in projects. Dada, (2010); Zenghua, (2011), posited that four techniques of risk response are: “risk avoidance, reduction, transfer and risk retention”. However, Smith et al., (2006), argued that risk response techniques can be divided into three by combining avoidance and or avoidance and acceptance.

2.3.4 Risk Control

New risks could also be identified in the control as the continuous process moves on. Risk control focuses on controlling deviations, minimizing risks and project value increase (Lester, 2007). Risks are being managed in this stage in such a manner to facilitate the effective management of the project adopting a proactive approach. According to (Schatteman, 2008), in handling the risks related to construction projects, the following corrective measures could be of help:

- Adjust the scope of the work and estimates in order to counter the consequences of risk
- Risks should be monitored regularly and also fashion out alternate plans to manage predictable risks when the need arises.
- Suitable decisions should be made.
- Everyone concerned should be informed about possible risks.
Risk experienced in the construction industry

Table 2.1: Types of Risk associated to construction Industries

<table>
<thead>
<tr>
<th>Types of Risks</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>Inadequate design, wrong building plan, poor scope of works, deficient available materials, etc.</td>
</tr>
<tr>
<td>Construction</td>
<td>Dispute among labourers, unsafe practices on construction sites, unrealistic quality standard, alteration in design etc.</td>
</tr>
<tr>
<td>Physical</td>
<td>Theft of materials, occupational hazards to workers, harm to structures, etc.</td>
</tr>
<tr>
<td>Organizational</td>
<td>Poor communication among participants, construction project team members inexperience, poor collaborative efforts, etc.</td>
</tr>
<tr>
<td>Financial</td>
<td>Changes in material cost, little market demands, taxes, postponements of professional fee, inappropriate estimations, etc.</td>
</tr>
<tr>
<td>Environmental</td>
<td>Natural disasters like war, riot and many others.</td>
</tr>
<tr>
<td>Socio-Political</td>
<td>Variations in law, fluctuation in inflation, corrupt officials, etc.</td>
</tr>
</tbody>
</table>

(Source: Sadiq, 2015)

2.4 PROJECT RISK MANAGEMENT IN AN ORGANIZATION

It is important that construction organization/companies should have risk strategy for the determination of common behaviour towards risk. According to Floricel and Miller, (2001), risk strategies for projects which are five in number especially construction projects are projected for large scale projects. These strategies described the proper handling of risks in large-scale projects. They stated that institutional anchoring elements must be set up notwithstanding the project level strategies. Ward and Chapman, (2003), were of the opinion that viewing corporate scale of risk is better than perceiving it as a project scale. The authors enacted the concept of risk efficiency as a component of risk management process instruments.

Baccarini and Archer’s (2001) avowed that during risk management strategies the level of riskiness of projects must be incorporated. Numerical scales from 1 – 5 can be used for
prioritising projects in accordance to the level of riskiness in which 5 means posing greatest risk while 1 refers meaning little risk.

2.5 FACTORS AFFECTING RISK MANAGEMENT

Projects are exposed to normal than higher risks by different factors which include:

- **History**: When compared to each other, newer projects are more susceptible to risks while there is a tendency that success against risk is recorded more in older projects having done projects that are similar before (Patel et al., 2013).

- **Management Stability**: Management stability is the common and singular goal and objective of the management for a particular project. With this common goal and objective accomplishing objectives of the project is easier but if the management are working towards a common goal but unstable in their decision and support, then it will affect the objectives of the project.

- **Staff expertise and experience**: Staff expertise and experience is important in achieving quality and cost effective project objectives. This is a factor that can be used alongside history.

- **Team Size**: Patel et al., (2013) opined that the smaller the team size the better for the reduction in risk and success of the project objectives.

- **Resource Availability**: If a good amount of the resources needed is available for the project, then the response. Because if the project resources is available in greater amount then it will be easier to deal with different risks (Patel et al., 2013).

- **Time Compression**: It is general knowledge that when time allocated for a project is compressed; it becomes difficult for project managers to carry out proper risk management processes. This is due the fact that project management try as much as possible to make sure the deliver the project at the stipulated time.

2.6 PRACTICES ADOPTED FOR RISK MANAGEMENT PROCESSES

The seven processes adopted for risk management process and is represented in Fig. 2.1 which are “context of risk, identifying risks, analysing risks, evaluating risks, communication and consultation across stakeholders, risk monitoring and controlling risk events”.
Establish the context
This is the first stage for risk management process and it entails breaking down of the project into different stage to examine the resources and stakeholders needed for each stage. This facilitates the depiction of the project in diverse format allowing the estimation of budget, equipment, resources goals and schedules.

Risk identification
This is the next stage and it entails the identification of the sources of risk as well as potential consequences before they can be worked upon for its mitigation. The identified risk are then entered into the risk register to be analysed in the next stage.
Risk analysis
The risk identified in the previous stage are then analysed in this stage to determine its impact on the project performance as a whole. At this stage the techniques used for risk analysis will be depending on the risk estimator and the nature of the data used in identifying the risk.

Risk evaluation
This stage involves arranging the risk that was analysed in the previous stage. The risk are evaluated according to the degree of their severity on the performance of the project. A Likert scale is usually utilised at this stage with the highest risk given the biggest scale and the lowest risk given a smaller scale.

Risk mitigation
This stage is concerned with mitigating the risk that has been identified in previous stages. The risk with the highest Likert scale will be the first to be mitigated because it has the potential for having higher impact on the project. While the risk with the lower Likert scale is not given immediate attention during mitigation.

2.7 FRAMEWORK FOR RISK MANAGEMENT TOOLS
The Australian Standard for Risk Management processes was adopted as a framework for this study and is presented in Figure 2.2.
- **Risk transfer for Contractors**
  Risk is transferred from main contractor/project manager to a subcontractor in a particular construction project. During this process a higher tier and lower tier relationship is created. The higher tier is referred to as the main contractor that intends to transfer the risk to the subcontractor known as the lower tier.

- **Controlling Job Sites and Construction Quality**
  Contractors are required to do more for increase in the product quality and customers/clients education on proper construction processes. Risks in construction based on quality can be reduced by making sure:
  
  i. Construction is done in sequence
  
  ii. Construction is done with proper supervision
iii. Construction plan changes should be documented
iv. Effective quality control techniques should be practiced.

Generally, good risk management in construction involves judging the capability of the subcontractor's to give a project that meets the stipulated standards.

2.8 CLASSIFICATION OF RISK IN CONSTRUCTION PROJECTS

Risks can be classified as either acceptable or unacceptable. The unacceptable risk is referred to as the risk that will hinder the project from meeting it’s required goal. The effect of this form of risk could either be visible for a short or longer term duration (Patel et al., 2013). The Estate Management Manual, (2001) provided the classification of risk in the construction industry into “socioeconomic factors, organisational relationships and technological problems”

2.9 LESSONS LEARNT

The literatures reviewed so far in this chapter showed that risk management in construction industry targets the identification of project risks, ways to tackle the identified risks as well as how to minimize their negative effects (Akindele and Macloed, 1997). In addition, it was revealed that after risk identification, the next thing to embark on is qualitative risk assessment which calls for additional assessment via evaluation for the tendency of risk occurrence and its effect on each of the identified risk (Schatteman, 2008).

It was revealed from the literatures that risk is analysed with the intention for achieving optimum project performance. Also risk has different impact on the project some may have direct impact while some may be un the long run. Towards identifying the risk a quantitative or qualitative approached can be embarked upon with the quantitative utilising formulas. However the qualitative risk analysis technique is the bedrock for the quantitative format.

2.10 CHAPTER SUMMARY

This chapter defined terms that appear throughout the study, such as performance projects, benchmarking as well as crucial concepts such as project management, performance management which were also explained; these are frequently used terms and concepts and are therefore important to the study. The following chapter will review the construction industries of two countries outside the continent of Africa, the problems they face as well as the lessons that can be learnt from these countries.
CHAPTER THREE
INTERNATIONAL PERSPECTIVE ON RISK MANAGEMENT

3.0 INTRODUCTION

This chapter gives a theoretical review of two international countries which are China and Malaysia. Firstly, this chapter gives a general overview of the two countries, then the construction industry of each country is reviewed as well as the challenges attached to risk management of their construction projects. On a final note, lessons that can be learnt from both countries were elucidated in relation to the factors affecting the risk management of construction projects.

3.1 CHINA

3.1.1 BACKGROUND

China is located in Asia continent it is bounded on the south by Mongolia on the west by Korean. A large part of China is made up of mountains and plateaus among which are the Tibet Plateau leading to the Himalayan Mountains which has Mount Everest as the highest. There are complex climatic patterns in China which ranges from north which is a cold-temperate region to the tropical south while the Tibet Plateau is cold as a result of its area and topography (Library of Congress, 2006).

The country has been the most populous nation in the world for many years with a record of 582 million in 1953 census which almost doubled in the year 2000 with a population of 1.2 billion. In 2005, the economy of the country became the 2nd biggest in the world having undergone reform for more than a quarter century when measured based on purchasing power parity. As at the same year, the gross domestic product GDP of China was US$2.2 trillion and her PPP was projected at nearly US$8.9 trillion with construction been the major contribution to the country’s GDP. Library of Congress (2006) asserted that China construction industry has witnessed increase in investment capital in the twenty-first century

3.1.2 THE CHINESE CONSTRUCTION INDUSTRY

Chinese construction industry growth has assured Chinese contractors of abundant business opportunities to improve their management practices and business approach. As at 2005, there were “15,545 design firms and 104, 297 construction firms in China”
which is a reflection of the sheer volume of Chinese participants and the size of the Chinese construction market and in all, the country consumes twenty-five percentage of the steel provided for the whole world (Vishnu, 2007).

Furthermore, there are yet some other inclinations which pointers to the openings are available within the construction market. The country is presently undergoing a rapid and strong urbanization process which is experienced in cities like “Beijing Shanghai and Guangzhou” whose impacts is apparent in numerous smaller cities in all the 23 provinces in the country. In the city of Chongqing which is centrally located, 453, 400 people joined the urban population annually and the population of the area referred to as urban increased from 14% to 46.71% just between 1998 and 2006. Even though, what is responsible for this shift could be ascribed to the growth of the cities themselves which is attached to the seizure of neighbouring lands and the relocation of its people to the city. In addition, this also reflected on the construction industry of the country as an extraordinary requirement for new buildings and infrastructures to meet the rising population in the urban cities (Vishnu, 2007).

Many governments of smaller city have to move further than their traditional sources of funding in a bid to address the demands of these increasing populations. Fortunately, the opening up of China has offered many new alternatives among which is, loans from governments of foreign countries, concession contracts and much more importantly is the Public-Private Partnerships (PPPs) to the Chinese construction market. The increasing need of these small cities for municipal services has made lot of them to seek private funding. Though, national defence projects are opened to overseas investment, the regulations controlling some makes them more appealing than the others. An example is found in the water supply sector which has strict limits on foreign ownership but there are no such regulations in the wastewater treatment sector. An estimate by Jumbo Analyses showed that more than seventy percentage of wastewater treatment plants involved some sort of PPP (Liao, 2007).

China construction industry is a big supporter for availability of inexpensive labour as many pundits in the sector posited that one of the greatest strengths of the China’s construction industry is low-cost labour. The cheap labour occurs from the short duration in which the workers are ready to work as most work on duty for 3 shifts a day, day and night as well as during national holidays is not a strange occurrence as laws related to overtime are rarely applied. In addition, many Chinese contractors commit an insignificant fraction of their capitals to work safety, of their workers. Apart from moral issues, the outcome of these rationalized
costs is that Chinese firms complete their projects early in enough and at a reduced cost (Vishnu, 2007).

The current level of urbanization, industrial development and increasing wealth of Chinese is responsible for the pace at which international businesses are presently seeking to have their firm in the country hence there is a mass exodus of insurance outfit, banks and other professional service providers into China most especially in her large cities. Though in major cities, good office space make up below 10% of the total available office space as two corporations that currently had to struggle in order to get the high end Grade A office space needed for conducting their business in Beijing are Ernst and Young and Price Water Cooper because the best office space in the country is available only in Beijing. There is no doubt about the fact that more firms will seek to have their office in the country as the wealth of the country continues to boom hence, there will be a constant demand for high quality office (Vishnu, 2007).

The strong point of Chinese construction firms in their country and outside China is that they can take the advantage of liberal governmental financing. An example is found in bidding for project in Zambia China firm’s better than other country because they can offer cash in advance which is an obligation by the World Bank bidding rule. Accessing such capital by Zambian firms is a cumbersome exercise thereby giving the Chinese firms abiding lead. Additionally, the Chinese loans can be critical when developments which could either be domestic or global run over-budget or come across unforeseen hitches (Vishnu, 2007).

3.1.3 CONSTRUCTION RISK MANAGEMENT IN CHINA

The construction industry has been noted for a low reputation with regards to coping with risk, the inability of many projects to meet up with deadlines coupled with cost targets. Although risks cannot be eradicated in the construction industry nevertheless, effective management can be improved upon via the application of risk management principles. Chinese construction industry has witnessed numerous substantial changes for the past 25 years since economic reform was implemented in the country. Many Chinese construction companies have become international industries as several new technologies have been imported into the construction industry. There has been significant increase in competition although construction companies have grown in size. The competition stems from infiltration of foreign companies into the industry with huge finance and advanced technology. The other competition occurs from the development of low cost developments for rural areas (Liu et al., 2003).
The Chinese construction industry experiences huge deficit annually as a result of low level of management, poor construction technology and a whole lot of risks. The construction industry has been under the control of the government for several years hence it has been used to support the economy of the country. Design institutes owned by the state have been responsible for designing most of the construction projects which the government finances just as state-owned construction companies have equally been saddled with the responsibility of building such projects as well. In addition to this bureaucracy of government processes is the low project-management skill of the enterprises and have jointly led to cost overruns, late completion of projects and poor quality work. In October, 1992, reforms of the construction industry were declared at the convention of the Chinese Party Congress. The focus of these reforms is the improvement of the efficiency in the construction enterprises which are owned by the state, the establishment of a construction market as well as making the Chinese construction firms to be able to compete with international counterparts. The following are some of the objectives of the construction reforms:

- Restructuring the administration system of the industry
- Construction markets opening
- Autonomy in construction enterprises which are state-owned
- Establishment of a bidding system which is competitive
- Adoption of professional construction management practices
- Project management skills improvement

In the year 1993, Hou Jian, the Minister of Construction enumerated different points in the future plan of the Chinese construction reforms among which are promotion of professional management development and cost control. In a bid to increase the industry’s competitiveness, the government of China is more responsive to project management technology and knowledge. Even though, risk management can be striking for Chinese construction companies yet such techniques and instruments have actually been utilised by only a few because it faces some barriers. It is sad to know that most Chinese construction companies are not knowledgeable or not familiar with it when it comes to risk management and also do not even make any effort to embark on it as just few understand its contribution to project outcomes. Unfortunately, many project managers have not come to the realization that project risks should be treated as a management issue because most think risks cannot be organized and they do not believe in risk management (Liu et al., 2003).
According to Liu et al., (2003), the major difficulties for managing risk is abridged as follows:

- Information collection does not have any standard procedure i.e. there is little perception to the nitty gritty of risk management
- Practitioners believe that network of personal relationships surpasses risk management
- There are educated people in China who are reluctant when it comes to decision making
- Another hinderance for managing risk is poor understanding by the general practitioners

Although the construction industry in China can be assisted by improved external risk management, however, this can only be achieved effectively only when the major conditions are put in place. Techniques of risk management are sophisticated and it can be expensive when it is not applied appropriately.

Vaughan, (2013) opined that majority of China construction projects fails to meet up with the expected budget. Furthermore, he argued that it is difficult to measure the progress as project starting point are not often paid attention to, respected man-hours are wasted shamelessly as well as a general lack of ability to program and manage resources (Chan and Wong, 1999). He blamed these disappointing results on what he described as the Chinese ‘Do-and-Fix’ (DAF) methodology which compared with the more Structured Methodology.

The major dissimilarity between the aforementioned method is the reduced amount of attention prominence on early planning hence many changes in the design and structure take place during the course of the construction process. Also, contrary to the concept of utilization of human resources as needed, all employees are utilised throughout the course of the construction project under the DAF methodology. This result in a waste when the need for the country to offer employment for its people is put into consideration, this area in particular is widely accepted. Conversely, under the Structured Methodology, there is extensive planning, there is strict adherence to the initial plan and human resources is only utilised as needed. The presence of projects that has a political backing primarily which are embarked upon for namesake if nothing else is responsible for the occurrence DAF methodology in China. Typically, government projects are badly managed and void of measures with which the success of the project can be quantified.

The construction market of China would have grown to become the largest in the world by the year 2020 just as the country requires infrastructure, housing, health care and education buildings. The speedy expansion of the China construction market is a function of the escalating demand for innovative construction technology and management. Therefore, the
China construction industry is faced by many new risks such as physical, financial, technical as well as operational risks (Liu et al., 2003).

3.1.4 LESSONS LEARNT

The following are some of the lessons that can be learnt from the Chinese construction industry with regards to factors that affect risk management in construction projects as summarised by Liu et al., (2003):

Even though, risk management can be remarkable for Chinese construction companies yet such techniques and instruments have actually been utilised by only a few because it faces some barriers. The process of information collection is not standardized; the attention given to risk management and what its outcome could offer is little. Another great hindrance to the acceptance of risk management is poor understanding by the general practitioners. Although the construction industry in China can be assisted by improved external risk management however, this can only be achieved effectively only when the major conditions are put in place. Techniques of risk management are sophisticated and it can be expensive when it is not applied appropriately.

3.2 MALAYSIA

3.2.1. BACKGROUND

Malaysia is situated at Southeast of Asia not far from the South China Sea. In the past the country has been confronted with numerous natural hazards like wild fire, flooding and many others. The hazards caused by man has been regarded to be more problematic than the so called natural disasters but it is not like that in other Asian countries. The major source of air pollution in Malaysia is automobile emissions though when compared to other Asian cities, air quality indicators for Malaysian cities have a tendency to suggest cleaner air. Even though government papers do not indicate that river pollution is highly problematic, yet livestock farming, domestic sewage and land clearing has added to river pollution (Library of Congress, 2006).

The most important economic sector of the country is the industrial sector most especially the manufacturing subsector. The country is a federated constitutional monarchy which uses a parliamentary system of government and a judiciary system which is independent. There has been continuous evolution of states in Malaysia for several reasons which include the current emergence from colonialism, higher attention on economic instead of political development
and the simultaneous traditional and non-traditional authorities. The conference of rulers is the supreme institution in the country which is made up of the hereditary rulers of nine states in Peninsular Malaysia and four state governors who were appointed by the king. Among the nine hereditary rulers, one is elected amidst themselves as the supreme sovereign or king into the position of the head of state for a single five-year term. Likewise in the same manner, the deputy head of state is elected even though he does not exercise power, nevertheless, he is available to fill the position of the King in case of absence or disability. The kings legitimize all government acts as the civilian and military public services and are indebted to the king and hereditary rulers in terms of their loyalty. On the other hand, the king acts based on the counsel of the parliament and the cabinet while the most powerful political authority is the Prime Minister (Library of Congress, 2006).

The most prominent and influential political leader in Malaysia since 1981 to 2003 is the Prime Minister Mahathir Mohammed who influences economic and social development. Abdullah Ahmad Badawi who is his successor has squarely faced the reduction of public expenditure, conceding numerous large-scale infrastructure projects as well as enabling the development of the agricultural and educational sector. The same political coalition under the leadership of the political party of Mahathir and Abdullah has led the country right from the 1960s. Although, some observers argued that a big problem in politics is corruption yet international organizations whose activities centres on corruption propose that even though business and politics in Malaysia portray a high level of corruption, still the level of corruption in the country is less in comparison to most countries in the world (Library of Congress, 2006).

### 3.2.2 THE MALAYSIAN CONSTRUCTION INDUSTRY

The construction industry in Malaysia contributes significantly to the economy of the Government. It contributed about 12.9% to the country GDP in 2012 and provides about 800,000 job opportunities for the workforce within the country (Department of statistics, 2015). Malaysian construction industry experienced tremendous growth around 2013 with the growth attributed by the residential sector. The civil engineering sector also contributed significantly to the growth of the construction industry by virtue of construction of large transport infrastructure project (REHDA, 2014).

The Construction Industry Development Board is a statutory board set up in the year 1994 and it operates under the Ministry of Works with the objective of facilitating the promotion of developing the Malaysian construction industry as well as its modernization. The agency is
saddled with the responsibility of making propositions to government on issues that has to do with the construction industry and overseas the key sections of the industry including contractors’ registration thereby advancing the industry’s knowledge base, training, safety and education.

Malaysian construction sector can be divided into three sub-sectors which are infrastructure, residential and non-residential. As at 2012, the construction sector has spent US$17.6 billion and by 2013 to 2018, it is expected that it will rise by 4.5% per annum (AECOM, 2013). As at the end of 2012, the non-residential industry generates 44.6% of the expenditure in the construction sector and is followed on by residential developments with 38.8% while the infrastructure sector accounted for 16.5%. Nevertheless, in the long run, it is expected that infrastructure subsector will record the wildest advancement in construction expenditure at 5% per annum to be trailed by residential sector. Malaysian construction industry has been consistent in playing a significant role in national economics thereby contributing substantially socio-economic conditions of the country.

The construction industry cater for a workforce of 1.2 million which are professionals such as; engineers, architects, planners and surveyors as well as skilled and unskilled construction workers and they thereby represent 9.5% of the country’s national workforce. Hence, the CITP 2016-2020 was known for delivery of increasingly modern practices which focused on attracting more local employees into the industry at higher remunerations. Nevertheless, the construction industry encounters problems which are enlarged by the current increase in population, industrialization impacts and request for construction (Kamar, Hamid and Alshawi, 2010). There should be a transformation of the construction sector from the traditional processes which are not sustainable with regards to depletion of resources and generation of waste to innovative methods which include sustainable construction through industrialized construction (Van Egmond, 2010). Therefore, reaching a state of sustainable performance that supports sustainable construction is the aim of the construction industry.

3.2.3. CONSTRUCTION RISK MANAGEMENT IN MALAYSIA

The Malaysian construction industry has had repute in risk management whereas, in a bid to avoid project failure and its deficit, risk management must be executed (Hamimah et al., 2008b). The process of risk management encompasses proper risk alleviation after the identification, evaluation and analysis of the risk events. The risk alleviation strategy must be
capable of minimizing the adverse effects with moderate costs. In a bid to ensure that Malaysian contractors achieve project success, it is necessary for them to embark on risk management (Hamimah et al., 2008).

In Malaysia, the major risks that have been identified are the financial risk and time risk. Incessant late payments and inadequate planning which affect local construction industry performance are responsible for the occurrence of financial and time risks. Both financial and time risk could activate each other and vice versa as a result of the interdependency of risks thereby leading to cumulative effects in the accomplishment of project objectives. Furthermore, different organisations are susceptible to different risk types for the reason that they initiate and engage the project at stages which differs from each other.

Malaysian contractors make use of simple, rapid, reasonable and cheap procedures in the course of identifying risk which are checklist methods and brainstorming sessions. The mode of risk identification differs for diverse projects as it is a function of construction projects and it must start in the early stage. The process of risk analysis necessitates workers experience, training, risk management software as well as expert advice so as to receive suitable response. Risk response focus on risky actions with high chance of occurrence and high impact for Malaysian contractors, nevertheless not all firms embark on the adequate process of reporting, reviewing and monitoring the continuing activity of risk management (Norazian et al., 2008).

Formal risk management is not often applied due to knowledge deficit and reservations in the appropriateness of risk management methods for construction activities (Akintoye and Macloed, 1997). In the same vein, poor knowledge could be responsible for the reason why formal risk management is not often applied by construction players in Malaysia. Every now and then, risk management is applied by local organisations yet risk management techniques applied naturally equals to undocumented practices which tactlessly refuse to accomplish the complete benefits of formal risk management practices. As stated earlier, the major risks which are inherent in the Malaysian construction industry are financial risk and time risk which both have a considerable effect on the performance of project in relation to cost, time and quality. When attention on how these two major risks can be managed in comparison to managing a whole lot of minor risks, there is a likelihood of achieving a greater improvement in project performance. Money, time and effort are invested massively for the completion of project as the highest level of risk is observed in the construction stage of the life cycle of the project.
Local construction projects witness schedule and time overruns possibly as a result of inadequate risk management practices (Goh and Abdul-Rahman, 2013).

Furthermore, the concept of risk management in the Malaysian construction industry is quite new (Norazian et al., 2008). Zultakiyuddin et al., (2008), stressed that risk management is vital and required for project performance; nevertheless, the sense of urgency attached to this concept does not apply to the key players in the Malaysian construction industry. Moreover, insufficient knowledge has made risk management to be rhetorical in the country’s construction industry (Roshana and Akintoye, 2005). Also, contractors hesitate in the implementation of risk management because they are unaware of the benefits and importance attached to risk management. However, there are still companies that implement risk management in construction activities although, identifiable and effective risk management framework practitioners are still very small in Malaysia. Nevertheless, it is only companies with reputable character, steady financial status and those involved in massive construction projects that execute formal risk management. In Malaysian construction companies, risk management differs because it is dependent on company’s policies, allocated resources, nature of projects and so on (Zultakiyuddin et al., 2008).

3.2.4 LESSONS LEARNT

The reviewed literature showed that there are a number of hindrances to the adoption of risk management in Malaysia. The following are some of the factors as indicated by scholars that affect risk management in construction projects:

An enhanced understanding of the risk factors is needed in the construction industry of Malaysia even though the risk management approach has been established yet a whole lot of them have not been properly structured and implemented formally (Kang et al., 2015). Risk management is vital and required for project performance; nevertheless, the sense of urgency attached to this concept does not apply to the key players in the Malaysian construction industry. Insufficient knowledge has made risk management to be rhetorical in the country’s construction industry (Roshana and Akintoye, 2005). Also, contractors hesitate in the implementation of risk management because they are unaware of the benefits and importance attached to risk management. However, there are still companies that implement risk management in construction activities although, identifiable and effective risk management framework practitioners are still very small in Malaysia. Nevertheless, it is only companies with reputable character, steady financial status and those involved in massive construction
projects are those that execute formal risk management. In Malaysian construction companies, risk management differs because it is dependent on company’s policies, allocated resources, nature of projects and so on (Zultakiyuddin et al., 2008).

3.3 COMPARISON BETWEEN CHINA AND MALAYSIA

Even though, risk management can be remarkable for Chinese construction companies yet such techniques and instruments have actually been utilised by only a few because it faces some barriers. The process of information collection is not standardized; the attention given to risk management and what its outcome could offer is little. Another great hindrance to the acceptance of risk management in the Chinese construction industry is poor understanding by the general practitioners. Although the construction industry in China can be assisted by improved external risk management however, this can only be achieved effectively only when the major conditions are put in place. Techniques of risk management are sophisticated and it can be expensive when it is not applied appropriately.

In Malaysia, brainstorming and checklists are the most popular risk management tools embraced by many organizations in the local construction industry hence formal risk management practice is not applied as those tools rests on the principles of highly subjective experiences. In the same vein, lack of knowledge and low exposure to risk management could be responsible for the reason why formal risk management is not often applied by construction players in Malaysia. Every now and then, risk management is applied by local organisations yet risk management techniques applied naturally equals to undocumented practices which tactlessly refuse to accomplish the complete benefits of formal risk management practices (Goh and Abdul-Rahman, 2013).

3.4 CONCLUSION

This chapter presented a review of literatures that are related to the Chinese and Malaysian construction industries. The chapter further provided an overview of the problems and challenges which the construction industries in each of these countries faced and on a final note, acknowledged the lessons that can be learnt from both countries. In the same vein, the next chapter reviews the literature of two countries but this time specifically from the African continent, their construction industry, problems they face as well as lessons learnt from both countries.
CHAPTER FOUR
AFRICAN LITERATURE REVIEW – SOUTH AFRICA AND GHANA

4.0 INTRODUCTION

This chapter gives a theoretical review and conceptual perspective of the construction industry in two African countries, namely South Africa and Ghana. This chapter begins with providing the overview of each country, to be followed by each country’s construction industry. Secondly, the chapter focuses on the construction risk management of both the South African and Ghanaian construction industries. Lastly, lessons learnt from the reviewed construction industries will be examined.

4.1 SOUTH AFRICA

4.1.1 BACKGROUND

South Africa is bounded to the Northwest by Namibia, to the north by Botswana and Zimbabwe while the country is bordered to the northeast and east by Mozambique and Swaziland while Lesotho is an enclave of the eastern part of South Africa. On the southeast of the South African coastlines and the Atlantic Ocean to the southwest is the Indian Ocean. The largest part of the country is covered by the plateau which drops from elevations of above 2400 metres in the region of Lesotho to about 600 metres in the sandy Kalahari in the west. The central part of the plateau consists of the Highveld which is ranges from 1200 to 1800 metres in elevation while the Great Karoo region is the location of the South of the Orange River. The plateau is separated from the areas of lower elevation by the Great Escarpment. In 2000, the United Nations Educational Scientific and Cultural Organization designated the Great Escarpment and the Natal Drakensberg which is part of Ukhahlamba/Drakensberg as world heritage site. The country is generally temperate, semi-arid and has a mostly dry climate with variable precipitation as farmers often face water shortages. Summers are usually warm to hot with hours of daylight temperature ranging from 21 to 32 °C while winters are cool to cold with higher areas which often have temperatures below freezing at night but 10 to 21°C in the daytime (Nel et al., 2015).
Migrants from the North settled in Southern Africa in the 4th century joining the indigenous San and Khoikhoi people. Just before the end of the 15th century, Portuguese navigator Bartholomeu Dias had travelled around the Southern tip of Africa and Vasco de Gama on the Natal coast. Cape Colony was founded by Jan Van Riebeeck at Table Bay in 1652 as he represented the Dutch East India Company while the British forces seized the Cape Colony from Netherlands in 1795. The Zulu empire in present day KwaZulu Natal was founded by King Shaka Zulu and then expanded towards the creation of a formidable fighting force. The Boers left the Cape Colony in the Great Trek from 1835 to 1840 leading to the creation to the Orange Free State as well as the Transvaal in the interior thereby declaring the Transvaal a republic in the years that followed. In 1899, the second Anglo-Boer war started in 1899 and came to an end in 1902 as the Transvaal and Orange Free State turned into self-sufficient colonies of the British Empire.

Nelson Mandela was sentenced to life imprisonment in the year 1964 while above three million people were forced to resettle back to black homelands in the 1970s as more than 600 black protestors were killed during the Soweto uprising of 1976. There was an increased civil resistance in the 1980s with township revolts as well as the state of emergency declaration. PW Botha was replaced in 1989 as president by FW de Klerk and public facilities were integrated in the same year as many ANC activists were set free. The party was then unbanned and Nelson Mandela was equally released from the prison after 27 years. Multi-party talks began in the early 1990s as de Klerk cancelled the remaining apartheid laws and international sanctions were also lifted. There was a major fight between the ANC and the Zulu Inkatha movement as
many were afraid of the beginning of a civil war but in 1994, the first non-racial elections was conducted and ANC won the election and Nelson Mandela became the president of the country in April, 1994. Mandela established a Government of National Unity and he appointed Archbishop Desmond Tutu as the chairman of the Truth and Reconciliation Commission which initiated hearings on human rights crimes committed during the apartheid era in 1996 and the parliament adopted a new constitution in the same year.

Thambo Mbeki became the president in 1999 as his party ANC won the general elections. In the same vein, Mbeki came back to office for second term as president just as the ANC won the general elections in April 2004 with nearly 70% of the total votes. As a result of allegations levelled against him that he interfered in a corruption case against his Deputy; Jacob Zuma, Mbeki resigned from office as the president of the country. This led to the choice of the deputy leader of the ANC as president by the parliament. The party won the general elections held in 2009 and the parliament elected Jacob Zuma as the president. In the year 2014, Jacob Zuma was re-elected but was forced to resign in February 2018 as a result of various corruption scandals and gains by opposition parties in municipal elections. Cyril Ramaphosa succeeded him and has promised to fight corruption and shore up state-owned enterprises (CIA, Factbook, 2018).

The country has a population of 54,841,552 million in which about two-thirds of the whole population resides in the urban areas. South Africans were categorised into four racial classes during Apartheid into black, white, coloured (mixed race) and Asian. Family background, cultural acceptance and appearance were the basis of these classifications. The coloured population was as a result of the intermarriage between the Khoikhoi and the San peoples of South Africa; and blacks, whites and Malagasy and Southeast Asian slaves. The Black people make up about three-fourths of the population of the county. Sotho Africans that originated from India constitute a large minority and small communities of other ethnic Asians living in some of the cities. A lot of white South Africans are offspring of Dutch, British and German settlers who started to move to South Africa in the middle of the 17th century. Eleven languages which are Afrikaans, English, Ndebele, Pedi, Sotho, Swati, Tswana, Tsonga, Tswana, Venda, Xhosa and Zulu all have official status in accordance to the 1996 constitution while the official, educational and formal business spheres is predominated by English. Four main linguistic categories make up the black population which have the Nguni as the largest among which are those speaking Swati, Ndebele, Xhosa and Zulu. Sotho-Tswana is the largest which include Sotho, Pedi and Tswana. The Tsonga or Shangaan and Venda speakers are the other two
primary linguistic groups. A vast majority of South Africans are Christians with denominations such as Methodist, Roman Catholic, Anglican and Dutch Reformed church members from different ethnic groups while many belong to the independent African Christian churches. Majority of Indians practised Hinduism while many Malays and Indians practise Islam and a significant minority of the white population practise Judaism.

Comprehensive macroeconomic prudence which was sustained and a helpful global environment facilitated the growth of South Africa’s GDP to a stable pace for decade before the global economic crisis of 2008-2009. However, the rating of South Africa was downgraded by some rating agencies which cited poor growth prospects. Owing to the combination of domestic constraints, the decrease in prices of commodity as well as the slowdown of the Chinese economy which has aggravated the already high unemployment and inequality rate, the country’s real GDP growth is estimated at 2.0% for 2016.

4.1.2 THE SOUTH AFRICA CONSTRUCTION INDUSTRY

South African construction industry contributes significantly to the economy of the country as well as her social development. It is an industry that is diverse in nature saddled with the responsibility of all built environment infrastructure which is described as the capital stock which produces services that are used by household members among which are water, sanitation and electricity, hospital services or which enables economic production or serves as contributions to production. Most of the supply chains in the continent of Africa can be considered to point towards South Africa because she is the largest construction market in the continent (Emuze, 2011).

The activities of the South African construction industry led to the development of the built environment which is vital to national development as one of the principal employers of labour in the country. An improvement in the quality of the built environment has made the industry to offer numerous employment opportunities which highlights why skilled graduates have to take up industry-related jobs (CIDB, 2012). Nevertheless, the industry is affected constantly by the scarcity of skilled graduates in meeting the needs of the industry (Department of Labour, 2007). When put into consideration several reforms put in place to check the issue in recent times, the condition of things become worrisome (Rasool and Botha, 2011).

Over the last decade, the reasonably modern and well developed infrastructure of South Africa has declined as a result of under-investment and shortage of skills (Emuze, 2011). Nonetheless,
The Presidency of South Africa, (2014), reported that for the past twenty years, the following are the achievements of the South African construction industry:

- Eighteen new hospitals have been constructed while more than 200 local hospitals have been renovated
- More than 1500 healthcare facilities have been built while those already in existence have been revitalised and renovated and are accessible at a radius of at least 5km
- About 84,468 new classrooms have been constructed alongside 21,774 ablution facilities
- About 12.5 million poor people have been provided with shelter through 3.7 million subsidised housing opportunities.

4.1.3 RISK MANAGEMENT IN THE SOUTH AFRICAN CONSTRUCTION INDUSTRY

Construction projects will be continuously characterized with delays, high costs and contractual disputes due to the absence of an effective risk management which normally would have combat risks and uncertainty present in any project (Serpella et al., 2014). Therefore, risk management remains a vital process that must be implemented systematically in the course of the construction project in a bid to achieve the objectives of the project (Banaitiene and Banaitis, 2012). According to Serpella et al., (2014), it is essential that the manner in which project team account for risks be carefully looked into. The use of contingencies or floats which does not embrace comprehensive evaluation of the risks that can affect a project is being applied in a lot of projects. As a result, it is inadequate to contain the degree of risks that will occur in the course of project realization thereby bringing about projects with high cost and schedule overruns (Kishkak and Ukaga, 2008).

This opinion is similar to a study carried out by Makombo, (2011), in which risk management was implemented in the projects of just 16% of professionals and firms investigated in South Africa as 42% claimed risk issues are being addressed at project completion hence such does not have scheduled risk management activities in the course of their project lifecycle. The lack of risk management is a function of the fact that experts address risk as they show up hence; it can be presumed that professionals are reactive contrary to having proactive management stance on risk.

Chihuri and Pretorius, (2011), posited that nevertheless, some corporations still embrace the principles of risk management therefore; absence of risk management implementation in
organizations is not a blanket notion that can be generalised. However, the lack of capacity to apply risk management principles in the project lifecycle results in project failure. Apparently, the benefits of a structured project risk management approach is not given proper consideration as many respondents are ignorant of the contribution of risk management towards the overall success of projects in South Africa. Current empirical data reveals the failure of about 65% of mega projects being unable to meet up with the objectives of the project as the fallout of lack of understanding.

Risk management has become a significant element of effective management in the construction industry. In a bid to anticipate and prepare for negative potential events, companies have recognized the need to advance risk management to be more predictive (PWC, 2013). An effective risk management process is vital in the process of ensuring that project managers monitor risks and evaluate when they need to put a mitigation plan in place. On the other hand, project management theory makes provision for risk management but the existing technique fails to detect many of the risks (PWC, 2013).

Baloyi and Bekker, (2011), conducted a research on the factors that hindered meeting up with the project objectives of the South African World Cup Stadia and deduced that the most substantial factor associated with cost is the increase in material cost. Chihuri and Pretorius, (2011), opined that high risk factors on South African construction projects remain the issue of escalating costs. They attributed this to an increase in the cost of construction materials over a period of months as a result of the unpredictability nature of the rand which is responsible for the increase in the price of imported materials. Furthermore, this acceleration in cost is influenced more by the downturn in the world economy as well as the increasing oil prices. Shortage of skills, inadequate planning and labour problems were also expressed as the highest ranked contributors to time delays on projects for the contractor. About 60% of the total project cost is used to cater for materials though South Africa manufactures its own strategic materials but depends heavily on foreign countries for equipment (Haskell, 2004). Just between October 2000 and 2006, it was reported that the prices of volatile building materials e.g. steel, cement, sand, copper, timber, polyvinyl chloride (PVC) pipes, bitumen and masonry escalated by approximately 100% (CIDB, 2007). According to Stats SA (2010b) and BER (2011), within the period of 2000 and 2010, prices of building materials increases ranging from 70% - 241%. Furthermore, between 2002 and 2010, the prices of building materials rose up linearly at an average rate of 70%, while the prices reach their peak generally in 2008 (BER, 2011).
An area that is void of infrastructure which include electricity, pipe-borne water, roads, streetlights and sewage disposal systems cannot develop hence sustenance of human settlements require infrastructure. A considerable amount of money is being spent on renewing old and run down urban and rural infrastructure in South Africa by the government (CIDB, 2007). Eberhard, (2008), opined that limitation on electrical capacity is a huge challenge as ESKOM which is the electricity-generation company in South Africa has a minimal generating capacity of 39,154 megawatts and there is a tendency that scarcity of water will become an increasing problem. In some cases like new areas with high end housing estate development, infrastructures that are related to housing are delivered increasingly by private property developers as an added cost of the development (Kihato, 2012).

An integral part of the South African Risk Management skyline is in the standards effected by the South African Bureau of Standards (SABS). They have been put in place to accomplish reliability and consistency in risk management by the creation of a standard that would be appropriate to all forms of risk. This national standard is the similar implementation of ISO 31000:2009 and has been approved with the permission of the International Organization for Standardization (ISO). The knowledge of experts selected from 28 countries was applied by the ISO to provide guidance for the development of the standard.

These specialists had the major role of representing the opinions of their national and sector mirror committees and organizations. As a result, these documents are not just the deductions of a small committee but stands for the opinions and know-how of experienced people involved in all facets of risk management. The advantage of SANS 31000:2009 is that it leads for more brainstorming sessions within many corporations thereby ensuring that risk management standard will be raised in a way to bring about remarkable and helpful change (Purdy, 2010).

4.1.4 LESSONS LEARNT

In the literature reviewed with regards to the South African construction industry and the challenges the industry faces in relation to construction risk management, the following is a summary of some of the lessons learnt on factors that affect risk management in construction industry:

Baloyi and Bekker, (2011), conducted a research on the factors that hindered meeting up with the project objectives of the South African World Cup Stadia and deduced that the most
substantial factor associated with cost is the increase in material cost. Chihuri and Pretorius, (2011), opined that high risk factors on South African construction projects remain the issue of escalating costs. They attributed this to an increase in the cost of construction materials over a period of months as a result of the unpredictability nature of the rand which is responsible for the increase in the price of imported materials. Furthermore, this acceleration in cost is influenced more by the downturn in the economy as well as the increasing oil prices. Shortage of skills, inadequate planning and labour problems were also expressed as the highest rated donors to time delays on projects for the contractor. About 60% of the total project cost is used to cater for materials though South Africa manufactures its own strategic materials but depends heavily on foreign countries for equipment (Haskell, 2004). According to Stats SA (2010b) and BER (2011), within the period of 2000 and 2010, prices of building materials increases ranging from 70% - 241%. Furthermore, between 2002 and 2010, the prices of building materials rose up linearly at an average rate of 70%, while the prices reach their peak generally in 2008 (BER, 2011).

4.2 GHANA

4.2.1 BACKGROUND

Ghana is located on the West Coast of Africa. There are ten administrative and commercial regions in Ghana with Accra as the capital of the country. The country is made up of different ethnic groups which are the Akan, Moshi-Dagomba, Ewe, Ga, Gurma and Yoruba. According to Intute, (2007a), about 1.5% of the whole population of Ghana are not African while 45% of Ghanaians follow traditional beliefs, 12% are Muslim while Christian makes up 43% (GoG, 2007).

Ghana gained independence in 1957 from Britain having been a Crown Colony since 1897 and now the country operates a multi-party democracy. Her post-colonial history comprised of several military coups and protracted military regime combined with short-lived times of civilian government. Democratic governance was returned with a new constitution in 1992 with the military head of state since 1981; Jerry Rawlings being elected as the democratic president. The country has since then conducted general elections which have been generally described as free and fair.

Agriculture, industry and services are the three sectors which contribute most of Ghana’s economy and the most dominant of the three is the agriculture sector. Closely 40% of GDP and
50% of all the country’s employment are found in the agricultural sector (Aryeetey and Kanbur, 2005). The sector has remained very important to Ghana as a prosperous cocoa industry which strengthened her economic growth in the course of the early part of the twentieth century though the vulnerability of Ghana as a mono-crop economy was exposed in 1965/1966 when the cocoa market collapsed (GoG, 2005a). The country experienced a considerable macroeconomic instability and poor growth between 1965 and 1983. Contributors to this turbulence include changes in government, major policy reversals and unstable application of centrally managed interventionist economic policies (McKay and Aryeetey, 2004). Ghana applied many structural adjustment policies through an Economic Recovery Programme (ERP) in the 1980s as reaction to the economic crisis during the military era which was conducted by the World Bank and International Monetary Fund (IMF) (GoG, 2005a). Even though, to a large extent, the structure of the economy remained the same, the twenty years that followed the economic reforms recorded 4.9% average GDP growth and 2.9% average per capital growth (Aryeetey and Kanbur, 2005).

According to Coulombe, (2005), in the rural areas, deprivation is substantially higher than in the urban centres. As at 1998/1999, 66.8% of the population reside in rural areas but approximately 84% of the poor were rural dwellers (McKay and Aryeetey, 2004). Small scale agriculture is the foremost economic activity of the majority of the rural people and for those who are primarily engaged in non-farming activity, their secondary activity is still agriculture (McKay and Aryeerey, 2004). The risk of poverty is at the peak amongst agricultural workers (Heintz, 2005).

4.2.2. THE GHANIAN CONSTRUCTION INDUSTRY

In the past two decades, the construction industry in Ghana has contributed immensely to the economic transformation of the nation and it is even responsible for Ghana becoming a middle-income country. The sector employs about 320,000 people and approximately 2% of young people and it also offers more training and apprenticeship opportunities to the youths when compared to any other sector (Owusuuaa, 2012; GSS, 2014). World Bank, already projected that in 2020, there may be skills gap of 250,000 artisans and tradesmen (Darvas and Palmer, 2014). Over the last 20 years, the country has benefitted from a consistent and democratic political system and high economic growth rates which were encouraged by the discovery of oil in commercial quantities. In the year 2010, the country became a middle income country ahead of schedule as a result of a technical statistical adjustment (Moss and Majerowicz, 2012). The
framework of Ghana’s economy is that of a country in transition: the services sector continues to be the driver of the economic growth as it makes up 51.1% of the economy, with agriculture following with 30% and industry by 19% (Jerven and Duncan, 2012).

The construction sector which have about 23,000 registered contractors is a major employer of Ghana’s workforce because it is labour-intensive (Ministry of Education, 2010). According to the Ghana Living Standards Survey (GLSS), about 2% of the youth work in the construction sector while the rate is 2.5% for young people who are out of school (GSS, 2013). Better infrastructure and housing is a bedrock of higher growth rates hence construction also has a catalytic effect on the development of the economy. In addition, construction has one of the highest multiplier effects as a result of its strong backward and highest multiplier effects (Osei, 2013).

In 2014, growth rates estimate in construction was 14% as further predictions opined that the increase in growth rates will be prolonged over the medium term to 2017. Investments in real estate, upgraded public infrastructure as well as the enlargement of the mining sector gave birth to these growth rates. Although investments in real estate have to a large extent served the middle class of the country, its diaspora, expatriates and speculators nevertheless, if the increasing urban population is to be housed, then numerous substantial opportunities in the low-cost housing sector can be maximised (Ministry of Education, 2010; UN-Habitat, 2011). One percentage point is contributed to Ghana’s annual per capital GDP growth during the 2000s by infrastructure developments yet annual growth rates could be increased by 3% points through boosting the national infrastructure endowment (Foster and Pushak, 2011).

Large investors in the built environment are the government of Ghana as well as a host of state-owned enterprises (Osei, 2013). This is not surprising regardless of privatisation efforts but this will likely change gradually as the country becomes wealthier. Nonetheless, this also suggests that the country’s negotiation with the IMF may affect the construction industry negatively just as assistance from IMF has conditions attached including a budget ceiling for infrastructure projects (African Economic Outlook, 2015).

In Ghana, there is no single agency of the government which supervises the construction sector as the management of the built environment is a joint responsibility of three ministries which are “the Ministry of Water Resources, Works and Housing (MWRWH), the Ministry of Transport and the Ministry of Roads and Highways”. Furthermore, labour and employment aspect of the sector is overseen by the Ministry of Transport and the Ministry of Roads and
Highways while research and development and vocational training is controlled by the Ministry of Education. The unpredictable and *ad hoc* characteristics of construction policies are a reflection of the way by which responsibility for the sector is shared across these ministries.

A National Housing Policy Committee which was constituted in 1986 by the then ministry of works came up with a report which climaxed in a National Housing Policy and Action Plan for 1987 – 1990 with a mandate to increase strategies for rural and urban shelter. Land tenure rationalising and regulations of title, improving the delivery of finance for the promotion of a cost-effective construction industry and the increase in the utilisation of local building materials and the involvement of women in the sector were contained in the Action Plan (Bank of Ghana, 2007). A greater collaboration with the private sector was represented in the policy thereby moving from the era of state-led construction (Arku, 2009).

Road construction is the predominant activity in transport infrastructure as road is the major means of transportation in Ghana. “*Road transport accounts for 98% of freight ton-miles and about 97% of passenger miles in the country* (GIPC, 2016; Ahiaga-Dagbui et al., 2013)”. There is 39,409km of road network in the country even though there must be an upgrading of the network if it is to keep up with the demand. The quality of the rural road is fairly good but there is an inadequacy of the physical extension of the rural network and only 24% of the rural population lives within 2km of an all season road.

Majority of the roads in Ghana is financed internationally and handled by firms owned by foreign contractor which are sometimes attached to the finance source. One of the major investors in urban, feeder and trunk roads which is the World Bank offers a 7.5% preference for local contractors which is not sufficient to permit domestic firms also to compete for such contracts. In addition, many local contractors lack the turnover to access the needed fund and equipment as they usually scuffle to get staff with the necessary engineering capability.

### 4.2.3 RISK MANAGEMENT IN THE GHANAIAN CONSTRUCTION INDUSTRY

The Ghana construction industry is a risky industry based on a number of fatalities as well as the increase in the number of accidents (Akomah *et al.*, 2010). Although quite a number of Acts of Parliaments seek to develop the health and safety record of the sector, yet it has not resulted in a coherent health and safety society. In fact, the situation has been aggravated further by the virtue of the absence of training for artisans in occupational health and safety (Fugar *et
The insufficiency of regulations not being alone has been substantiated by evidences from other countries. For instance, increase in impromptu site inspections has been described to be the cause of reduction in construction accidents in the United Kingdom (NAO, 2004).

The contribution of the construction industry to the GDP of Ghana has been about 8.2% annually (Owusu-Manu and Badu, 2011) while it is 8-10% in the United Kingdom and other developed countries (Crosthwaite, 2000). Comparing the level of development in many countries to what is obtainable in Ghana; it appears the country is backward with regards to conscious efforts being made in other countries to improve the performance of the construction industry globally. This extensive culture of underperformance shows that the bulk of the key projects in Ghana are granted to very few large firms most of which are owned by foreign contractors (Tawiah, 1999; Chileshe and Yirenkyi-Fianko, 2012).

Therefore, a major cause of alarm amongst construction stakeholders in Ghana is performance. According to Ahadzie, (2007), contractors were blamed for underperformance in many situations and critiqued for having inadequate knowledge in the use of requisite management methods. Vulink, (2004), who supported this claim, opined that construction firms do not employ professionals who are knowledgeable on how to manage their firms towards sustainable growth. Also, the sector is described as that which have an highly inconsistent business environment in which inflation consumes the contractors’ capital among other challenges which makes the management of construction business to be a very difficult one (Dansoh, 2005).

The abovementioned highlights the challenges connected with governance within the Ghanaian construction industry. However, challenges are pointers to a bigger problem of the absence of a well-defined outline for the Ghanaian construction industry as well as the lack of opportunity to pursue improvements across the length and breadth of the industry. Consequently, the cooperation among stakeholders such as“Metropolitan, Municipals and District Assemblies (MMDAs), professional bodies – Ghana Institution of Surveyors (GhIS), Ghana Institute of Architects (GIA), Ghana Institution of Engineers (GIE), Ghana Institute of Architects (GIA), Ghana Institution of Engineers (GIE), Ghana Institute of Construction (GIOC)” – and private firms is very little. Usually, these professional bodies are feeble when it comes to putting into professional standards fairly due to the lack of a legal mandate as membership of these bodies is non-compulsory for both of them. An effective leadership is needed in the Ghanaian construction industry for the required improvements in the industry.
Some researchers have highlighted the problems of the construction industry amongst whom are Ofori, (2012), who identified the challenges affecting the Ghanaian construction companies. Challenges identified include the inability to secure sufficient working capital, poor management, poor engineering capability and insufficient workmanship. In addition, accessing finance for small and large contractors in Ghana for projects is not an easy task. In a situation where there is availability of debt finance, interest rates tend to skyrocket which resorts to large numbers of abandoned projects (Badu et al., 2012). The cost with regards to lost time, the cost of sourcing for new construction firms, the cost of rework and making good defects is equally high, for instance, delay in projects results in high rises in cost due to high inflationary trends.

According to Adams, (2008), a common trend that constitutes a major reason for delays in projects completion is delays in the payment of contractors for work done (Fugar and Agyarkwa-Baah, 2010). In a strange and very rare development, a collection of Ghanaian contractors had to protest to demand compensation for projects they have completed for the government having delayed their payments after a number of months of projects completion (Osam, 2012). Projects with a high standard of quality and excellence can only be delivered by quite a little number of construction firms within the country and are mostly foreign owned firms.

According to Laryea, (2010), who explored the challenges and opportunities which contractors in the Ghanaian construction industry face posited in his study which involved selected building and civil engineering firms and road contractors that challenges which both groups of contractors encounter are alike. Different challenges identified include “difficulty in accessing funds, delay in disbursement, poor design quality, employees issues, bribery and corruption, poor contractor grouping and workloads, cumbersome payment processes, lack of capacity to compete in the competitive system of procurement, inability to contend with foreign owned companies as well as breakup of contractor representation bodies. Others include low technology, poor supervision of contracts, poor preparation for projects, revision of bills of quantities, politicization of the contract bidding process as well as absence of effective barriers to entry”.

4.2.4 LESSONS LEARNT

Below is a summary of some lessons that can be learnt from the Ghanaian construction industry with regards to factors which affect the risk management in construction projects:
One of the most risky industries in Ghana is the construction industry which is based on a number of fatalities as well as the increase in the number of accidents (Akomah et al., 2010). Although quite a number of Acts of Parliaments seek to develop the health and safety record of the sector, yet it has not resulted in a coherent health and safety society. In fact, the situation has been aggravated further by the virtue of the absence of training for artisans in occupational health and safety (Fugar et al., 2013). The insufficiency of regulations not being alone has been substantiated by evidences from other countries. For instance, increase in impromptu site inspections has been described to be the cause of reduction in construction accidents in the United Kingdom (NAO, 2004).

Therefore, a major cause of alarm amongst client groups and stakeholders in the Ghanaian construction industry is performance. According to Ahadzie, (2007), contractors were blamed for underperformance in many situations and critiqued for having inadequate knowledge in the use of requisite management methods. Vulink, (2004), who supported this claim, opined that construction firms do not employ professionals who are knowledgeable on how to manage their firms towards sustainable growth. Also, the sector is described as that which have an highly inconsistent business environment in which inflation consumes the contractors’ capital among other challenges which makes the management of construction business to be a very difficult one (Dansoh, 2005).

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The difference between design and construction with professionals wanting to function independently with loyalty to their respective professional bodies which include Ghana Institution of Architects (GIA), Ghana Institution of Engineers (GhIE) and Ghana Institution of Surveyors (GhIS) is one of the major characteristic of the Ghanaian construction environment. Consequently, the oppositional relationships which conventionally characterises the construction industry are also very noticeable in the Ghanaian industry (Ahadzie, 2007). Although, the Ministry of Water Resources, Works and Housing and the Ministry of Roads and Highways are saddled with the responsibility of categorisation of contractors yet none of the two ministries has any supervisory systems in place to control the performance of contractors or adjust standards. Penalties for non-performance on projects do not stand for an adequate deterrent measure to provoke high levels of performance amongst contractors (Ofori-Kuragu, 2014).

4.3 COMPARISON BETWEEN SOUTH AFRICA AND GHANA

An examination of the two African countries under review showed that there are some differences with regards to factors that affect risk management in the construction projects of both countries. Chihuri and Pretorius, (2011), opined that high risk factors on South African construction projects remain the issue of escalating costs. They attributed this to an increase in the cost of construction materials over a period of months as a result of the unpredictability nature of the rand which is responsible for the increase in the price of imported materials. Furthermore, this acceleration in cost is influenced more by the downturn in the world economy as well as the increasing oil prices. Shortage of skills, inadequate planning and labour problems were also expressed as the highest ranked contributors to time delays on projects for the contractor. About 60% of the total project cost is used to cater for materials though South Africa
manufactures its own strategic materials but depends heavily on foreign countries for equipment (Haskell, 2004). Just between October 2000 and 2006, it was reported that the prices of volatile building materials e.g. steel, cement, sand, copper, timber, polyvinyl chloride (PVC) pipes, bitumen and masonry escalated by approximately 100% (CIDB, 2007). According to Stats SA (2010b) and BER (2011), within the period of 2000 and 2010, prices of building materials increases ranging from 70% - 241%. Furthermore, between 2002 and 2010, the prices of building materials rose up linearly at an average rate of 70%, while the prices reach their peak generally in 2008 (BER, 2011).

4.4 CONCLUSION

This chapter has reviewed the construction industry of South Africa and Ghana both of which are African countries as well as the challenges they face with regards to risk management in their construction projects and a summary of the lessons that can be learnt from the review. The next chapter reviews the literature on Nigeria, its construction industry and the lessons that can be learnt from the construction industry.
CHAPTER FIVE
NIGERIAN LITERATURE REVIEW

5.0 INTRODUCTION

This chapter presents a theoretical view of the Nigerian construction industry, risk management of the construction industry in Nigeria. Problems and challenges the industry faces that influence the performance of their construction projects. In addition, this chapter examines the lessons that can be learnt from the Nigerian construction industry.

5.1 NIGERIA

5.1.1 BACKGROUND

Nigeria is located in the western part of Africa. The country is the seventh most populous nation on the planet earth and the most heavily populated in Africa with a population size of about 186 million inhabitants. The name Nigeria is derived from its main river which is ‘River Niger’. The country is bordered in the west by Benin Republic, Niger Republic to the north and northwest, to its north east is the Chad and to the east is Cameroon while Atlantic Ocean (Gulf of Guinea) is to the south. It has a total land area of 923,768 sq km. The topography of the country is divided by two major rivers: River Niger and River Benue which separated the country into three different regions. The third longest river in Africa is the River Niger (4200km) and it runs into the country from the north-west while River Benue (1400km) flows into the country from the north-east. The two rivers met at Lokoja which is located in the central part of the country and is referred to as the confluence town. The rivers empty into the Atlantic ocean at the Niger Delta. Adamawa Plateau, the Mambilla Mountains, the Benue Hills and the Jos Plateau are the highest altitudes in the country are located towards the central part of the country, along the eastern border. The Adamawa and Jos Plateaus, the Niger and Benue Rivers, and the Niger Delta region include some of the notable geographical features in Nigeria (CIA, Factbook, 2018).

The country is divided into six geopolitical zones and presently has 36 states with 774 local government areas. Lagos, Kano, Benin City, Port Harcourt and Ibadan include the largest cities in the country. Lagos has been the capital until 1991 when Abuja which was centrally located became the capital with the hope of unifying a nation that has been plagued by several ethnic and religious crises. The country which gained independence in 1960 has its post-independence area marked with coups and largely military era until the death of a military head of state in
1998 which paved way for a switch into the political era. There was adoption of a new constitution in the year 1999 and there was a successful and peaceful transition to a democratically elected government. Since then the country has been faced with the challenges of institutionalizing democracy and diversifying a mono-product dependent economy which is crude oil whose revenues have been embezzled via corruption and mismanagement. Also, the country has continued to witness both ethnic and religious strains. The 2003 and 2007 general elections were flawed by apparent abnormalities and violence nevertheless, the country is presently witnessing its longest period of civilian government since she gained independence in 1960. The first transition of power from one civilian government to another in the history of the country was a product of the general elections that was held in April 2007 while the 2011 general elections was generally described as credible. Another giant stride recorded in the political history of Nigeria was in 2015 which was considered to be the most well run in the country which saw All Progressive Congress; the umbrella opposition party defeated the ruling People’s Democratic Party which had been in power since the inception of democracy in 1999 (CIA, Factbook, 2018).

The country has about half the population of the entire Western African region with the estimated population of above 186 million inhabitants in 2016 to 392 million in 2050 thereby becoming the world’s fourth most populous country. About 250 various ethnic groups exist in the land having Hausa-Fulani, Yoruba and Igbo as the dominant ones. Ibibio, Ijaw, Tiv and Kanuri are among the other major ethnic groups. The three major languages spoken by the three major dominant ethnic groups in the country are Hausa, Igbo and Yoruba. Nevertheless, there still exist about 520 languages spoken in the country and this rich diversity of language paved way for the adoption of English as the official language because none of the language is being spoken by a significant number of people all over the country (CIA, Factbook, 2018).
5.1.2 THE NIGERIAN CONSTRUCTION INDUSTRY

In the 1940s, few foreign companies came into the country which marked the beginning of organized construction contracting in Nigeria. Independence which the country gained in 1960 and was boosted by the oil boom of the 1970s resorted to an ascending trend in the construction activities even till 1983 which marked the completion of the second Republic; the industry has experienced an awesome expansion in construction contracting majorly by colonial companies and a small number of indigenous companies. Conversely, the period revealed the low level of human resources development of the indigenous companies needed for planning, designing, constructing as well as the size and number of projects conceived by the government. Nevertheless, as a result of improvement in training institutions, expatriates engagement, teamwork between indigenous and foreign industrialists, political stability and improvement in government policies, it has led to resources gap required for successful projects completion.
between indigenous companies as well as their foreign counterparts who are closer now in comparison to the pre-independence period (Mbamali and Okotie, 2012).

According to Capital Management Limited report which beams its searchlight on the Nigerian construction industry, private sector’s involvement or participation in the sector is insignificant and this has made the industry to be greatly correlated with the budget allocation (Oluwakiyesi, 2011). Between the year 1982 and 2006, regression analysis of the construction sector on the entire expenditure of the government gave a correlation coefficient of 0.92 (Oluwakiyesi, 2011). This implies that the bulk of clients patronising the industry are the federal, state and local governments however, continuous deregulation of the different parts of the economy has ushered in clients from the private sector thereby accounting for larger share of the contracts. Those who are in need of infrastructure, housing compounds and office space which are more or less the large oil companies such as Chevron, Total, Shell, Mobil, Oando and Exxon are the biggest private sector clients in Nigeria (Oluwakiyesi, 2011). In addition, there are international clients which include non-governmental organization, the United Nation, large real estate developers in Lagos and Abuja as well as new generation banks.

About 95% of the sector is being controlled by foreign companies while non-indigenous companies have now been coming on board over the years but usually bond with foreign companies (Oluwakiyesi, 2011) due to the low quality of technology in Nigeria hence high tech equipment have to be imported thereby revealing the inherent advantage in partnering with foreign companies. With regards to viable human resources, there are competent hands in the country like engineers and planners but they have been put-aside because majority of the contracts have been awarded to foreign companies (Oluwakiyesi, 2011).

5.1.3 CONSTRUCTION RISK MANAGEMENT IN NIGERIA

A significant role which a project manager must agree to is risk management. However, the duty of a project manager is principally cumbersome and is of no use if proper risk management practice has not been in place from the start of the project. Efficient and effective risk management calls for proper systematic methodology as well as the part of experience and knowledge (Baloi and Price, 2003).

Nigeria has witnessed project failure due to the inadequate management of risks during construction as less emphasis has been placed on risks (Ijaola, 2012). One of the nine knowledge areas propagated by the Project Management Institute is risk management with
others listed as scope management, integration management, cost management, time management, resource management, human management and procurement management. Risk identification, improvement in the management of construction processes, efficient and effective usage of resources are all embedded in the goals of risk management process. Conversely, risk may also stand as opportunities but the negative consequences that accompany risk is usually considered (Baloi and Price, 2003).

This shows that risk management precautions in the construction projects executed in Nigeria has been implemented in a very inadequate and inefficient manner with the lack of knowledge for its implementation and knowledge deficit. This becomes obvious in the course of the execution of each project that would be useful for new projects is responsible for this condition. Therefore, judging from the client, contractor and consultant’s perspective, knowledge is a major factor in the realization and improvement of risk management in construction projects (Adeleke et al., 2015).

It has been reported in previous researches that industries which patronize construction services periodically do not make use of risk management practices in projects and this has resulted to negative consequences for projects performance (Aibinu and Jagboro, 2002). According to Ojo, (2010), who carried out research on entitlements and contract disputes in a host of construction projects stated that the event of risks occurrence that were not assessed properly or incorporated by either clients, contractors and consultants as one of the main causes of claims and disputes in the construction projects.

Using questionnaire as the preferred tool for data collection, the possibility of occurrence and the effects of certain risk factors at pre and post contract stages in the Nigerian construction was examined by Odeyinka, et al., (2007). They discovered that at the pre contract phase, the tendency of the occurrence of the highlighted risk factors follows the order of design risk, estimating risk, competitive tendering risk and tender evaluation risk as well as their effects following a similar order. The tendency of the occurrence of those risk factors follows this order: financial risk, political risk, contractual risk, logistic risk, legal risk and environmental risk at post contract stage while the effect differs with regards to the tendency of occurrence (Aminu, 2013).

According to Belel and Mahmood, (2012), who assessed risk management in the Nigerian construction industry, they identified knowledge deficiency as the most intolerant issue that hinders risk management practice as well as inadequate skilled staffs as the main source of risk
in construction activities. They posited that the major benefit of risk management is its contribution to project success. They opined that a large number of their respondents are conscious of risk management with regards to safety threat on site compared to identifying the concept with relations to accomplishing the objectives of the project in terms of cost, quality and time. They proposed that the workforce in the Nigerian construction industry should be trained on how to manage risks (Belel and Mahmood, 2012).

5.1.4 LESSONS LEARNT

In the literature reviewed relating to the Nigerian construction industry, the problems and challenges the industry faces in relation to risk management in the construction industry, it is apparent that there exist a number of significant factors that affect risk management in their construction projects. Some of the lessons learnt are summarized as follows:

An adequate and organized methodology is required to have an efficient and effective risk management and more significantly knowledge and experience of several kinds of project that has been handled before. For instance, knowledge of the unforeseen situations that could happen during the process of project implementation on the actions that functions better or not when either of these event takes place on techniques to analyze a risk or estimate the likelihood that it will take place in no distant time. Lot of bad consequences for members in a project due to the non-existence of plan in place to counter risks and uncertainty that any project could result into is the outcome of the dearth of a project risk management function which is effective. For example, delays, substantial increase in costs, contractual disputes and litigation among others results from the lack of prevention against the risk of definition of project scope, environmental hazards or communication risks, poor site management and slow decision making (Adeleke et al., 2015).

This shows that risk management precautions in the construction projects executed in Nigeria has been implemented in a very inadequate and inefficient manner with the lack of knowledge for its implementation and knowledge deficit which becomes obvious in the course of the execution of each project that would be useful for new projects is responsible for this condition. Therefore, judging from the client, contractor and consultant’s perspective, knowledge is a major factor in the realization and improvement of risk management in construction projects (Adeleke et al., 2015).
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5.2 CONCLUSION

This chapter has reviewed the literature relating to Nigeria, its construction industry as well as the problems and challenges faced by the Nigerian construction industry. It further reviewed the literature on lessons that can be learnt from the Nigerian construction industry. The next chapter addresses and explains the methodology used in this study.
CHAPTER SIX

RESEARCH METHODOLOGY

6.0 INTRODUCTION
This chapter showcases the research method used in making sure that the objectives of this study are achieved in line with the problem statement. Also, this chapter explains the location where the research was carried out, as well as the design structure and sampling. Additionally, the data collection instrument and the methods used to ascertain the reliability and validity of the instrument was discussed.

6.1 SIGNIFICANCE OF THE RESEARCH METHODOLOGY
This research is significant and coming up at a time like this because of its proposed contribution to the body of knowledge by evaluating the risk management in the Nigeria construction industry by examining the factors affecting the management of construction risk, identifying the risk management methods used, the effectiveness of these methods and factors that influence risk management on construction projects in Nigeria.

6.2 RESEARCH APPROACH AND DESIGN
Research approach is a stepwise process where broad assumptions are made which is further streamlined to a detailed method(s) of data collection, analysis, and interpretation. This procedure involves taking decisions that are dependent on the researchers’ experience in research study and how it makes sense to the researcher.

The choice of research approach is basically based on the research problems, objectives and questions. According to researchers, as quoted by Creswell (2013), there are basically 3 types of research approach which are qualitative, quantitative and mixed. The mixed research approach was stemmed out of the fact that the advantages of qualitative approach can be used to negate the disadvantages of quantitative approach and vice-versa.

6.2.1 Qualitative Research Approach
This is a type of research that makes use of open-ended questions such as interview questions rather than close-ended questions that is an attribute of quantitative research. This method chooses the option of using framed words and qualitative data collection tools such as interviews.

In the opinion of Jennifer (2011), qualitative research approach is achieved by observing words, texts, pictures, etc in data collection. It is known to allow interaction between researcher and
its participants. Hence, it can be adapted for most research. Its flexibility is used as advantage when carrying out research studies. It is noteworthy to state that due to its descriptive and analytical nature, qualitative approach deeply describes the research problems before analysis the gathered for the study (Jennifer, 2011).

6.2.2 Quantitative Research Approach
Quantitative research is an approach for researching and testing the validity of the theories surrounding the objectives by exploring the relationship among variables (Creswell, 2013). These variables are measured using typical tools, so that numbered data can be analyzed using statistical process or software.

This approach allows the gathering of data by numbers and then used to quantify or measure the phenomena and develop findings through an objective, formal, and systematic process. It is usually used to define test and examine cause and effect of relationships deductively (Burns & Groove, 1987; Duffy, 1985). Creswell, (2003) was of the opinion that quantitative research asserts the theories of an empiricist paradigm, while Leedy and Ormord (2001) maintained that quantitative research is solely specific in its survey and experimentation, because it builds on existing theories.

Many are the weaknesses of a quantitative research approach but its strength makes it appropriate to be used in some studies. One of its strength is its ability to be independent of the researcher, as this reduces the infiltration of the researchers’ interest (Creswell, 2003). As against qualitative research, quantitative research approach test theories deductively and its findings can be generalized to a larger population because of its large sample size. Also, analyzing quantitative data has been made less tedious because there is lots of computer software that has been developed to make data analysis less time consuming (Connolly, 2007).

6.2.3 Mixed Research Approach
This is a research approach that tries to incorporate the elements of qualitative and quantitative approaches by taking a stance at the middle of the approaches (Creswell, 2013). Mixed research approach allows the researcher to collect varying types of data which gives a holistic understanding to the research problem than either singularly using quantitative or qualitative data (Creswell, 2013).

Johnson and Onwugbuzie (2004, supported by Greene, 2007) are of the opinion that this research approach gives the researcher the ability to juxtapose the inherent limitations, on
inherent strengths and offset inevitable biases. Furthermore, as commented by Creswell and Plano (2011), mixed research methods gives a greater level of understanding to be formulated than if a single approach was adopted to specific studies.

6.2.4 Methodology for this Study

Based on the explanations above, the quantitative survey method was adopted because a large portion of the sample population in the selected research area could be adequately covered in a relatively short period. This approach further makes use of a standard research design and fixed procedures which make it possible to be replicated (De Vos et al. 2005).

De Vaus (2013) explains that research design is the process that a researcher chooses to input the different elements of the study in a coherent and logical way, thereby, ensuring that the research problem is effectively addressed. It was further stressed that it is the blueprint for the collection, measurement and analysis of data. It is important to know that the research problem determines the choice of research design and not the other way round.

According to Yin (2013), research design is divided into descriptive, exploratory or explanatory. A descriptive study was selected because it gives an accurate account of the characteristics, for example, the behaviour, opinions, abilities, beliefs and knowledge of a situation or group. This method was chosen to meet the objectives of this study, namely to establish the current level of risk management practice in Nigeria, identification of risk factors with the highest possible occurrence, identification of the factors responsible for poor risk management practice in Nigeria, and to identify factors and procedural practices that will increase risk management practices in Nigeria.

6.3 RESEARCH AREA

This study was carried out in 3 cities in Nigeria, these cities are known to be center of construction development. These cities are Lagos, known as the commercial hub of the country, which has and is presently experiencing major construction projects. Lagos once was the capital of Nigeria, located in the south-western region of the country. Lagos is home to a lot of construction companies and its workers because of its viable economy; Port-Harcourt, a major city in the Niger-Delta region, known for its massive development due to the concentration oil companies; and lastly, the Federal Capital Territory (Abuja), this is the power seat of the
country and hence, it is expected to have lots of construction going on in this area. This forms the basis for the selection of the research area.

6.4 PILOT STUDY
Defining pilot study is important to this section. According to Polit (2001), the term pilot study in social science researches explained in two (2) different ways: feasibility studies conducted on a small scale before embarking on a research or a trial run of a research instrument. However, Baker (1994) gave a more concise explanation that pilot study is used to determine the validity of the research instrument. One of its advantages is that it has the possibility of showing if the proposed research instrument is not appropriate or complicated.

The pilot study of this research was conducted in the three study cities. A total of thirty (30) questionnaires were administered to professionals that were randomly selected across the three cities. It was ensured that the pilot questionnaire was administered just the same way the original questionnaire will be administered. During this pilot study, the following was observed:

1. The professionals were asked for feedbacks to identify ambiguities and difficult questions.
2. The time taken to finish the questionnaire was recorded decided if it was reasonable or not;
3. Determination of unnecessary questions that could be removed from the actual study
4. Assess if the responses can be interpreted in terms of the information that is required
5. Assess whether the questions gives an adequate range of responses;
6. Check if there is need to shorten, revise the questionnaires.

Based on the aforementioned observations, the inputs of the construction professionals were considered and slight modifications were made in the preparation of the main questionnaire.

6.5 TARGET POPULATION
Target population also known as research population is the total number of individuals that is the main focus of a scientific research (Burns & Grove, 1993). Also, Ledwaba (2012) explains target population in research as groups or individuals who are in a position to answer the questions and to whom the results of the survey apply.
The target population for this research comprised of active construction professionals located in Lagos, Port-Harcourt and Abuja FCT. These include managing directors, construction project managers and construction managers (Site supervisors) in the three (3) cities mentioned above. The choice of managers was because they are part of the construction team and when contracts are being awarded, they make the policies and give the financial backings and the fact that they are likely to have in-depth knowledge of the factors of risk that is the main objective of this study.

6.6 SAMPLING
Sampling techniques is a range of different methods that allow researchers to reduce the number of data needed by concentrating on getting data from sub-groups rather than all possible cases or elements. Many researchers, example of which is Henry (1990), argued that sampling techniques increases the accuracy of the data. Sample is that part of the target population that is actually gotten through a sampling technique and then studied (Nworgu, 1991). The sample of this study was hence drawn through a definite procedure from the target population.

According to Teddlie & Yu (2007), the probability sampling and the purposive sampling are the two statistical sampling used in social sciences. It was further opined that, probability sampling techniques are used in quantitative research. Hence, this study adopted the random sampling technique above the cluster, stratified, and multiple probability sampling because it gives all participants equal chance to be selected for the study with the same criteria. As initially stated, the criteria for participation in this study was that each participant must be a construction professional practising in the three cities listed above which are the centre of construction activities in Nigeria which is large enough to represent the entire population sufficiently.

6.7 DATA COLLECTION
Data collection simply refers to the process of acquiring relevant and useful information needed to respond to research questions (Ibemere, 2017). However, this research used the primary information collection method, which is simply the use of responses gotten from questions answered by the sampled population.

According to researchers (Kumar, 1999; Robson, 2002; Denscombe, 2007), information gathering in social research are just two. It was further noted that, the needed information by the researcher may be already available and only need to be extracted, this is known as secondary data while the other which is the most used method of information gathering is
collection of data through the use of questionnaires administered to the study’s’ sampled population; this is known as primary source of data gathering.

The questionnaire used in this study was designed using google forms and the link was sent to the sampled population through electronic mail (e-mail). A total of 200 questionnaires were sent out, out of which 155 were deem useable for the analysis. The remaining 45 questionnaires were either not completed or not attempted at all by the proposed respondents. it was made sure that, it wouldn’t take more than 15minutes to complete the questionnaire. Also, a time frame was given for the answering of the questionnaire and this was done for 2months, taking into consideration that the sampled population could be busy and forget to attend to the questionnaires, hence a reminder was always sent to the proposed respondent every first working day of every week throughout the 2month duration.

6.8 DESIGN OF INSTRUMENT FOR DATA COLLECTION

Questionnaires are convenient ways of collecting useful comparable data from a large number of individuals. However, this can only generate meaningful results if the questions are clear and precise and if they are asked consistently across all respondents (Mathers, Fox and Hunn, 2009).

The questionnaire consisted of five (5) sections; A, B, C, D, and E. section A was aimed at obtaining demographic (Age, level of education, years of working with the construction firm, gender, etc.) data of the respondents. Section B was aimed at identifying the factors affecting the management of construction risk in the Nigerian construction industry. Section C was aimed at knowing the method of risk management usually used in managing construction risk in Nigeria. Section D was aimed at knowing how effective the methods noted in section C in the management of construction risk in Nigeria. While section E was used to determine the factors that influences risk management on construction projects in Nigeria.

The questionnaire is a technique of data collection in which individuals are asked to answer the same set of questions in a predetermined order (DeVaus 2002). Also attached to the questionnaire were guidelines and instructions to aid the respondents in answering the questionnaire successfully.

Out of the 200 copies of questionnaire sent out through electronic mails, 150 were received valid and deemed useable for the study. This represent 75% of the total questionnaire administered. Summary of the mode of administering the question as shown in Table 6.1 forms the basis of this study. The percentage response was considered acceptable for analysis based
on the study by Moser and Kalton (1971) who indicated that the survey result could be described as biased and of little importance if the response rate was lower than 30 percent to 40 percent.

Table 6.1: Table showing questionnaire response rate

<table>
<thead>
<tr>
<th>Survey Responses</th>
<th>Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire administered</td>
<td>200</td>
</tr>
<tr>
<td>Questionnaire completed and submitted</td>
<td>150</td>
</tr>
<tr>
<td>Useable questionnaire</td>
<td>150</td>
</tr>
<tr>
<td>Useable response rate (%)</td>
<td>75</td>
</tr>
</tbody>
</table>

The data was collected by the researcher between the months of October to December 2017.

6.9 METHOD OF DATA ANALYSIS

This research study evaluates risk management in the Nigerian construction industry. Using a five-point likert scale, the respondents were asked to rate the factors affecting the management of construction risk in the Nigerian construction industry. They were also asked to rate the risk management methods used in the management of construction risk. Furthermore, the respondents were asked to rated the effectiveness of the methods adopted in Nigeria’s construction industry in risk management. Finally, they rated the factors that influences risk management on construction projects in Nigeria. The data was tested using cronbach’s alpha (α) to determine the internal consistency of the data gathered.

6.9.1 MEAN ITEM SCALE (MIS) AND EXPLORATORY FACTOR ANALYSIS (EFA)

For this study, a five-point Likert scale was used to determine the perception of respondents with respect to evaluating risk management in the Nigerian construction industry. The adopted scales followed the pattern showed below:

1 = strongly disagree (SD)
2. = disagree (D)
3. = neutral (N)
4 = agree (A)
5 = strongly agree (SA)
The five-point Likert scale was inputted into SPSS 22 and an exploratory factor analysis was carried out.

According to Fabrigar at al. 2004, there are five methodological steps that researchers must consider in carrying out EFA. The first being the determination of EFA being the most appropriate statistical method to achieve the objectives of the study, secondly, it is important to consider the sample size an variables of the study. Thirdly, the extraction method should be chosen followed by the selection of method to decide to number of factors to retain and lastly, the researcher need to select the rotation method to give a final interpretable result. Failure to make the right decision about one or more of the five steps may lead to error in result and limit the use of EFA (Hogarty et al. 2004).

EFA was used to provide evidence of validity and reliability of the evaluation of risk management in the Nigeria construction industry. A component analysis of the items of the questionnaire was carried out. The eigen values and scree plot were then studied to determine the number of factors. For this study, factor loadings higher than 1.0 were termed to be significant. From this, the conceptual factors and cluster factors measured by the questionnaire were identified. The EFA was conducted using SPSS version 22.

6.10 RELIABILITY
To test the reliability of the data collected, the completed questionnaire was inputted into Statistical Package for Social Science, version 21 (SPSS 21) to test the reliability and ensure high-quality measurement of the item. The reliability of a data collection instrument (questionnaire) is the degree of consistency with which it measures the attribute it is supposed to be measuring. Reliability can be equated with the consistency, stability or dependability of a measuring tool. For reliability measurement, Cronbach’s alpha was used. The Cronbach’s alpha measures the internal consistency of a scale or test (Tavakol & Dennick, 2011). It further describes the extent to which the various items in a test or scale measure the same construct or concept and hence it is connected to the inter-relatedness of the items within the tests. This present study adopted the Cronbach’s alpha to check the internal consistency.

An alpha coefficient of 0.70 and larger was considered acceptable as stated in the guidelines of Nunnally & Bernstein (1994). From this study, the Cronbach’s alpha coefficients of all the variables in the questionnaire ranged between 0.735 and 0.904, which showed that the internal reliability of the individual constructs was quite high. The questionnaire was therefore suitable for this study as a value of more than 0.7 is considered as suitable. Humaidi and Said (2011)
explained that the closer the reliability coefficient is to 1.0, the better the reliability of the measure.

6.11 ETHICAL CONSIDERATION
According to (Saunders et al, 2012), the protection of participants in any research is very vital. Therefore, for the purpose of this study, the following ethical principles was adhered to

i. Respondents identity was protected by applying the principle of pseudonyms which keeps respondents anonymous.

ii. Voluntary participation was encouraged as respondents were neither forced nor deceived to fill the questionnaire.

iii. Obligations to the authors whose work had contributed to the review of literature to ensure that they had been properly referenced and cited

Principle of informed consent was also adopted by ensuring that the respondents are aware of the purpose of the study and the importance of their perception in achieving desired outcome.

6.12 CHAPTER SUMMARY
In this chapter, the research methodology adopted for this study was described, including the data collection instruments, the reasons for questionnaire usage and design, the sample, populations, and strategies used to ensure ethical standards. The next chapter of this research study presents the data analysis and discussions.
CHAPTER SEVEN
DATA ANALYSIS OF THE QUESTIONNAIRE SURVEY RESULTS

7.0 INTRODUCTION
This chapter discussed the research methodology that was adopted in the study. As stated in chapter six (6), the questionnaire was designed on google forms and the link sent out by mail to 200 respondents but only 150 respondents completed the questionnaire. Hence, only the 150 responses which amount to 75% of the total questionnaire responses were used in analysing the result.

The analysis and interpretation of the data generated from the questionnaire is presented in this chapter. It thus divided into sections as seen in the questionnaire.

7.1 DESCRIPTION OF THE SAMPLE
As stated in the preceding chapter, the quantitative research design was utilized in this research. The sample population in this study comprised owners and employees in the Nigerian construction industry and a total of 150 completed questionnaires were received. The following section presents the main results.

7.2 DESCRIPTIVE DATA ANALYSIS
7.2.1 Descriptive analysis of the Respondents Background Information
Figure 7.1 shows the gender distribution of the respondents. It could be seen that the males dominant the study with 79.3% and 20.7% were females.

![Figure 7.1: Respondents’ Gender](image)

Figure 7.1: Respondents’ Gender
From Figure 7.2 below, it is seen that the above 50 years age range has the lowest per cent with 14%, while age range of 31-40 years account for the highest with 51%. The figure below also showed that age 18-30 years and 41-50 years are represented by 15% and 19% of the respondents respectively.

Figure 7.2: Age Distribution of Respondents

As seen in the figure below, civil engineers makes the highest number of respondents with 24.70%, this was closely followed by building engineers with a percentage response of 22%. Land surveyors has the least representative in the respondents with 13.3%, while architect and quantity surveyor have 21% and 19% response rate respectively.

This can be attributed to the fact that, it is mostly within the purview of the civil engineer and building engineer to see how risk can be reduced.
Figure 7.3: Occupational Position of Respondents

Figure 7.4 represents the educational qualification of the respondents. 34% of the total respondents are Masters’ degree holder while 19% of the respondents are doctorate degree holders. The remaining 47% was shared among National diploma with 7%, higher national diploma (HND) with 16% and honors degree with 24%.

Figure 7.4: Educational Qualification of Respondents

Figure 7.5 shows the years of working experience in construction industries by the respondents. The result showed that majority of the respondents have worked for 16-20 years in the
construction industry. This is observed by the close figures that exist between the two ranges (11-15 years and 16-20 years). Furthermore, 10% of the respondents have been active in the Nigeria construction industry above 25 years while only 6.7% has worked between 5-10 years. Lastly, 11.3% has worked between 21-25 years in the Nigerian construction industry.

![Figure 7.5: Respondents’ Years of Experience](image)

7.3 ANALYSIS OF FACTORS AFFECTING RISK MANAGEMENT

The 7 identified factors affecting risk management were exposed to principal component analysis using SPSS version 23. Prior to this; a correlation matrix inspection was carried out. This revealed the presence of coefficient of 0.7 and above which was acceptable for factor analysis. The Kaiser-Meyer-Olkin (KMO) shows if the value of distribution is valid before proceeding with factor analysis. According to the KMO; a value < 0.5 is not acceptable, > 0.5 is miserable, > 0.6 is mediocre, >0.7 is fair, >0.8 is commendable and 0.9 is marvelous.

<table>
<thead>
<tr>
<th>Kaiser-Meyer-Olkin measure of sampling adequacy</th>
<th>0.814</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartlett's test of sphericity</td>
<td></td>
</tr>
<tr>
<td>Approx. chi-square</td>
<td>2641,183</td>
</tr>
<tr>
<td>Df</td>
<td>264</td>
</tr>
<tr>
<td>Sig.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The table above shows the result of KMO with a value sampling adequacy of 0.814. This is considered sufficient to conduct a factor analysis as any value above 0.6.
Anti-image correlation

On the anti-image correlation table, the various measures running diagonally marked with ‘a’ indicate the extent to which each item is correlated to another. They are called the measures of sampling adequacy (MSA). The MSA values should exceed or be equal to 0.6 to show their efficient correlation to remain in the factor unless the researcher chooses to retain the item due to its theoretical relevance (Eiselenet et al. 2005:112). From the anti-image correlation table, the items exceed 0.6 so it is safe to proceed with the factor analysis process.

Communalities table

Table 7.2: Communalities

<table>
<thead>
<tr>
<th></th>
<th>Initial</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1 Resource availability</td>
<td>0.722</td>
<td>0.557</td>
</tr>
<tr>
<td>B.2 History</td>
<td>0.737</td>
<td>0.666</td>
</tr>
<tr>
<td>B.3 Time compression</td>
<td>0.665</td>
<td>0.775</td>
</tr>
<tr>
<td>B.4 Team size</td>
<td>0.717</td>
<td>0.671</td>
</tr>
<tr>
<td>B.5 Staff expertise and experience</td>
<td>0.727</td>
<td>0.641</td>
</tr>
<tr>
<td>B.6 Complexity</td>
<td>0.700</td>
<td>0.589</td>
</tr>
<tr>
<td>B.7 Management stability</td>
<td>0.781</td>
<td>0.704</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Axis Factoring.

Table 7.2 shows the various items after extraction and should contain values above 0.5. The values as seen from the table all consists of items greater than 0.5.

Table 7.3: Total variance explained

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3.990</td>
<td>57.000</td>
</tr>
<tr>
<td>2</td>
<td>1.539</td>
<td>21.986</td>
</tr>
<tr>
<td>3</td>
<td>.735</td>
<td>10.500</td>
</tr>
<tr>
<td>4</td>
<td>.445</td>
<td>6.357</td>
</tr>
<tr>
<td>5</td>
<td>.142</td>
<td>2.029</td>
</tr>
<tr>
<td>6</td>
<td>.091</td>
<td>1.300</td>
</tr>
<tr>
<td>7</td>
<td>.058</td>
<td>.828</td>
</tr>
</tbody>
</table>

Table 7.3 shows the number of factors affecting risk management and their respective eigen values. This study adopts a rule of thumb of selecting factors with above 1 eigen value therefore 2 components were extracted.

Scree plot

The scree plot further confirms that two components are suitable for analysis with a value greater than 1 were retained. The components were further subjected to, oblimin rotation which gave rise to the pattern matrix as seen in Table 7.4. The oblimin method of rotation was used because the 7 factors
correlated with one another to a certain degree: if this were not the case, a varimax or quartimax rotation would have been used for uncorrelated factor solutions.

![Figure 7.6: Scree plot for factors affecting risk management](image)

Table 7.4: Pattern matrix

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.4 Team size</td>
<td>.465</td>
<td>-.211</td>
</tr>
<tr>
<td>B.7 Management stability</td>
<td>.435</td>
<td>-.209</td>
</tr>
<tr>
<td>B.1 Resource availability</td>
<td>.271</td>
<td>-.071</td>
</tr>
<tr>
<td>B.3 Time compression</td>
<td>.197</td>
<td>-.224</td>
</tr>
<tr>
<td>B.5 Staff expertise and experience</td>
<td>-.023</td>
<td>-.718</td>
</tr>
<tr>
<td>B.6 Complexity</td>
<td>-.075</td>
<td>-.694</td>
</tr>
<tr>
<td>B.2 History</td>
<td>.028</td>
<td>-.690</td>
</tr>
</tbody>
</table>

7.3.1 Factor analysis reporting the two cluster factors affecting risk management

i. Four items loaded onto Factor 1. It is evident from Table 7.4 that these four items all relate to resources needed to manage construction risk. This factor loads ‘team size’; ‘management stability’; ‘resource availability’ and ‘time compression’. These set of factors involves the ability of professionals in the Nigerian construction industry to manage risk associated to their field through resources. The possession of these factors is important in managing risks associated to construction industry in Nigeria. Thus, they were marked ‘**Resources needed to manage construction risk**’. With a variance of
52.828% of the total variance, these factors were identified as the most important for effective risk management in construction industry in Nigeria.

ii. A total of three items loaded onto Factor 2. From table 7.4, these three items relate to history or experience of staff in managing construction risk. Though a very good factor to possess, nut it shouldn’t be depended on because of the changing technologies, policies and laws. This factor loads ‘staff expertise and experience’; ‘complexity of project’ and ‘history’. These factors were labelled ‘Experience in managing construction risk’. With a variance of 18.186% of the total variance, these factors are principal but was ranked low in respect to other factors affecting risk management in the construction industry in Nigeria.

Table 7.5: Reliability of the factors affecting risk management

<table>
<thead>
<tr>
<th>Cluster factors</th>
<th>Cronbach’s alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Resources needed to manage construction risk</td>
<td>0.837</td>
</tr>
<tr>
<td>Factor 2 – Experience in managing construction risk</td>
<td>0.904</td>
</tr>
</tbody>
</table>

Table 7.6: Factors affecting risk management correlated with selected factors

<table>
<thead>
<tr>
<th>Cluster Factor Groupings</th>
<th>Factor Loadings</th>
<th>Eigen Values</th>
<th>Percentage of Variance</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Resources needed to manage construction risk</td>
<td>3.990</td>
<td>52.828</td>
<td>68.5</td>
<td>68.5</td>
</tr>
<tr>
<td>Team size</td>
<td>0.465</td>
<td></td>
<td></td>
<td>59.8</td>
</tr>
<tr>
<td>Management stability</td>
<td>0.435</td>
<td></td>
<td></td>
<td>78.0</td>
</tr>
<tr>
<td>Resource availability</td>
<td>0.271</td>
<td></td>
<td></td>
<td>73.2</td>
</tr>
<tr>
<td>Time compression</td>
<td>0.197</td>
<td></td>
<td></td>
<td>63.0</td>
</tr>
</tbody>
</table>

| Factor 2 – Experience in managing construction risk           | 1.539           | 18.186       | 71.5                    | 75.2 |
| Staff expertise and experience                                | -0.718          |              |                         |      |
According to Patel (2015), there are four major steps in the risk management process. These steps were analysed one after the order.
7.4.1 Factor analysis for risk identification

Table 7.7: KMO and Bartlett’s test for role risk identification in risk management method

| “Kaiser-Meyer-Olkin measure of sampling adequacy” | 0.755 |
| “Bartlett's test of sphericity” | “Approx. chi-square” | 2008.134 |
| “Df” | 240 |
| “Sig” | .000 |

Table 7.7 shows the KMO result with sampling adequacy value of 0.755.

Communalities table

Table 7.8: Communalities

<table>
<thead>
<tr>
<th>Initial</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.1 Brainstorming</td>
<td>.552</td>
</tr>
<tr>
<td>C.2 Past experience</td>
<td>.621</td>
</tr>
<tr>
<td>C.3 Delphi techniques</td>
<td>.637</td>
</tr>
<tr>
<td>C.4 Check list</td>
<td>.590</td>
</tr>
<tr>
<td>C.5 Interview or expert opinion</td>
<td>.748</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Axis Factoring.

The table above present the different items after extraction and should contain values above 0.5. The values as seen in Table 7.8 all consist of values above 0.5.

Table 7.9: Total variance explained

<table>
<thead>
<tr>
<th>“Factor”</th>
<th>“Initial Eigenvalues”</th>
<th>“% of Variance”</th>
<th>“Cumulative”</th>
<th>“Total”</th>
<th>“Extraction Sums of Squared Loadings”</th>
<th>% of “Variances”</th>
<th>“Cumulative”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Total”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.134</td>
<td>42.680</td>
<td>42.680</td>
<td>2.101</td>
<td>42.020</td>
<td>42.020</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.113</td>
<td>22.260</td>
<td>64.940</td>
<td>1.173</td>
<td>23.560</td>
<td>65.580</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>.707</td>
<td>14.140</td>
<td>79.080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>.535</td>
<td>10.700</td>
<td>89.780</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>.511</td>
<td>10.220</td>
<td>100.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7.9 shows the risk identification method and their respective eigen values. The two factors with eigen values beyond 1 were retained, resulting in 2.134 and 1.113 which explains 42.020% and 23.560% of the variance respectively. This shows that the first cluster of factor that aid risk identification as a method of risk management accounted for 42.020% of the total method in risk identification and the second cluster of factors accounted for 23.560%. These two clusters of factors together have a total cumulative percentage of 65.580% of the risk identification method as a tool for risk management.

Scree plot
The two large cluster factors which are greater than 1 were retained. To aid the interpretation of these two factors, oblimin rotation was performed which gave rise to the pattern matrix as seen in Table 7.10. The oblimin method of rotation was used because the 5 factors correlated with one another to a certain degree: if this were not the case, a varimax or quartimax rotation would have been used for uncorrelated factor solutions.

![Scree Plot](image)

**Figure 7.7 Scree plot for risk identification as a method of risk management**

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.3 Brainstorming</td>
<td>.309</td>
<td>.081</td>
</tr>
<tr>
<td>C.4 Delphi techniques</td>
<td>.232</td>
<td>.022</td>
</tr>
<tr>
<td>C.2 Interview or expert opinion</td>
<td>.167</td>
<td>.068</td>
</tr>
<tr>
<td>C.5 Checklist</td>
<td>.084</td>
<td>.656</td>
</tr>
<tr>
<td>C.1 Past experience</td>
<td>.131</td>
<td>.703</td>
</tr>
</tbody>
</table>

**Table 7.10: Pattern matrix**

7.4.1.1 **Factor analysis reporting the two cluster factors of risk identification**

i. Three items loaded onto Factor 1. It is evident from Table 7.10 that these three items all relate to sourcing for information needed to manage construction risk. This factor loads ‘brainstorming’; ‘delphi techniques’ and ‘interview or expert opinion’. These set
of factors forms the tools that could be used to identify risk and hence know how to manage it in the Nigerian construction industry. The possession of these factors is important in identifying risks associated to construction industry in Nigeria. Thus, they were marked ‘Information needed to manage construction risks’. With a variance of 42.020% of the total variance, these factors were identified as the most important for risk identification in construction industry in Nigeria.

ii. A total of two items loaded onto Factor 2. From table 7.10, these two items relate to predetermined factors that occurred in similar projects. Though a very good factor to possess, but it shouldn’t be depended on because of the changing technologies, policies and laws. This factor loads ‘past experience’ and ‘checklist’. These factors were labelled ‘History of construction projects undertaken’. With a variance of 23.560% of the total variance, these factors are principal but was ranked low in respect to other factors that support the identification of risk as a method of risk management in the construction industry in Nigeria.

**Table 7.11: Reliability of the factors of risk identification**

<table>
<thead>
<tr>
<th>Cluster factors</th>
<th>Cronbach’s alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Information needed to manage construction risks</td>
<td>0.829</td>
</tr>
<tr>
<td>Factor 2 – History of construction projects undertaken</td>
<td>0.857</td>
</tr>
</tbody>
</table>

**Table 7.12: Methods of risk identification correlated with selected factors**

<table>
<thead>
<tr>
<th>“Cluster Factor Groupings”</th>
<th>“Factor Loadings”</th>
<th>“Eingen Values”</th>
<th>“Percentage of Variance”</th>
<th>“Mean”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Information needed to manage construction risks</td>
<td>2.134</td>
<td>42.020</td>
<td>80.9</td>
<td></td>
</tr>
<tr>
<td>Brainstorming</td>
<td>0.309</td>
<td></td>
<td>67.0</td>
<td></td>
</tr>
<tr>
<td>Delphi techniques</td>
<td>0.232</td>
<td></td>
<td>88.8</td>
<td></td>
</tr>
<tr>
<td>Interview or expert opinion</td>
<td>0.167</td>
<td></td>
<td>87.0</td>
<td></td>
</tr>
<tr>
<td>Factor 2 – History of construction projects undertaken</td>
<td>1.113</td>
<td>23.560</td>
<td>73.8</td>
<td></td>
</tr>
</tbody>
</table>
7.4.2 Factor analysis for risk assessment methods

Table 7.13: KMO and Bartlett’s test for role risk identification in risk management method

| “Kaiser-Meyer-Olkin measure of sampling adequacy” | 0.841 |
| “Bartlett's test of sphericity” | “Approx. chi-square” | 2022.245 |
| “Df” | “Sig” | .000 |

Table 7.13 shows the KMO result with sampling adequacy value of 0.841.

## Communalities table

Table 7.14: Communalities

<table>
<thead>
<tr>
<th>Item</th>
<th>Initial</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.1 Risk priority number</td>
<td>.590</td>
<td>.510</td>
</tr>
<tr>
<td>D.2 Decision trees</td>
<td>.681</td>
<td>.634</td>
</tr>
<tr>
<td>D.3 Scenario analysis</td>
<td>.716</td>
<td>.651</td>
</tr>
<tr>
<td>D.4 Sensitivity analysis</td>
<td>.601</td>
<td>.602</td>
</tr>
<tr>
<td>D.5 Probabilistic analysis</td>
<td>.622</td>
<td>.537</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Axis Factoring.

The table above present the different items after extraction and should contain values above 0.5. The values as seen in Table 7.8 all consist of values above 0.5.

Table 7.15: Total variance explained

<table>
<thead>
<tr>
<th>“Factor”</th>
<th>“Initial Eigenvalues”</th>
<th>“Cumulative Variance %”</th>
<th>“Extraction Sums of Squared Loadings”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Total”</td>
<td>“% of Variance”</td>
<td>“Cumulative %”</td>
</tr>
<tr>
<td>1</td>
<td>2.127</td>
<td>42.540</td>
<td>42.540</td>
</tr>
<tr>
<td>2</td>
<td>1.142</td>
<td>22.840</td>
<td>65.380</td>
</tr>
<tr>
<td>3</td>
<td>.839</td>
<td>16.780</td>
<td>85.160</td>
</tr>
<tr>
<td>4</td>
<td>.664</td>
<td>13.280</td>
<td>95.440</td>
</tr>
<tr>
<td>5</td>
<td>.228</td>
<td>4.560</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Table 7.15 shows the risk assessment methods and their respective eigen values. The Kaiser’s criterion of retaining any of these factors with eigen values greater than 1.0 was employed. Hence, two factors with eigen values exceeding 1 were retained, resulting in 2.127 and 1.142 which explains 40.160% and
21.060% of the variance respectively. This shows that the first cluster of factor that aid risk identification as a method of risk management accounted for 40.160% of the total method in risk assessment and the second cluster of factors accounted for 21.060%. These two clusters of factors together have a total cumulative percentage of 61.220% of the risk identification method as a tool for risk management.

Scree plot

The two large cluster factors which are greater than 1 were retained. To aid the interpretation of these two factors, oblimin rotation was performed which gave rise to the pattern matrix as seen in Table 7.16.

The oblimin method of rotation was used because the 5 factors correlated with one another to a certain degree: if this were not the case, a varimax or quartimax rotation would have been used for uncorrelated factor solutions.

![Scree Plot](image)

**Figure 7.8 Scree plot for risk assessment as a factor for risk management**

<table>
<thead>
<tr>
<th>Table 7.16: Pattern matrix</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>D.4 Sensitivity analysis</td>
<td>.291</td>
<td>.091</td>
</tr>
<tr>
<td>D.3 Scenario analysis</td>
<td>.253</td>
<td>.071</td>
</tr>
<tr>
<td>D.5 Probabilistic analysis</td>
<td>.141</td>
<td>.053</td>
</tr>
<tr>
<td>D.2 Decision trees</td>
<td>.091</td>
<td>.703</td>
</tr>
<tr>
<td>D.1 Risk priority number</td>
<td>.102</td>
<td>.661</td>
</tr>
</tbody>
</table>
7.4.2.1 Factor analysis reporting the two cluster factors in risk assessment

i. Three items loaded onto Factor 1. It is evident from Table 7.16 that these three items all relate to sourcing for analysis of event needed to assess construction risk. This factor loads ‘sensitivity analyses; ‘scenario analysis’ and ‘probabilistic analysis’. These set of factors forms the tools that could be used to assess the impact of risk and hence know how to manage it in the Nigerian construction industry. The possession of these factors is important in assessing risks associated to construction industry in Nigeria. Thus, they were marked ‘Analysis of construction risk assessed’. With a variance of 40.160% of the total variance, these factors were identified as the most important for risk assessment in construction industry in Nigeria.

ii. A total of two items loaded onto Factor 2. From table 7.16, these two items relate to risk factors that that should have the maximum attention. Though a very good factor to possess, but it shouldn’t be depended on because some risk might be at the lower end of the decision tree or have a low risk priority number but still cause great havoc during construction. This factor loads ‘decision tree’ and ‘risk priority number (RPN)’. These factors were labelled ‘Pictorial representation of risk assessed’. With a variance of 21.060% of the total variance, these factors are principal but was ranked low in respect to other factors that support the identification of risk as a method of risk management in the construction industry in Nigeria.

Table 7.17: Reliability of the factors of risk assessment

<table>
<thead>
<tr>
<th>Cluster factors</th>
<th>Cronbach’s alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Analysis of construction risk assessed</td>
<td>0.831</td>
</tr>
<tr>
<td>Factor 2 – Pictorial representation of risk assessed</td>
<td>0.906</td>
</tr>
</tbody>
</table>

Table 7.18: Methods of risk assessment correlated with selected factors

<table>
<thead>
<tr>
<th>“Cluster Factor Groupings”</th>
<th>“Factor Loadings”</th>
<th>“Eingen Values”</th>
<th>“Percentage of Variance”</th>
<th>“Mean”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Analysis of construction risk assessed</td>
<td>2.127</td>
<td>40.160</td>
<td>77.1</td>
<td></td>
</tr>
<tr>
<td>Sensitivity analysis</td>
<td>0.291</td>
<td></td>
<td>67.0</td>
<td></td>
</tr>
<tr>
<td>Scenario analysis</td>
<td>0.253</td>
<td></td>
<td>88.8</td>
<td></td>
</tr>
</tbody>
</table>
Probabilistic analysis 0.141 87.0

Factor 2 – Pictorial representation of risk assessed

<table>
<thead>
<tr>
<th>Decision trees</th>
<th>0.703</th>
<th>49.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk priority number (RPN)</td>
<td>0.661</td>
<td>68.0</td>
</tr>
</tbody>
</table>

Total variance explained 61.220

7.4.3 Factor analysis for risk response planning
Table 7.19: KMO and Bartlett’s test for risk response planning as a tool for risk management

| “Kaiser-Meyer-Olkin measure of sampling adequacy” | 0.663 |
| “Bartlett's test of sphericity” | “Approx. chi-square” | 1984.327 |
| “Df” | Sig” | .000 |

Table 7.19 shows the KMO result with sampling adequacy value of 0.663 therefore making it suitable
Communalities table

Table 7.20: Communalities

<table>
<thead>
<tr>
<th>Item</th>
<th>Initial</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.1 Risk mitigation/reduction</td>
<td>.847</td>
<td>.963</td>
</tr>
<tr>
<td>E.2 Contingency plan</td>
<td>.790</td>
<td>.785</td>
</tr>
<tr>
<td>E.3 Risk acceptance</td>
<td>.773</td>
<td>.659</td>
</tr>
<tr>
<td>E.4 Risk acceptance</td>
<td>.658</td>
<td>.504</td>
</tr>
<tr>
<td>E.5 Risk avoidance</td>
<td>.622</td>
<td>.537</td>
</tr>
<tr>
<td>E.6 Risk transfer</td>
<td>.712</td>
<td>.663</td>
</tr>
<tr>
<td>E.7 Risk share</td>
<td>.700</td>
<td>.654</td>
</tr>
<tr>
<td>E.8 Risk enhance</td>
<td>.719</td>
<td>.445</td>
</tr>
</tbody>
</table>

The table above present the different items after extraction and should contain values above 0.5. The values as seen in Table 7.14 all consist of values above 0.5.

Table 7.21: Total variance explained

<table>
<thead>
<tr>
<th>Factor</th>
<th>&quot;Initial Eigenvalues&quot;</th>
<th>&quot;Extraction Sums of Squared Loadings&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Total&quot;</td>
<td>&quot;% of Variance&quot;</td>
</tr>
<tr>
<td>1</td>
<td>2.475</td>
<td>30.938</td>
</tr>
<tr>
<td>2</td>
<td>2.104</td>
<td>26.300</td>
</tr>
<tr>
<td>3</td>
<td>1.003</td>
<td>12.538</td>
</tr>
<tr>
<td>4</td>
<td>.807</td>
<td>10.088</td>
</tr>
<tr>
<td>5</td>
<td>.609</td>
<td>7.612</td>
</tr>
<tr>
<td>6</td>
<td>.479</td>
<td>5.987</td>
</tr>
<tr>
<td>7</td>
<td>.295</td>
<td>3.687</td>
</tr>
<tr>
<td>8</td>
<td>.228</td>
<td>2.850</td>
</tr>
</tbody>
</table>

Table 7.15 shows the risk response planning methods and their respective eigen values. The, three factors with eigen values exceeding 1 were retained, resulting in 2.475, 2.104 and 1.003 which explains 26.850%, 25.387 and 11.237% of the variance respectively. This shows that the first cluster of factor that support response to risk planning as a method of risk management accounted for 26.850% of the total method in risk response planning, while the second cluster of factors accounted for 25.387% and the third accounting for 11.237%. These three clusters of factors together have a total cumulative percentage of 63.474% of the risk response planning method as a tool for risk management.

Scree plot

The three large cluster factors which are greater than 1 were retained. To aid the interpretation of these three factors, oblimin rotation was performed which gave rise to the pattern matrix as seen in Table 7.22. The oblimin method of rotation was used because the 3 factors correlated with one another to a certain degree: if this were not the case, a varimax or quartimax rotation would have been used for uncorrelated factor solutions.
Figure 7.9 Scree plot for risk response planning as a tool for risk management

Table 7.22: Pattern matrix

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.1 Risk mitigation/reduction</td>
<td>.217</td>
<td>.111</td>
<td>.024</td>
</tr>
<tr>
<td>E.4 Risk avoidance</td>
<td>.204</td>
<td>.104</td>
<td>-.218</td>
</tr>
<tr>
<td>E.3 Risk acceptance</td>
<td>.136</td>
<td>.002</td>
<td>-.057</td>
</tr>
<tr>
<td>E.8 Risk exploit</td>
<td>.091</td>
<td>.703</td>
<td>-.014</td>
</tr>
<tr>
<td>E.2 Contingency plan</td>
<td>.072</td>
<td>.661</td>
<td>.199</td>
</tr>
<tr>
<td>E.5 Risk transfer</td>
<td>.100</td>
<td>.122</td>
<td>.600</td>
</tr>
<tr>
<td>E.6 Risk share</td>
<td>-.184</td>
<td>.131</td>
<td>.554</td>
</tr>
<tr>
<td>E.7 Risk enhance</td>
<td>-.034</td>
<td>-.017</td>
<td>.426</td>
</tr>
</tbody>
</table>

7.4.3.1 Factor analysis reporting the three cluster factors in risk response planning
i. Three items loaded onto Factor 1. It is evident from Table 7.16 that these three items all relate to reduction of risk in construction projects. This factor loads ‘risk mitigation/reduction; ‘risk avoidance’ and ‘risk acceptance’. These set of factors forms the tools that could be used to plan how construction professionals respond to risk and know how to manage it in the Nigerian construction industry. The possession of these factors is important in assessing risks associated to construction industry in Nigeria. Thus, they were marked ‘Risk reduction in construction industry’. With a variance
of 26.850% of the total variance, these factors were identified as the most important for risk response plan in construction industry in Nigeria.

ii. A total of two items loaded onto Factor 2. From table 7.16, these two items relate to fall back plans for risk occurrence and management. Though a very good factor to possess, because the initial method of managing such risk might fail hence a backup plan is always needed so as to avoid having an uncontrollable situation at hand. This factor loads ‘contingency plan’ and ‘risk exploit’. These factors were labelled ‘Risk management by having a backup plan’. With a variance of 25.387% of the total variance, these factors are principal but was ranked low in respect to other factors that support the risk response planning method.

iii. Factor 3 loads a total of three items which are ‘risk transfer’, ‘risk share’ and ‘risk enhance’. These three factors relates to contracting the whole risk that may/will occur during construction project to a third party or sharing the responsibility with a third party. These factors can be labelled ‘Risk management by contracting a third party”. With a variance of 11.237%, these factors are ranked as the lowest that could help in risk response planning.

Table 7.23: Reliability of the factors of risk assessment

<table>
<thead>
<tr>
<th>“Cluster factors”</th>
<th>“Cronbach’s alpha coefficient”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Risk reduction in construction industry</td>
<td>0.878</td>
</tr>
<tr>
<td>Factor 2 – Risk management by having a backup plan</td>
<td>0.906</td>
</tr>
<tr>
<td>Factor 3 – Risk management by contracting a third party</td>
<td>0.923</td>
</tr>
</tbody>
</table>

Table 7.24: Methods of risk assessment correlated with selected factors

<table>
<thead>
<tr>
<th>Cluster Factor Groupings</th>
<th>Factor Loadings</th>
<th>Eingen Values</th>
<th>Percentage of Variance</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 –Risk reduction in construction industry</td>
<td>2.475</td>
<td>26.850</td>
<td>70.9</td>
<td></td>
</tr>
<tr>
<td>Risk mitigation/reduction</td>
<td>0.217</td>
<td></td>
<td>72.6</td>
<td></td>
</tr>
<tr>
<td>Risk avoidance</td>
<td>0.204</td>
<td></td>
<td>72.0</td>
<td></td>
</tr>
<tr>
<td>Risk management approach</td>
<td>Factor</td>
<td>Risk exploit</td>
<td>Risk transfer</td>
<td>Risk share</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------</td>
<td>--------------</td>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>Risk acceptance</td>
<td></td>
<td>0.136</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2 – Risk management by having a backup plan</td>
<td>2.104</td>
<td>25.387</td>
<td>81.7</td>
<td></td>
</tr>
<tr>
<td>Risk exploit</td>
<td></td>
<td>0.703</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contingency plan</td>
<td></td>
<td>0.661</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3 – Risk management by contracting a third party</td>
<td>1.003</td>
<td>11.237</td>
<td>79.8</td>
<td></td>
</tr>
<tr>
<td>Risk transfer</td>
<td></td>
<td>0.600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk share</td>
<td></td>
<td>0.554</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk enhance</td>
<td></td>
<td>0.426</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total variance explained**: 63.474
7.4.4 Risk Control

Table 7.25: Table showing the risk control options mostly employed by Construction Industries in Nigeria

<table>
<thead>
<tr>
<th>Risk control</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>the risk response action has a “positive/negative” impact on achieving the project aim</td>
<td>63%</td>
<td>37%</td>
</tr>
<tr>
<td>After implementing the response action, the risk profile of the project is/is not tracked and recorded</td>
<td>68%</td>
<td>32%</td>
</tr>
</tbody>
</table>

Result gathered and analysed from respondents based on the last option (Risk Control) of the risk management methods employed by the construction industry in Nigeria is shown in Table 7.25. As observed from the table, 63% of the respondent agrees that their risk response action have positive effect in achieving the objectives of the project. Furthermore, 68% of the total respondent also agreed that the risk response action is always tracked and documented for future use.

7.5 FACTOR ANALYSIS FOR EFFECTIVENESS OF RISK MANAGEMENT METHODS

Table 7.26: KMO and Bartlett's test for risk response planning as a tool for risk management

| “Kaiser-Meyer-Olkin measure of sampling adequacy” | 0.718 |
| “Bartlett's test of sphericity” | “Approx. chi-square” | 2115.612 |
| “Df” | “Sig” | 214 | .000 |

Table 7.26 shows the KMO result with sampling adequacy value of 0.718. This is considered valid to conduct a factor analysis as any sampling adequacy value above 0.6 is acceptable according to Eiselen et al., 2007).

Communalities table
Table 7.27: Communalities

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial</th>
<th>Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.1 Submission of low estimates is avoided</td>
<td>.719</td>
<td>.445</td>
</tr>
<tr>
<td>F.2 Undefined scope of work</td>
<td>.804</td>
<td>.708</td>
</tr>
<tr>
<td>F.3 Inaccurate project programme is avoided</td>
<td>.855</td>
<td>.709</td>
</tr>
<tr>
<td>F.4 Lack of consistency between BoI, drawings and specifications is identified and prevented</td>
<td>.834</td>
<td>.640</td>
</tr>
<tr>
<td>F.5 Accidents are prevented because poor safety procedures are identified and addressed</td>
<td>.787</td>
<td>.658</td>
</tr>
<tr>
<td>F.6 Non-conformance to quality is avoided</td>
<td>.796</td>
<td>.594</td>
</tr>
<tr>
<td>F.7 Gaps between implementation and specifications due to misunderstanding of drawings and specifications is identified and prevented</td>
<td>.824</td>
<td>.742</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Axis Factoring.

The table above present the different items after extraction and should contain values above 0.5. The values as seen in Table 7.14 all consist of values above 0.5.

Table 7.28: Total variance explained

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“Total”</td>
<td>“% of Variance”</td>
</tr>
<tr>
<td>2</td>
<td>1.815</td>
<td>25.929</td>
</tr>
<tr>
<td>3</td>
<td>.887</td>
<td>12.671</td>
</tr>
<tr>
<td>4</td>
<td>.700</td>
<td>10.000</td>
</tr>
<tr>
<td>5</td>
<td>.543</td>
<td>7.757</td>
</tr>
<tr>
<td>6</td>
<td>.501</td>
<td>7.157</td>
</tr>
<tr>
<td>7</td>
<td>.437</td>
<td>6.243</td>
</tr>
</tbody>
</table>

Table 7.28 shows the risk assessment methods and their respective eigen values. The Kaiser’s criterion of retaining any of these factors with eigen values greater than 1.0 was employed. Hence, three factors with eigen values exceeding 1 were retained, resulting in 2.117, and 1.815 which explains 28.614% and 23.271% of the variance respectively. This shows that the first cluster of factor that support the effectiveness of risk management methods accounted for 28.614% of the total method while the second cluster of factors accounted for 23.271%. These two clusters of factors together have a total cumulative percentage of 51.885% of the effectiveness of risk management methods.

Scree plot

An inspection of the scree plot on Figure 7.10 shows a break after the second factor. The steep slope shows the large factors while the gradual trailing off shows the rest of the factors that have an eigen value lower than 1. The two large cluster factors which are greater than 1 were retained. To aid the interpretation of these two factors, oblimin rotation was performed which gave rise to the pattern matrix as seen in Table 7.29. The oblimin method of rotation was used because the 2 factors correlated with one another to a certain degree: if this were not the case, a varimax or quartimax rotation would have been used for uncorrelated factor solutions.
Figure 7. 10 Scree plot for risk effectiveness of risk management methods

Table 7.29: Pattern matrix

<table>
<thead>
<tr>
<th>Factor</th>
<th>Factor</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.1 Submission of low estimates is avoided</td>
<td></td>
<td>.446</td>
<td>.158</td>
</tr>
<tr>
<td>F.4 Lack of consistency between BoQ, drawings and specifications is identified and prevented</td>
<td></td>
<td>.581</td>
<td>.176</td>
</tr>
<tr>
<td>F.7 Gaps between implementation and specifications due to misunderstanding of drawings and specifications is identified and prevented</td>
<td></td>
<td>.229</td>
<td>-.024</td>
</tr>
<tr>
<td>F.6 Non-conformance to quality is avoided</td>
<td></td>
<td>.358</td>
<td>.011</td>
</tr>
<tr>
<td>F.2 Undefined scope of work</td>
<td></td>
<td>.678</td>
<td>.115</td>
</tr>
<tr>
<td>F.3 Inaccurate project programme is avoided</td>
<td></td>
<td>.572</td>
<td>.166</td>
</tr>
<tr>
<td>F.5 Accidents are prevented because poor safety procedures are identified and addressed</td>
<td></td>
<td>.529</td>
<td>.002</td>
</tr>
</tbody>
</table>

7.5.1 Factor analysis reporting the two cluster factors in the effectiveness of risk management methods

i. Four items were loaded onto Factor 1. It is evident from Table 7.16 that these four items all relate to the quality of work in construction projects. This factor loads ‘submission of low estimates is avoided; ‘Lack of consistency between bill of quantities, drawings and specifications is identified and prevented’, ‘Gaps between implementation and specifications due to misunderstanding of drawings and specifications is identified and
prevented’ and ‘Non-conformance to quality is avoided’. These set of factors are the most effective in risk management based on the data gathered from respondents. Carrying out these factors by construction companies in Nigeria will see a more robust risk management process in the industry. Thus, they were marked ‘Quality of Construction projects’. With a variance of 28.614% of the total variance, these factors were identified as the most effective for risk management in construction industry in Nigeria.

ii. A total of three items loaded onto Factor 2. From table 7.16, these three items relate to the understanding of the type of construction project being embarked on. This factor loads ‘undefined scope of work is prevented’, ‘inaccurate project programme is avoided’ and ‘Accidents are prevented because poor safety procedures are identified and addressed’. These factors were labelled ‘Understanding of construction Project’. With a variance of 23.271% of the total variance, these factors are principal but was ranked low in respect to other factors that support the risk response planning method.

Table 7.30: Reliability of the factors of risk assessment

<table>
<thead>
<tr>
<th>“Cluster factors”</th>
<th>“Cronbach’s alpha coefficient”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 – Quality of Construction Project</td>
<td>0.861</td>
</tr>
<tr>
<td>Factor 2 – Understanding of Construction Project</td>
<td>0.879</td>
</tr>
</tbody>
</table>

Table 7.31: Methods of risk assessment correlated with selected factors

<table>
<thead>
<tr>
<th>“Cluster Factor Groupings”</th>
<th>“Factor Loadings”</th>
<th>“Eigen Values”</th>
<th>“Percentage of Variance”</th>
<th>“Mean”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 –Quality of construction projects</td>
<td>2.117</td>
<td>28.614</td>
<td>70.9</td>
<td></td>
</tr>
<tr>
<td>Submission of low estimates</td>
<td>0.446</td>
<td></td>
<td></td>
<td>72.6</td>
</tr>
<tr>
<td>Lack of consistency between bill of quantities, drawings and specifications is identified and prevented</td>
<td>0.581</td>
<td></td>
<td></td>
<td>72.0</td>
</tr>
<tr>
<td>Gaps between implementation and specifications due to misunderstanding of drawings and specifications is identified and prevented</td>
<td>0.229</td>
<td></td>
<td></td>
<td>68.0</td>
</tr>
<tr>
<td>Non-conformance to quality is avoided</td>
<td>0.358</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.6 EXTENT TO WHICH RISK MANAGEMENT FACTORS AFFECTS THE NIGERIA CONSTRUCTION INDUSTRY

Table 7.32: Table showing the extent to which factors that influences risk management affects the Nigeria construction industry

<table>
<thead>
<tr>
<th>Does the factors that influences risk management have affects the Nigeria construction industry positively?</th>
<th>Yes</th>
<th>Undecided</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>106</td>
<td>13 (8.6%)</td>
<td>31 (20.6%)</td>
</tr>
<tr>
<td>Does the factors that influences risk management have affects the Nigeria construction industry negatively?</td>
<td>25 (16.6%)</td>
<td>9 (6%)</td>
<td>119 (79.3%)</td>
</tr>
</tbody>
</table>

Result gathered and analysed from respondents based on the extent to which the factors that influences risk management affect the construction industry as shown in Table 7.32. As observed, 106 respondents representing 70.6% of the total respondent said the factors that influences risk management have positive effect on the country’s construction industry while 31 respondent making up 20.6% of the total responses said these factors does not have a positive effect on the construction industry in Nigeria. The remaining 8.6% are undecided toward the question.

Furthermore, asking the question inversely shows that 16.6% of the respondent agreed that factors that influences risk management has a negative effect on the construction industry while 79.3% said these factors do not have a negative effect on the construction industry. A small percentage (6%) of the respondent was undecided.
7.7 CONCLUSION
This chapter focused on the analysis of the primary data gathered through a well-structured questionnaire designed by the researcher making use of comparable researches to formulate the questions. As a researcher, the questionnaire was designed using google forms and distributed to the targeted respondents through the use of electronic mail (e-mail). The targeted respondents were construction professionals such as construction project managers, civil engineers, building engineers, quantity surveyors, etc., all active players in the construction players in Nigeria. To ease the interpretation of the data gathered, the analysed data was further represented using tables. The next chapter will focus on discussing the result shown in this chapter in relation with the research questions stated in chapter one of this research work. The next chapter will also establish if whether the objectives of the study were met.
CHAPTER EIGHT
DISCUSSION OF FINDINGS

8.1 INTRODUCTION

This chapter discusses the findings based on the data analysis carried out in chapter seven in relation to the research questions stated in the chapter one. In discussing these findings, the literature review was taken into consideration so as to support or disagree with existing literature the effects of risk management on the construction industry in Nigeria.

8.3 RESEARCH QUESTION 1
What are the factors affecting the management of construction risk in the Nigeria construction industry?

8.2.1 Research findings

Cluster Factor 1 - RESOURCES

The four item loaded onto Factor 1 are team size (0.465), management stability (0.435), resource availability (0.271) and time compression (0.197). This cluster gave a total variance of 52.828%. These items all relate to resources that affects risk management in the Nigeria’s construction industry. As stated by Patel, et al. (2013), these factors exposes construction projects to higher risks, it is therefore important that these factors are passed through the four main stages of risk management (Smith et al., 2006; Giannakis and Louis, 2011; Ubani et al., 2015).

According Patel et al. (2013), it is important that the team size of a construction project be small rather than larger. It was argued that the larger the team sizes the more chances of occurrence of risks which will be due to miscommunication and lack of agreement within the team. Hence, a smaller team size is better because this helps reduce the possibility of risk and increases the project performance.

Stability in decision and management support will lead to a helpful influence on the project and therefore reduce the occurrence of risk but if the management are unstable in decision and support despite having a common and singular goal and objective, meeting project objectives will be difficult and this will amount to high occurrence of risk. Lack of sufficient resources increases the occurrence of construction risk, Patel et al. (2013), argues that it is not a must that all the resources should be made available but if a good amount of the resources are available then it will be easier for construction project managers to deal with different risks. It is general
knowledge that when time allocated for a project is compressed; it becomes difficult for project managers to carry out proper risk management processes. This is due the fact that project management try as much as possible to make sure the deliver the project at the stipulated time.

**Cluster Factor 2 - EXPERIENCE**

The three components in factor 2 were staff experience (0.718), complexity (0.694) and history (0.690). This factors account for 18.86% of the total variance and related to experience of the construction project team. Staff expertise and experience is important in achieving quality and cost effective project objectives. This is a factor that can be used alongside history because newer projects are more prone to risks as they are different from the other projects. Older projects have likelihood of success against risks because there are `similar projects has been done before (Patel et al., 2013). These two factors determines how complex a project can be, a new construction project that the team has no experience in will be complex and increases the chances of the occurrence of risk.

**8.2.2 Implication of findings**

The theoretical stance of this thesis collaborates with the empirical findings of this study. This is seen from the empirical findings which showed that the respondents considered resources as the most important factors that affect risk management in construction industry in Nigeria. This factor includes team size, management stability, availability of resources and time compression. This is so because the reviewed literature has observed the role of these factors in risk management. The dynamism of construction risk requires that these factors be checkmated practically in managing Nigerian construction industry risk. Towards reducing the problems of the Nigerian construction industry, it is essential that construction project managers ensure that when embarking on construction projects, the history, team size, delivery time, stability of the management, experience and the availability of resources is considered critically so as to reduce the occurrence of risk and have an effective strategy in managing the risks.

**8.3 RESEARCH QUESTION 2**

What risk management methods are utilised for the management of construction risk in the Nigeria construction industry?
8.3.1 Research findings
Empirically, the risk management processes of identification, assessment, response and control are all used by construction project managers in Nigeria. This research went further to check the most used methods of these processes.

8.3.2 Risk Identification

Cluster Factor 1 – INFORMATION SOURCING
The three item loaded onto Factor 1 are brainstorming (0.309), Delphi techniques (0.232), and interview or expert opinion (0.167). This cluster accounted for 42.020% of the variance. These items all relate to resources that help identify risk in construction projects. As explained by Kuang (2011), risk identification is the first stage of risk management that lays the foundation for the next stage. The method used in identifying the risk is as important as the risk itself. This is based on the summary of Kuang (2011), where it was stated that improper identification of risk could lead failure of the entire risk management process which could escalate into incidences that could not be managed with an unforeseen consequences. Hence the choice of brainstorming, Delphi techniques and interview or expert opinion solidifies the claim of (Awodele et al., 2009; DEAT, 2006) which states that risk management plan may have to recognise definite risk identification practices that are either preferred or rejected by the organisation as part of their risk culture. This information can stir up thoughts on different risk matters and concerns when analysed by employing the tools and techniques of risk identification. The tools and technology differs with regards to the projects they serve but the commonly used types include brainstorming, interviews, questionnaires, Delphi technique, and expert systems among others.

Cluster Factor 2 - HISTORY
The two extracted items loaded onto cluster factor 2 were checklist (0.656) and past experience (0.703). This factors account for 23.560% of the total variance and related to history of the construction projects being embarked on by construction firms in Nigeria. Based on Tchankova (2002) submission, relying on past construction projects to identify possible risks and situation that may have negative impact on projects is not the best option for risk identification. Because for effective risk identification, the primary project documentation must be available. In addition, the project charter, scope statement as well as the project management plan which must include the work breakdown structure must be in place in order to identify an exhaustive list of risks. If those elements are not available as a frame of reference, then an effective
identification of the risks on a project becomes cumbersome. This was against the argument of Awodele et al. (2012), where it was stated that the previous knowledge can be used to predict future risk.

8.3.2.1 Implication of findings
The findings were similar to the results in the study by DEAT (2006), Kuang (2011), and Tchankova (2002). These studies agree that risk identification is important in risk management plan and a failure to effectively identify risk leads to a failure of the whole risk management process. Kuang (2011) puts it that:

“The outcome of not being able to identify positive risks is equal to the consequences of the non-identification of negative risks. Risk identification has to do with the identification of all possible risks and situations that may have a negative impact on the organisation including the circumstances that gave rise to the risks as well as opportunities. Therefore, the process of risk identification affords the opportunity to effectively study the areas and activities where the resources of the organization are at risk hence hindering them from attaining their business goals despite having the ability to do so.”

While Tchankova (2002) inferred that: “Risk Identification is the first stage in the risk management process and it has to do with capturing all the risks that have the tendency of occurring in the course of the project.” These two summarily confirms the result gotten from the data gathered from construction professionals in the country. The choice of risk identification method is important because a failure in this step of risk management could mean a failure in every other process of risk management.

8.3.3 Risk assessment

Cluster Factor 1–EVENT ANALYSIS
From the pattern matrix (Table 7.16) in chapter seven (7), it is seen that the first cluster had three items loaded under it. These factors are sensitivity analysis (0.291), scenario analysis (0.253) and probabilistic analysis (0.141). These items were termed event analysis and they accounted for 40.160% of the total variance. According to respondents, these items were identified to be the most method of risk assessment in construction projects. These items are quantitative method of risk assessment has divided by Alfredo and Pillar, 2002; Banaitiene and Banaitis, 2012. This type of risk assessment is data-driven.
Cluster Factor 2 –PICTORIAL RISK ASSESSMENT

Furthermore, decision tree and risk priority number were loaded on factor of the pattern matrix as seen in Table 7.16. These items were termed pictorial risk assessment because they make use of diagrams and pictures to carry out risk assessment. As noted by Alfredo and Pillar (2012) decision tree technique falls under the quantitative method of risk assessment while risk priority number falls under the qualitative method of risk assessment.

8.3.3.1 Implication of findings

This result is in tandem with the opinion of Touran (2006) who explained that quantitative risk analysis is more established than qualitative risk analysis as attainment of the project goals depends on use of many tools and because of its all-encompassing analysis of the project (Touran, 2006), though this is best carried out after conducting qualitative risk assessment Galway (2004). Touran (2006) went further to summarize that out of all the techniques available under risk assessment, the important ones are sensitivity analysis, scenario analysis, and probabilistic analysis/Monte Carlo analysis. This was supported by De Marco and Thaheem, (2014) and Touran, (2006).

8.3.4 Risk response planning

Cluster Factor 1 - RISK REDUCTION

From the pattern matrix in Table 7.22 in chapter seven (7), it is observed that the first cluster had three items loaded under it. These factors are risk mitigation/reduction (0.217), risk avoidance (0.204) and risk acceptance (0.136). These items were named risk reduction and accounted for 26.850% of the total variance. This is in line with the techniques of risk response listed by Dada (2010) and Zenghua, (2011). According to respondents, these items were identified to be the most method of risk response in projects because of their essentiality and suitability in reducing the effects of negative risk having passed through the initial stages of risk identification, assessment and allocation.

Cluster Factor 2 –RISK MANAGEMENT BACKUP PLAN

Additionally, two factors were loaded by the second cluster. These factors were termed risk management backup plan and they accounted for 25.387% of the total variance. These factors are contingency plan (0.703) and risk exploit (0.661). Contingency plan is an inherent component of the overall risk assessment and budget setting process prior to an investment decision and a key aspect of sound project management across the project lifecycle. Contingency is not a substitute for proper cost estimating. Contingency should not be added to
base estimates – in budgets, cost plans or forecasts – as an alternative to sound, properly founded estimating. An undesirable event that is highly likely to occur should be included in the base estimate, rather than in contingency (Laryea & Hughes, 2006).

**Cluster Factor 3—RISK MANAGEMENT BY A THIRD PARTY**

Lastly, is the risk management by third party which comprise of risk share (0.554), risk enhance (0.426) and risk transfer (0.600) which are the factors loaded by the third cluster. These factors make up 11.237% of the total variance.

When risk is being managed by a third party, it is usually from main contractor/project manager to a subcontractor in a particular construction project. “When it comes to transferring of risk, contractors and other parties in a contract are referred to as either higher tier or lower tier. The higher tier hires a lower tier contractor to perform work and transfer its risk of loss to the lower tier contractor. A contractor’s risk management strategy should include contractually transferring as much risk as possible to lower tier contractors”

**8.3.4.1 Implication of findings**

Identification and assessment of risk is important in construction projects, but without taken the correct action, then the initial two methods becomes useless. Hence, it is important that planned action to eradicate or moderate an anticipated risk is the best form of response (Tumbough, 2005).

Considering the enormous work involved in construction projects this finding have been able to establish and also support existing literatures like Dada (2010) and Zenghua (2011) whom have in their various research suggested that for the objective of a construction project to meet, proper risk response must be put in place. This response according to them should either be risk transfer, avoidance, or retention.

This finding further supports the Contractors’ Risk Management Practice Guide (CRMPG) (2012), which teaches that the effective management of construction risk is by adopting the risk transfer option which allows the transfer of risk to third party company which is at a lower tier to the construction company. With this the project/construction manager will have more time to concentrate on meeting the project objectives and less time to worry about the occurrence of risk.
8.3.5 Risk control
Based on the rankings, it was shown that 63% of the total respondents believe that the response action taken has a positive impact in achieving the project objective. This is in line with the submission of Lester (2007), who opined that the major challenge in controlling of construction risk is the implementation of the risk response, once this is sorted out; the rate at which the project objective will be delivered becomes higher. He further posited that risk control is a proactive approach in risk management rather than a reactive approach.

Also, according to the percentage of respondents, 68% agreed that construction managers always record and track the risk profile of a project while 32% said otherwise. This finding support the research of Awodele et al. (2012), where the impact of past experiences and lessons learnt from previous project was supported because if a construction company keeps a risk profile of a particular project, it will be easy to identify, assess, respond and control risks if similar project is embarked on.

8.4 RESEARCH QUESTION 3
How effective are these methods in the management of construction risk in the Nigeria construction industry?

8.4.1 Research findings
Cluster Factor 1 –CONSTRUCTION PROJECT QUALITY
Avoidance of submission of low estimates (0.446), lack of consistency between BoI, drawings and specifications are identified and prevented (0.581), gaps between implementation and specifications due to misunderstanding of drawings and specifications are identified and avoided (0.229) and non-conformance to quality is avoided (0.358) are the item loaded onto factor 1. These items accounted for 28.614% of the total variance. According to Ahmed et al. (2007), construction risk can be reduced if quality is taken as a priority. They further opined that construction/project managers are to do more in educating customers/clients about proper construction processes so as to ensure good quality of the project.

Cluster Factor 2–PROJECT PROGRAMME
Three items were loaded on this factor and they are undefined scope of work is prevented (0.115), inaccurate project programme is avoided (0.166) and accidents are prevented because poor safety procedures are identified and addressed (0.002). All these items accounted for
23.271% of the total variance. According to Mills (2001), undefined scope of a project exposes the project to negative risk. This was supported by Schatteman (2008) where he explained that a clear and adjustable scope of work will help in handling any risk they may occur during construction projects.

8.4.2 Implication of findings
This study has been able to reveal the effects of certain methods in risk management. According to the data analysis, respondents have been able to identify that the quality of a construction project is important and if quality is seen as important, some processes such as the items loaded on the first cluster will be done at the project design and contract bidding stage of the construction project which will reduce the occurrence of risk during the implementation stage.

Also, items loaded on the second cluster though important but according to respondents the first four items are important because if low estimates are avoided, it simply means the accurate project programme and timing would have been taken care of. Additionally, consistency between drawings and specification will make the work scope clear and understandable. For a construction/project manager to be quality conscious, he/she must also be safety conscious because lack of safety can affect the objective of the construction project.

8.5 RESEARCH QUESTION 4
To what extent does the factor that influence risk management affect the Nigeria construction industry?
Based on the rankings, it was shown that 70.6% of the total respondents believe that factors that influences risk management has a positive effect on the Nigeria construction industry. This is in line with the assessment of Belel and Mahmood (2012), who opined that the Nigeria construction industry is waking up to the standards of risk management being employed by their foreign counterparts and this is basically due to the high level of risk occurrence experienced in the past. Furthermore, in their conclusion they were able to discover that a larger number of their respondents who professional and active practitioners in construction industry are more conscious of risk management with regards to safety hazards on site and achieving the overall project objectives. Though previous researches have shown that industries that patronizes construction services do not make use of risk management practices (Aibinu and Jagboro, 2002). But this was countered in recent research by Ojo (2010) were it was concluded
that construction projects managers are more conscious in reducing the occurrence of risk and this was achieved through the importation of technological ideas as seen in developed nations.

8.6 CONCLUSION

The data gathered from the questionnaire answered by the respondents regarding the evaluation of risk administration in the Nigeria construction industry, the method of risk management and how effective these methods are were presented and discussed in relation to the research questions of the study. The result gotten from the data gave answers to the research questions of the study. The next chapter discusses the conclusions and recommendations of this research in relation to the research objectives of the study.
CHAPTER NINE

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

9.1 INTRODUCTION

This chapter concludes the whole study and makes recommendations in relation to the stated objectives of the study. In achieving this, the specific objectives of the study as highlighted in the first chapter are as follows:

1. To examine the factors affecting the management of construction risk in the Nigeria construction industry.

2. To appraise the risk management methods utilised for construction project in Nigeria.

3. To evaluate how effective these methods are in the management of construction risk in the Nigeria construction industry.

4. To establish the extent to which risk management factors influences the Nigeria construction industry.

9.2 RESEARCH OBJECTIVE ONE

The first objective was to examine the factors affecting the management of construction risk in the Nigeria construction industry.

Various research studies have shown that certain factors that hinders the management of risk in the construction industry and Nigeria is not left out. The first of these factors is termed history which is the type or mode of construction projects handled by the company. In Nigeria, due to the dynamism of the industry, many construction companies are without project specialization. Hence, they tender for all sorts of construction project irrespective of if they have carried out such projects before.

The literature further revealed that “management stability, staff expertise and experience, team size”, resource availability and time compression are other factors that mitigate against the effective management of risk in Nigeria’s construction industry. Though the most important one might defer from country to country but in Nigeria which was the location of the research, the result of the randomly selected respondents revealed that team size, management stability, resource availability and time compression are the important factors that construction project managers should look into if they want to effectively manage risk related to construction
projects. While the rest of the factors (history, staff expertise and experience) are less important in Nigeria’s construction industry. Hence, from the reviewed literature and the findings, the first research objective can be said to be achieved.

9.3 RESEARCH OBJECTIVE TWO

The second objective was to appraise the risk management methods utilised for construction project in Nigeria

According to reviewed literature, best practice framework for risk management in construction industry is to first establish the context of the project by representing the project(s) in resource usage, equipment requirement, budget, management involvement, contract deliverables, schedule and project goals. After establishing the context, then identification of the risk that is normally involved in such projects or that are possible to occur is then carried out, followed by risk analysis or assessment. This is followed by evaluation or response plan to reduce the possible occurrence or effect the risk will have on the project. This is determined based on past experience, best practices, organizational knowledge and expertise, industry benchmark and standard practices. Finally, the risk is then treated or controlled so as to achieve the project objectives.

These were the methods used by construction management practitioners in Nigeria. According to the survey carried out, respondents agreed that these steps are followed though the name given to each method might differ from countries but the activities of each method are the same. Therefore, it can be inferred that the research objectives was met based on the analysed data gotten from the structured questionnaire.

9.4 RESEARCH OBJECTIVE THREE

The third objective was to evaluate how effective these methods are, in the management of construction risk in the Nigeria construction industry.

Researchers have had different conclusion on the effectiveness of risk management methods on the overall occurrence and control of risk in construction projects. Hence, according to the data gathered and analysed, the risk management method can only be effective if the professionals can make sure the project design and bidding for construction stage is taken serious without sacrificing quality. And this can only be done by avoiding some activities that could mar the effects of risk management methods. These activities include but not limited to
submission of low estimates, gaps between implementation and specification due to misunderstanding of the project drawings, etc. This agrees with some of the conclusion made by researchers which interprets that the third research objective in terms on the effectiveness of risk management methods in the management of construction risk has been achieved.

9.5 RESEARCH OBJECTIVE FOUR

The last objective was to establish the extent to which risk management factors influences the Nigeria construction industry.

Despite the high occurrence of risk occurrence in Nigeria construction industry in time past which is majorly cause by lack of technological advancement, knowledge and instability in the country’s leadership system (private and government), construction project managers are becoming aware of the importance of risk in projects and its subsequent effects after experiencing series of abandon or failed projects. This they have been able to achieve through continuous training both with and outside the country and trying to import technologies that can help in risk management. This is in tandem with the reviewed literatures and hence this objective was academically achieved.

9.6 General Conclusion

The main aim of this study was to evaluate the risk management in the Nigeria construction industry. To know if risk occurs in construction projects, how such risks are identified, assessed, responded to and controlled, to know the methods used in managing risks in construction projects and how effective the method is. This research was achieved through the collection of data from respondents who are professionals in the construction industry ranging from architects to construction project managers. The following conclusions were obtained from the research:

i. The Nigeria construction industry is a continually evolving one because of new trends, introduction of technology, improved delivery methods, fluctuating policies, etc. All these form the peculiarity of the industry and the types of construction risk that occurs in the industry.

ii. Just like other countries, Nigeria construction industry adopts the industry best practices of risk management methods which are identification, assessment, response planning, and control of construction risks.
iii. To ensure the effectiveness of this method, it is important that submission of low project estimate is avoided, project programme should be followed, there should be consistency between the bill of quantity, drawings and specifications, conformance to good project quality should be encouraged and the scope of work should be defined before the commencement of the project.

iv. Practitioners in the construction industry are becoming more aware about construction project risk and the steps to take in reducing it by have started incorporating it their contract bids.

9.7 LIMITATION OF THE STUDY
In the course of this research, the researcher faced some limitations which might have affected the outcome of this research. Of such limitation is the concentration of the researcher on just four cities in Nigeria despite the fact construction risk management cut across the whole country. This was so because of the financial strength of the researcher. Nigeria being the 9th most populated country in the world with 36 states and a federal capital territory, hence gathering of data from all the states in country will not only be time consuming but also cost intensive. Hence, the result of the research may not depict the general opinions of other construction project practitioners in the country. To achieve this, a larger sample that will represent about 80% of the construction project practitioners’ in Nigeria need to be used.

9.8 RECOMMENDATIONS
Overall, the findings of this study reveal that risk management in Nigeria construction industry is notable and administered. Despite these, it is also observed that a structured risk management system is lacking and there are variances in the techniques used and the risk management system used is not very effective as projects objectives are still marred by the negative impact of risks. Hence, there is need for professional bodies like the council of registered engineers to ensure the enforcement of statutory regulations such as adherence to approved Standards, building codes guiding the construction industry in the country

The organization of construction project practitioners need to increase the awareness of risks related to construction projects and make sure its members are trained and updated with evolving construction risks and its management. Furthermore, a certifying body should be put in place that regulates the activities of construction practitioners in the country so to ensure proper conformance to the laid down standards.
Additionally, construction risk management should be an all-round thing irrespective of the strength and size of the organization. It is therefore important that a system that is affordable and accessible to all Nigerian construction companies should be put in place so as to standardize risk management activities. This system must be updated periodically so as to be at par with international standards.

9.9 AREAS FOR FURTHER RESEARCH

The research recommends the following areas of possible research:

- Further improvement can be made to the body of knowledge by carrying out a study that shows how the components that affect management of construction can be utilized in other to have a more effective risk management in the construction industry.
- Also, an addition can be made to the body of knowledge by determining the most preferred risk management method used by the construction industry in Nigeria and why such method is preferred over the rest.
- Further research can also look at if there exist any other methods of risk management employed in by the construction industry in Nigeria that was not captured in this study
- Also, it is recommended that factors of risk management should be isolated and studied individual so as to determined how it affect the construction industry in Nigeria

REFERENCES


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APPENDIX 1: COVER LETTER

University of Johannesburg,
Republic of South Africa,
20th January, 2018

Dear Respondent,

INTRODUCTION LETTER

I am a final year student of the Department of Construction Management and Quantity Surveying the above institution. I am presently carrying out a research project on the topic “Evaluation of Risk Management in the Nigeria Construction Industry” as part of the requirements for the award of a Masters’ Technologiae in Construction Management.

I am appealing to you to please complete the questionnaire attached for this purpose. I promise that your response to the questionnaire will be treated confidentially and will be used only for the purpose of the study.

Your cooperation is highly appreciated.

Yours faithfully,

C.M., Ugwu.
APPENDIX 2: QUESTIONNAIRE

QUESTIONNAIRE ON AN EVALUATION OF RISK MANAGEMENT IN THE NIGERIA CONSTRUCTION INDUSTRY

INSTRUCTIONS:

PLEASE ANSWER THE FOLLOWING QUESTIONS BY MARKING (X) ON THE RELEVANT BLOCK

Example of how to complete this questionnaire:

Your gender? If you are female:

<table>
<thead>
<tr>
<th>Male</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2</td>
</tr>
</tbody>
</table>

SECTION A: BACKGROUND INFORMATION

This section of the questionnaire refers to background or biographical information. Although we are aware of the sensitivity of the questions in this section, the information will allow us to compare groups of respondents. Once again, we assure you that your response will remain anonymous. Your cooperation is appreciated.

1. Gender

<table>
<thead>
<tr>
<th>Male</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2</td>
</tr>
</tbody>
</table>

2. What is your age group?

<table>
<thead>
<tr>
<th>18 years – 30 years</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 years – 40 years</td>
<td>2</td>
</tr>
<tr>
<td>41 years – 50 years</td>
<td>3</td>
</tr>
<tr>
<td>Above 50 years</td>
<td>4</td>
</tr>
</tbody>
</table>

3. Which position do you hold in your present company

<table>
<thead>
<tr>
<th>Quantity Surveyor</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineer</td>
<td>2</td>
</tr>
<tr>
<td>Land Surveyor</td>
<td>3</td>
</tr>
<tr>
<td>Architect</td>
<td>4</td>
</tr>
</tbody>
</table>
4. State your highest educational qualification?

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Diploma (ND)</td>
<td>1</td>
</tr>
<tr>
<td>Higher National Diploma (HND)</td>
<td>2</td>
</tr>
<tr>
<td>B.Sc. or its equivalent</td>
<td>3</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>4</td>
</tr>
<tr>
<td>Doctorate Degree (PhD.)</td>
<td>5</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Experience</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10 years</td>
<td>1</td>
</tr>
<tr>
<td>11-15 years</td>
<td>2</td>
</tr>
<tr>
<td>16-20 years</td>
<td>3</td>
</tr>
<tr>
<td>21-25 years</td>
<td>4</td>
</tr>
<tr>
<td>Above 25 years</td>
<td>5</td>
</tr>
</tbody>
</table>

SECTION B: COMPONENTS AFFECTING THE MANAGEMENT OF CONSTRUCTION RISK

<table>
<thead>
<tr>
<th>S/N</th>
<th>Factors Affecting Risk Management</th>
<th>Very influential</th>
<th>Influential</th>
<th>Undecided</th>
<th>Slightly Influential</th>
<th>Not Influential</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Team Size: The larger the team the more it affects/does not affects the management of risk</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**UNIVERSITY OF JOHANNESBURG**
### SECTION C: RISK MANAGEMENT METHODS UTILIZED FOR THE MANAGEMENT OF CONSTRUCTION RISK IN NIGERIA

Rank the methods based on how often you use them in your company

<table>
<thead>
<tr>
<th>Risk identification methods</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>14</strong> Past experience: Past experience from the same kind of project is usually used to identify possible risk that could occur in construction projects</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Interview/Expert opinion:</strong> Experts in particular type of construction projects are usually sort after to help identify the possible risk that could occur when carrying out the projects</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>---</td>
<td>-------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>16</td>
<td><strong>Brainstorming:</strong> All persons relevant to the projects gather at one place to critically discuss the factors that could affects the project.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td><strong>Delphi techniques:</strong> All persons relevant to projects though not gathered in the same place and not known to each other are interviewed and their personal opinion are recorded and the facilitator sums up all the identified factors</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td><strong>Checklist:</strong> Predetermined list of factors that occurred in similar construction projects and their responses are used.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Risk assessment methods</strong></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td><strong>Risk priority number:</strong> This number determines the risk that requires the maximum attention and the one that requires the least attention</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td><strong>Decision trees:</strong> This is done by using decision tree diagram which help to formulate and evaluate the risk that could be involved in the project</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21</td>
<td><strong>Scenario analysis:</strong> This gives the impact of different scenario of the project or the impact of different risks if they occur simultaneously.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22</td>
<td><strong>Sensitivity analysis:</strong> This is used to identify the uncertain project components which can have maximum impact on the outcome of the project</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<td></td>
<td>Probabilistic analysis: Monte Carlo Simulation is used to determine the different level of uncertainties during project execution</td>
<td>1</td>
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<td>---</td>
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<tr>
<td>23</td>
<td>Risk Response Planning</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24</td>
<td><strong>Risk mitigation/reduction:</strong> Taking early actions to reduce the probability and/or impact of a risk to an acceptable threshold</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25</td>
<td><strong>Contingency plan:</strong> Having a fall back plan when the risk eventually occurs.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26</td>
<td><strong>Risk acceptance:</strong> When it is not possible or practical to respond to the risk by other strategies.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27</td>
<td><strong>Risk avoidance:</strong> Warding off of risk by removing the cause of the risk or by isolating the project objectives from the risk impact</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>28</td>
<td><strong>Risk transfer:</strong> Finding another party that will best able to deal effectively with the risk</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>29</td>
<td><strong>Risk share:</strong> Finding another party that will best able to deal effectively with the risk and also share in the benefit of the opportunity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>30</td>
<td><strong>Risk enhance:</strong> Increase the size of the positive risk (opportunity) thereby maximizing the benefits gained from the project</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>31</td>
<td><strong>Risk exploit:</strong> Elimination of uncertain risk by creating an opportunity for a particular risk to happen</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Risk control</td>
<td>1</td>
<td>2</td>
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<td>5</td>
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<tr>
<td></td>
<td>the risk response action has a positive/negative effect on achieving the project objective</td>
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<td></td>
<td>After implementing the response action, the risk profile of the project is/is not tracked and recorded</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**SECTION D: EFFECTIVENESS OF THE ABOVE METHODS IN RISK MANAGEMENT**

<table>
<thead>
<tr>
<th>Factors Affecting Risk Management</th>
<th>Very Effective</th>
<th>Effective</th>
<th>Undecided</th>
<th>Slightly Effective</th>
<th>Not Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>Submission of low estimates is avoided</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>35</td>
<td>Undefined scope of work is prevented</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>36</td>
<td>Inaccurate project programme is avoided</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>37</td>
<td>Lack of consistency between bill of quantities, drawings and specifications is identified and prevented</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>38</td>
<td>Accidents are prevented because poor safety procedures are identified and addressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>39</td>
<td>Non-conformance to quality is avoided</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>40</td>
<td>Gaps between implementation and specifications due to misunderstanding of drawings and specifications is identified and prevented</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
### SECTION E: EFFECTS OF THE FACTORS THAT INFLUENCES RISK MANAGEMENT ON THE NIGERIA CONSTRUCTION INDUSTRY

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>41</td>
<td>Does the factors that influences risk management have affects the Nigeria construction industry positively?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>42</td>
<td>Does the factors that influences risk management have affects the Nigeria construction industry negatively?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>