RISK MANAGEMENT PRACTICE IN BUILDING CONSTRUCTION SITE IN MSINNA METROPOLIS, NIGER STATE.

BY

OLUFE VICTOR
2016/1/63797TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION
FEDERAL UNIVERSITY OF TECHNOOGY, MINNA

APRIL, 2023

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A RESEARCH PROJECT SUBMITTED TO THE
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DECLARATION

I OLUFE VICTOR BOLUWATIFE with Matric No: 2016/1/63797TI an undergraduate student of the Department of Industrial and Technology Education certify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this or any other library.

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OLUFE VICTOR BOLUWATIFE. SIGNATURE

CERTIFICATION

This project has been read and approved as meeting the requirements for the award of B. Tech degree in Industrial and Technology Education, School of Science and Technology Education, Federal University of Technology, Minna.

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Dr. A. M. Hassan Sign & Date
Project Supervisor

_____ _____

Dr. T. M. Saba Sign & Date
Head of Department

_____ _____

External Examiner Sign & Date

DEDICATION

This work is dedicated to my parent Mr MOSES ADELEKE OLUFE and Mrs IFEJOLA FELICIA OLUFE and to My wonder siblings.

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I would like to express my sincere gratitude to God Almighty for making this undergraduate programme a reality and for his guidance over me, I Thank God for his abundant provision for my needs, the journey mercies throughout the duration of this course.

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ABSTRACT

This study examined the Risk management practice in building construction site in Minna metropolis, Niger State. The study made use of descriptive research design method. A self-structured questionnaire was the main instrument of data collection. The study makes use of 50 respondents comprising 25 contractors and 25 builders. The finding of the study shows that perceived risk in construction industry include are supplies of defective materials, varied labour and equipment productivity, not coordinated design (structural, mechanical, electrical, etc.), lack of consistency between bill of quantities, drawings and specifications, financial failure of the contractor, unmanaged cash flow. The study revealed that utilization of quantitative risk analyses techniques for accurate time estimate, dependence on subjective judgment to produce a proper program, production of a proper schedule by getting updated project information, planning alternative methods as stand-by, conscious adjustment for bias risk premium to time estimation, transfer or share risk to/with other parties, reference to previous and ongoing similar projects for accurate program are risk management practice often utilized in construction in Minna Metropolis. Based on the findings of the study it was recommended that contractors (especially indigenous contractors) should create risk management organization (people saddled with responsibilities of Risk Management) e.g., Project Managers. This will allow the responsibility of risk management not to be handled by technical (site engineers/builders) personnel who are usually not trained in such areas and that there should be frequent training of contractors" Risk Management personnel which will allow top management of the contractors have a deep understanding of what risk management entails. Also, when planning for site organisation and work schedule in relation to risks, other factors like capability of bearing the risk, insurance coverage and contract procurement methods should be considered.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Today, every organisation experience unforeseen events that occur in varied contexts and with varying characteristics and implications. These unanticipated events may have severe implications for the organisation (Aven, 2011). (Aven, 2011). Risks are unforeseen events that have unwanted outcomes. The construction industry is not immune to these risks, which are complex and varied (Zhao et al, 2013). The presence of uncertainty in everyday life as well as in businesses has become a fundamental problem at this time, and establishing effective management has become a challenge. Because of the dynamic and intricate environment that exists around companies, risks become a key worry that must be addressed for the effective completion of any project (Rohaninejad and Bagherpour, 2013). Risk is a measure of the frequency and severity of undesirable repercussions on project objectives (Aven, 2011). According to Wang and Yuan (2011), risk is a multifaceted phrase that is currently an issue for every company. Risks are inescapable in the construction industry, and they occur throughout the project's life cycle, so the organisation should address them efficiently (Goh et al, 2013).

On the opposing hand, risks are not always related with negative consequences; they may even signify the presence of a significant opportunity. When these opportunities are taken advantage of, they may result in time and money savings, as well as the generation of value for the project (Hillson, 2013). Risk has long been explored in diverse fields. Hillson (2013) defines risk as quantifiable uncertainty, whereas uncertainty is unmeasurable risk. We depend on risk management, which is a key component of project management, to seek to reduce or eliminate risk. Risk management is a proactive and constructive process aimed to decrease the possibility of

unsatisfactory project results across its numerous stages, such as design, construction, and operation (Rohaninejad & Bagherpour, 2013).

Risk management is a process that was created in the 1930s in the United States to manage, identify, assess, and monitor risks that arise within an organisation or project (Zheng et al, 2009). This process became an integral part of project management in the 1970s (Arikan et al, 2009). Risk management must realise that risk is prevalent in all projects and that one of the most tough issues is deciding which risks to concentrate. This is an essential process, which is why project managers realise that risk management is important for effective project management (Goh et. al., 2013).

According to Alfredo, Ximena, Larissa, and Sergio (2014), risk management is an important part of project management as it permits projecting the occurrence of events that can adversely impact a construction project and specifying procedures to reduce their consequences. One of the major roles of any contractor is to deal with eventualities or risks that develop periodically during project management, and this position is extremely complex and ineffectual if risk management has not been undertaken or supported effectively from the project's commencement. To assure risk management an effective and efficient function, it is essential to have a good and systematic approach, as well as numerous types of knowledge and expertise. Different models of the risk management process have been offered in the literature by different researchers and bodies of knowledge (Goh et. al., 2013). The purpose of risk management is to discover, assess, and control risks in order to minimise them to an acceptable level and have a successful project (Rohaninejad and Bagherpour, 2013).

Risk management is an important part of project management since it permits projecting the occurrence of events that can adversely impact a construction project and creating methods to reduce their consequences. One of the major roles of any project manager is to deal with

contingencies or risks that develop periodically during project management, and this position is extremely complex and inefficient if risk management has not been undertaken or supported enough from the project's commencement. To make risk management an effective and efficient function, an appropriate and systematic methodology, as well as several types of knowledge and skill, are necessary. For many years, construction companies in developing countries have managed risk management in construction projects and organisations by utilising a set of procedures that are typically insufficient, giving poor results most of the time, and reducing project management success. This issue may be encountered in both contractor and owner companies. In general, risk management in these firms is inadequate, lacking a systematic and formal approach, and its performance is not assessed (Nielsen, 2006).

The repercussions of inadequate risk management in construction projects are an important issue to explore. Some of the contracts or projects being conducted out today by government and private entities, such as the construction of roads, hospitals, recreational facilities, and schools, are intended to enhance the overall quality of life of the people residing within the jurisdiction of a specific municipality. However, owing to insufficient risk management to eliminate risks such as fraud, corruption, and poor selection of competent service providers, the bulk of the projects have either been delayed or have altogether failed. In this era of expanding globalisation, it is hard to ignore risk, which has become an inherent component of daily life. There are risks in every element of our existence. Effective risk management does not entail risk removal, which appears to be the most cost-effective alternative (Rohaninejad & Bagherpour, 2013).

The construction industry's fast evolution has put additional obligations on construction project management. Risk management is an important project management control and planning method for lowering uncertainty and boosting decision making. One of the major roles of a project manager

is risk management. Proper and systematic approaches, competence, and experience are vital ways to enable effective and efficient risk management. In a simple example, information about unforeseen events that may occur during project execution is important (Serpella et al., 2014). Construction projects vary in size from small to medium to huge, with various degrees of risk (Hwang, Bon- Gang, Zhao, and Toh, 2014). Frequently, the risk is not treated with adequacy, and as a result, the industry suffers from poor performance (Iqbal, Shahid, Rafiq, Klaus, Ahsan and Jolanta, 2015). Many infrastructure projects, owing to their huge risk, necessitate substantial budgets, resulting in considerable monetary losses, and these injuries are caused by the varied risks involved with such megaprojects (Deviparaseth, 2007).

Risk management systems are used to manage such risks, which may also include accidents, malfunctions, and mistakes. The performance may therefore be related to the project's outcome in reference to the purpose of the risk management systems applied, i.e. accidents, defects, uncertainties, and sometimes even expenditures. Natural risks associated with climate systems (hurricane, typhoon, flood, etc.) as well as geological methods (earthquake, volcanic eruption, geotechnical issues) as well as human risks inherent with a governmental, fiscal, economic, legitimate, well-being, managerial, complex, cultural, and social dynamics are all present in construction projects. Construction projects are highly risky due to increased investment, complex interfaces, wide collection of stakeholders, risk and material integration, and rigorous timetables. These difficulties are getting increasingly complicated in the current construction industry, and they are related to other variables such as contractual, technical, and financial demands (Serpella et al., 2014).

The construction industry is a risky industry, but it is critical to the economic progress of both developed and developing countries, so risk management in construction projects is an extremely

important step to achieving project goals in risks of time, safety, quality, cost, and environmental sustainability. Identifying risk management is a crucial approach for dealing with construction risks and overcoming task failure concerns. Risk management is a management strategy that aims to identify the sources of uncertainty and risk, analyse their effect, and determine suitable management measures. In other words, risk management in the context of building project management is a systematic and detailed process of recognising, analysing, and responding to risks in order to meet project goals. Construction project failure or success is decided on risk management (Alfredo, Ximena, Larissa, and Sergio 2014).

The construction industry's risk management procedures in Nigeria are reason for great alarm. There have been multiple reported incidents of incomplete projects and building collapses in both rural and urban Nigeria. The bulk of the structures that collapse are residential buildings with one, two, three, or four levels. Humans and their goods are housed in residential structures. As a consequence, they must be carefully designed, developed, and constructed in order to gain the right amount of pleasure from the environment. Various aspects must be addressed during the planning and construction stages of a construction project for this to occur. Durability, proper stability to minimise failure or pain to users, resistance to weather, fire breakout, and other forms of catastrophes are all issues to consider in building construction. In other words, risk management procedures in the country's construction industry must be extensively investigated (Oyedele, 2012).

Risk management is an essential component that may have a favourable or bad influence on a construction project depending on how it is executed. When great risk management processes are implemented, they may result in high capital value, a competitive edge, maximum market profit margins, and stable shareholder equity. Similarly, inadequate risk management, which includes

the use of improper risk management and control tools, insufficient utility of essential management methods, and poor management and assessment quality, may lead to catastrophic catastrophe in any construction project setup. Failure to address risk potential in a project may result in financial loss, strained relationships between company and client, and even project failure. As a consequence, when critical elements are missing or unavailable at the point of action, incidences of project delays, worse project quality, and loss of business reputation are inescapable.

Second, from the viewpoint of contractors and builders, most cost increases that occur on-site are the outcome of multiple changes in customer requirements. As a consequence, a misunderstanding of the risks that can be incurred from specific clients might cause even more severe deviations from the previously laid-out expenditure plans. Customers' and customers' newly stimulated interest in trending goods or labour leads in increasing pay rates, which, if not adequately regulated, may drastically raise overall project costs. Poor risk management leads to overspending, which may lead to debt if not appropriately controlled. Risk management consumes a lot of money, but the expense of coping with the implications of insufficient risk management significantly surpasses the former. It causes the project team to look for extra financing that was not budgeted for elsewhere in order to keep the project from failing. Budget overruns emerge when linked risks and their effects are not budgeted for from the outset of construction activity.

According to Oyedele, (2012), building failure may also be ascribed to dishonesty among project stakeholders, Key personnel regularly transferred/replaced, a lack of respect and trust among stakeholders, a lack of commitment from project stakeholders to mention a few. As a result, the effects of risk management should be quantified via variables or indicators of project performance. The assessment allows key risks to be highlighted and targeted for action. The determination of a right judgement on the risk-related component in residential building construction. Residential

building construction is the construction of a building for the purpose of residence. Many researchers have found that residential constructions are often marked by failure and collapse. The goal of this research is to analyse risk management measures utilised by a building construction firm in the Minna metropolitan.

1.2 Statement of the Problem

Construction organizations in developing countries like Nigeria often use insufficient risk management practices, which leads to poor results and limits the success of project management. This is a problem for both contractors and owners' organizations. Risk management in these organizations is inadequate, lacks a formal approach, and is not measured. Additionally, there is evidence that risk is sometimes mishandled and allocated to contractors instead of clients, despite regulations stating that it should be handled by the client. This demonstrates a disconnect between regulations and their implementation. The building construction industry is complex due to increased client expectations, technological advancements, and the development process. Building projects are also naturally complex due to the diverse nature of project sites, high pressure to meet deadlines and stay within budget, and increasing complexity in construction methods. Residential buildings, which are constructed for people to live in, are expected to be durable but there have been instances of residential building collapses or failures in Nigeria. Despite efforts to make risk management objective and quantifiable, there is a lack of evidence on risk assessment or risk management practices in the Nigeria construction industry. This study aims to assess risk management practices at construction sites in Minna, Niger state.

1.3 Purpose of the Study

The purpose of the study is to analyse the risk management practises on construction sites in the capital city of Niger State, Minna, in order to identify the risk management practises from the views of contractors and employees. The study's specific aims comprise:

1. To identify risk management techniques used in construction projects.
2. To identify the different risk management approaches that are widely utilised and estimate the degree of risk in construction projects.
3. To give advice for risk management risks in construction projects.
4. To identify the risk-reduction technique employed in construction projects.

1.4 Significance of Study

The general public, building clients, the construction industries, industrial technical instructors, and local, state, and federal governments would greatly benefit from the findings of this study.

Throughout the whole project, the risk management will be continuously upgraded in order to maximize its risk. With this approach, risks were identified and managed at every level. The benefits of risk management will extend to the participants as well as the project itself. The main driving forces are a firm understanding of and awareness of potential project risks. To put it another way, risk management helps to provide a better picture of the likely consequences of poorly managed risks and how to avoid them. Working also gives you greater control over the project as a whole and more effective problem-solving techniques that may be based on more genuine principles. Risk management also provides a way to maybe prevent unexpected, jarring events.

By empowering the owner and contractor, this study reduces the risk of a building collapsing in Minna and the adjacent building and promote standard and quality at the construction site. This study will contribute to successful building construction with fewer failure risks.

1.5 Scope of Study

The focus of this study's research is risk management in the Minna metropolitan area's construction industry, thus it incorporates data from the conducted questionnaire from both developers and contractors in small and large firms. However, the research's primary concern is the perspective of Nigerian contractors, which is why participants in the study who are contractors were included. The study is limited to the contractor's and the workers' perspectives on the risk management strategy used at a construction site in Minna, the capital of the Niger State. Risk management, risk identification, risk assessment, and risk response are all included in the subject. Since they are unavoidable natural occurrences, such as windstorms, floods, and other natural forces, they are not included as natural risk factors that might happen on a construction site.

1.6 Research Question

1. What are the risks and risk management perceived in a construction project?
2. What is risk management process used in practice?
3. What are the solutions to managing risk factors in construction building in Minna metropolis?

1.7 Hypothesis

The following hypothesis were formulated to guide the study,

1. There was no significant difference between the mean response of contractor and builders on the risk and risk management perceived in a construction project in construction company in Minna metropolis.
2. There was no significant difference between the mean response of contractors and builders on risk management process use in practice in Minna metropolis.

3. There was no significant difference between the mean response of contractor and builders on what are the solution to managing risk factors in construction building in Minna metropolis.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Probability Theory

The Bayesian theory of probability is the conventional method for handling uncertainty. In order to mimic precisely planned, repetitive trials with observable but unexpected outcomes, probability theory has been used. The traditional theory of probability makes the implicit assumption that all uncertainties are estimates of randomness or arbitrary judgements of confidence. The statistics is the main problem with random processes. There are historical roots for probability theory as the most reliable and efficient instrument to deal with uncertainty. Since its inception, probability theory has been widely used and has solid scientific foundations. Random methods are supposedly the only effective ways to deal with uncertainty, according to probability theory. The use of deterministic methods is common in the "hard" sciences, where the pursuit of correctness is regarded more highly than qualitative models.

2.1.2 Dempster-shafer Theory of Evidence

Epistemic probability is a term that refers to the Dempster-Shafer Theory of Evidence (Shafer 1976), which offers an alternative paradigm for the assessment of numerical degrees of confidence. Dempster-Shafer used belief functions rather than probabilities to distinguish between uncertainty

and ignorance. The following are the key differences between Dempster-Shafer model and Bayesian models of numerical degrees;

- Dempster-belief Shafer's functions are set functions rather than point values;
- They reject the rule of additivity for beliefs in contradictory propositions; and
- They provide an operation for combining information from diverse sources.

2.2 Conceptual Review

2.2.1 Nigerian Construction Industry

The Nigerian economy relies heavily on the construction sector, according to Dantata (2008). According to Albert, Shakantu, and Ibrahim (2021), who cited Ugwu & Attah (2016), the Nigerian construction industry contributes around half of the nation's total fixed capital investment. According to DBIS (2013), the construction sector is divided into three categories: "construction contracting industry; supply of construction linked professional services; and construction associated goods and materials." The construction industry is a system that includes all participants, including clients, general contractors, contractors, consultants, and those involved in the construction, supply, and distribution of building materials. It also includes all types of construction-related educational institutions, including polytechnics, universities, and technical and research institutes.

Three main categories may be used to divide the construction industry. These include hiring general contractors or building contractors to construct the building. These contractors construct residential, commercial, industrial, and other buildings. Sewers, roads, highways, bridges, tunnels, and other projects are developed by the Heavy and Civil Engineering Construction Contractors category. The third category consists of specialty trade contractors that provide electrical, mechanical, woodworking, painting, drainage, and other specialised construction-related services. Those that hire out huge machinery, plants, and earth moving equipment for construction projects fall under this group (Austin et al, 2003).

According to Oyedele (2012), Nigeria's construction industry is neither organised nor regulated. There is no apparent distinction between the contractors, and some of them just exist to make money, regardless of the kind of project. For instance, Julius Berger Nig Plc, a key participant in

Nigeria's construction business, provided the federal government with Mercedes Benz saloon automobiles in 1985. While the majority of construction companies in Nigeria divide their workforce by scope, on a global scale, the industry's market segmentation has moved from scope to specialisation. For instance, leading British builders Redrow and Lang O'Rourke will not abandon home construction and will only engage in public-private partnerships (PPP).

Nnabugwu (2013) claims that foreign companies are the major participants in Nigeria's construction industry. Although the federal government has advised indigenous Nigerian construction companies to refrain from hiring foreign workers since it goes against the principles of building local skills. By providing foreign companies the edge in the competition for her most important contracts, the federal government is at fault for the absence of local capacity building of indigenous contractors.

The Nigerian construction industry is unregulated, allowing anybody to create any project without consulting the government or following the requirements of the building code. Despite the implementation of the National Building Code of 2006, this strategy has caused many building collapses in Nigeria with significant death rates. Significant construction work was carried out in the 1970s and the first part of the 1980s by expatriate (foreign) contractors who adhered to industry principles. Due to the potential consequences and the expense to the builders and contractors in terms of integrity, buildings were not constructed on natural drainage systems. These days, the industry is filled with many "emergency contractors" (both international and domestic) that lack integrity and uphold ethical standards (Nwachukwu, Emoh and Egolum, 2010).

Oyedele (2012) asserts that the industry is also underfunded. Major participants in the industry have voiced their concerns about the underfunding of the Nigerian construction industry and urged

the establishment of a bank for construction similar to the Bank of Industry (BOI) and the Bank of Agriculture (BOA). As of 2011, a major national road infrastructure gap and a 17 million housing shortage are the results of this underfunding (World Bank research, 2012). "With double digit growth rates in the years 2015–2018, the construction industry outperformed all other sectors of the Nigerian economy," according to Dantata (2018). However, it still has a relatively little impact on both employment and the GDP of Nigeria. Despite this outstanding achievement, the industry still confronts several challenges, such as a lack of locally skilled people, a lack of electricity, a lack of materials, and a high prevalence of unethical industry. Nigeria does not make use of the Construction Skills Certification Scheme (CSCS), which is regarded by construction businesses as the greatest solution to addressing the skills shortage (Mackenzie, Kilpatrick and Akintoye, 2000).

The Nigerian construction industry faces a variety of challenges on all three sides. Contractors and mangers, or site management and artisans, develop a vertical rivalry. There is lateral tension between clients and contractors, plumbers, electricians, and carpenters. A manager in the general contractor's business and a lower cadre staff member of the consultants, or the manager of a consulting firm and a craftsman, are examples of those who have a "diametrically opposed" relationship (Oyedele, 2013).

Because the industry is still in its infancy, there are many untapped prospects, particularly in the manufacture of building materials, supply chain management, ICT, education, and subcontracting. Although there is evidence that the concept is understood, Akintoye and Black (2000) said that "it seems that construction supply chain management (SCM) is still in its infancy." Suppliers, contractors, and contractors do not work well together and lack teamwork, team spirit, team players, and team orientation, which significantly restricts the team's ability to concentrate on its goals. Project management, LEAN operations, Six Sigma, marketing management, quality

management, strategic management, contracting management, and e-commerce are among the innovations that the industry is sluggish to implement. 2012 (Oyedele).

Nwachukwu, Emoh, and Egolum (2010) claim that the industry is very litigious and often appears in Nigerian courts. According to statistics from the Corporate Affairs Commission (CAC), contractors enter and leave the Nigerian construction industry at a significant rate. The industry also has a high employee turnover rate. The National Union of Civil Engineering, Construction, Furniture, and Wood Workers' Secretary General, Mr. Babatunde Liadi, reportedly said that "40,000 members of the union have been forced into the labour market in the previous two years because of abandoned projects" (News Agency of Nigeria, 2011). As instances of abandoned projects that have left construction workers without jobs, he cited the Sango-Ota road, the bridge on the Lagos-Abeokuta Expressway, and the Abuja-Lokoja Road (Liadi, 2011).

Furthermore, construction projects in Nigeria have an unpredictably short lifespan. Numerous projects have been abandoned owing to poor planning, legal disputes, and financial constraints. "Capital flight, capital stagnation, and capital sink" affect construction projects (Oyedele, 2013). Due to imported technology and materials used in construction projects, capital flight occurs. Capital sink results from poor planning, poor procurement, poorly placed projects, and overly designed construction. Capital sinks are characterized by inflated contract amounts and projects that are abandoned because of insufficient cash flow. If a project has a greater than required temporal overflow, capital stagnation results. Public projects in Nigeria also lack a succession plan, which results in a large number of abandoned projects and finished projects that are not used. The legislation that would make it mandatory for a government successor to continue the projects of his predecessor is not in effect.

2.2.2 Risk and Risk Management in Construction

All human endeavours, including construction activities, include a certain amount of risk, and there are many different types of risk (Odeyinka, 2000 quoted in Odeyinka, Oladapo and Dada, 2010). Risk has been defined in a variety of ways by economists, insurance professionals, and experts in construction management, among others. Knight (2011) defines risk as quantified uncertainty or uncertainty of loss in the context of business and insurance. Risk has also been defined as the unpredictability of the occurrence of certain events (Greene, 2013). With these ideas in mind, risk may be regarded as a psychological phenomenon that has a big impact on how people react to and perceive things. It might also be seen as an impersonal phenomenon that doesn't always elicit a reaction or experience from the observer.

According to Perry and Hayes (2015) and Healey (2012), risk in the context of construction management is the possibility of experiencing an economic gain or loss as a result of participating in the construction process. However, Moavenzadeh and Rossow (2016) only looked at risk as an exposure to loss. According to Bufaied (2017), risk in construction is a variable in the building project whose volatility results in uncertainty as to the project's final cost, duration, and quality. Akintoye and MacLeod (1997) assert that the time and financial overruns associated with construction projects have made risk in the construction the focus of attention. According to Perry and Hayes (1985), many schedule and cost overruns are a result of either unexpected or foreseen circumstances for which uncertainty was not well managed. According to Thompson (2012), one project that risk affects construction projects is by causing them to fall short of the necessary operational and quality criteria. In addition, numerous authors have noted expense and timeline overruns.

Design risk, competitive bidding risk, tender evaluation risk, and estimating risk are a few of the risk sources in construction that have been emphasized by Perry and Hayes (1985), Thompson (2012), and Akintoye and MacLeod (1997). The risk factors they identified at the post-contract stage also included, among others, physical risk, site condition, poor weather, legal liability, threats to the environment, logistical risk, political risk, financial risk, and contractual risk. Kikwasi (2012) asserts that managing construction projects involves a significant amount of risk management. Planning, identifying, analyzing, developing risk management techniques, monitoring, and control are all part of risk management. In order to minimize the bad effects risks have on the finance with the least amount of expense, risks must be managed after assessment and analysis. To ensure that potential risks do not jeopardize the project's success, the contractor must recognize and evaluate them (Enshassi and Jaser, 2008).

It is possible to define risk management as "a rigorous approach to looking at risk categories and actively determining how each should be handled. Aiming to identify sources of risk and uncertainty, evaluate their impact, and develop appropriate management solutions, it is a management method (Uher, 2003). Risk classification, risk identification, risk analysis, and risk reaction are the four components of a systematic approach to risk management. The four components of the risk response are retention, reduction, transfer, and avoidance. 2016 (Fadhili). A sound risk management plan may help in understanding not only the types of dangers that are there but also how to control these dangers at different phases of a project.

Due to its increasing importance, risk management is now recognised by most firms as a need, and a number of strategies have been developed to mitigate the effects of potential dangers (Baker and Reid, 2005). In an ideal risk management scenario, risks with the highest loss potential and highest risk of occurrence are treated first, followed by risks with lower occurrence potential and lower

loss. The risk may be quite complex, and managing the trade-off between risks with high loss but low likelihood of occurrence and hazards with high loss but low probability of occurrence may often go wrong. The proper allocation of resources is a difficulty for risk management as well (Enshassi and Jaser, 2008). The risk management approach emphasises the steps that must be taken to recognise, manage, and control risk.

Any potential future event that might prevent the team from achieving its goals is considered a risk in the risk management process. You may identify each risk, assess its impact, and take immediate action to stop it from occurring and lessen the harm should it occur using a risk management process (Damien et al, 2010). The risk management strategy is used whenever the project's ability to achieve its objectives is in risk. Most teams often deal with dangers. The hazards may be tracked and reduced by using this risk management method. Executing risk assessments in order to identify and quantify risks is part of the risk process. After the risks are identified, you may take steps to reduce their likelihood by using the risk management method. This risk management strategy will help you set up the necessary risk management controls right now (Damien et al, 2010). Therefore, risk management involves not only identifying risks but also deciding which threats deserve immediate attention and solutions. The risk management process often comprises identifying construction risks and hazards, evaluating those risks, and developing efficient risk management plans to reduce and mitigate potential risks (Damien et al, 2010).

2.2.3 Risk Management Process

The basis for identifying and containing risks in project activities is the risk management strategy. All phases of the risk management process must be included in process for a project to be successfully completed while dealing with threats. The following are the key steps in the risk management process (Kuria and Kimutai, 2018). Risk management is the endeavour to optimise

behaviours to decrease uncertainty about future occurrences (Jafari, Rezaeenour, Mazdeh and Hooshmandi, 2011). The construction industry needs comprehensive risk management to reduce the hazards affecting construction projects. Four well-known risk management strategies have been promoted by PMBOK (2004), Project Risk Analysis and Management (PRAM) (APM, 2004), Management of Risk (MOR) (Office of Government Commerce, 2007), and Standard Australia (2007), but there aren't any notable differences between them, claim Jafari et al. (2011).

The fundamental procedures of planning, identification, qualitative and quantitative analysis, risk response, and control are used in all of these techniques. Jia, Ni, Chen, Hong, Chen, Yang, and Lin (2013) claim that risk management planning is the first step in the risk management process. It is typically helpful to regulate and promote the four subsequent processes in the core risk management cycle to move forward with management system-oriented self-improvement in the entire project development flow from project inception through design and construction to project completion. The last phase in the risk management process is risk management reporting. In order to help organisations comprehend the present situation and implement the necessary risk management practises, it is customary to summarise risk management with frequent outputs in relation to preset risk control points.

2.2.4 Risk Identification

The first step in the risk management process, according to Nnadi et al. (2018), is risk identification, which lays the groundwork for the succeeding steps of analysis, assessment, and control. If done well, this ensures that risk management is effective. Consequently, it exemplifies the need to view risk identification broadly rather than only as what can be managed or insured (Nnadi et al., 2018). Starting with the identification process provides a strong basis for project execution and eliminates any obstacles to the kind of risk that may be

identified or the resources that might be affected. Project risks and conditions are identified and quantified via risk identification. Project managers may evaluate actions and areas where resources are at risk-thanks to-risk identification. Tchankova (2002) claims that these elements may be utilised to define risk identification.

- **Sources of risk**: they are project environment components that might have a positive or negative impact.
- **Hazard**: is a situation or scenario that raises the likelihood and severity of losses or profits.
- **Peril**: a situation that is dangerous and has bad, non-profitable outcomes. Peril may strike at any moment and produce unforeseeable, predictable losses. Losses are caused by danger.
- **Exposure to risk**: this is an item that might lose or earn money. If the risk arises, they will be impacted.

Therefore, risk identification is a continuous process. It is not possible to identify risk as a single occurrence. The techniques listed below are used to fully document the important risks affecting a building construction project.

I. ***Brainstorming***: This approach is the most common (APM, 2004). To detect and assess risk in a building development project, the technique requires assembling all interested and pertinent parties or persons. This objective is to generate many potential project risks. Consequently, this process encourages the non-critical discovery of risk concerns while avoiding imputing blame for the risk that was discovered (Fadun and Saka 2018). There should be a maximum of 12 participants in an effective brainstorming session, all of whom should have knowledge, experience, and competence in risk management.

II. ***The Delphi Technique***: This process includes contacting competent people and asking them to identify risks or evaluate the process and propensity of already identified specific risks using questionnaires. Anonymous opinions are provided (which enables the technique to be used remotely) (this allows the technique to be carried out remotely). The risk coordinator compiles a summary of the responses and requests estimates in light of the results. For a follow-up session, this information is shared once again. The process will go on until a reliable judgement is reached (Fadun and Saka 2018). In technique to brainstorming, this technique requires more effort and money. Another drawback of this technique is the lack of connection and communication, which may make it difficult for respondents to understand the questions and results.

III. ***Interviews***: The group-oriented techniques may be supplemented by interviews. To evaluate risk factors, identify potential mitigation and contingency measures, and collect data, experts in each risk scenario may be questioned. This is a prerequisite for any potential quantitative study (Fadun and Saka 2018). This technique requires a lot of time. The questions must be carefully planned due to the time limits in order to get the required information as soon as feasible. Avoid asking ambiguous or imprecise questions to prevent interviewers from giving deceptive answers (Chapman, 2001). The fact that the information received via this technique is reliant on experts' subjective opinions, which might be biased, is another issue.

IV. ***Experiential knowledge:*** Through this procedure, individuals get knowledge from their construction industry skills (Clear Risk, 2015). (2015) Clear Risk It is crucial

to emphasise that knowledge-based information acquired through this kind of technique must be relevant and suitable to the present building construction project.

V. ***Outputs from Risk-oriented Analysis:*** According to Clear Risk report (2015), there are many types of risk-oriented analysis. Examples include event tree analysis and fault tree analysis. These techniques are top-down analytic procedures that aim to identify what circumstances, flaws, or events could lead to an undesirable or unsatisfactory outcome. These events could be connected to a risk in a construction project.

VI. ***Risk Register***: The risk register provides a standardised framework for documenting risk data obtained utilising the techniques for risk identification. For each risk issue, it gathers a range of data, including a description, likely causes, ownership, probability, ramifications, mitigation and fallback plans, and status (Fadun and Saka 2018). In its most comprehensive form, it may even include quantitative measurements, contingency plans, and secondary risk detection (Fadun and Saka 2018). However, it is not advised to use checklists to start the risk identification process since they may prevent the detection of new hazards.

2.2.5 Risk Assessment/Analysis

The next phase in the risk management process after identification, in accordance with Kumar et al. (2018), is analysing the identified risk. The process of risk assessment/analysis utilises the information currently available to establish the likelihood of occurrence as well as the severity of impacts in risk management (Olamiwale, 2014). The process of doing a qualitative risk assessment, which involves additional research and evaluation of the risk of risk occurrence and

its effect on each of the identified hazards, comes after all the project's risks have been recognised. The qualitative risk analysis is regarded as the most useful step in the risk management process since the results will be used extensively in the following stages. Critical risk information is now required, including the likelihood, severity, and ownership of the risk. Probability-Impact (P-I) Grids are often used for qualitative risk analysis. A tabular format called Probability-Impact (P-I) Grids is used to quantify and rank risks. As indicated in the table below, the chance of occurrence and risk effect combine to generate the rows and columns of the grid. Because probability-impact grids are so straightforward, risks may be evaluated without being fully described in terms of their effects and likelihood of occurring (Fraser and Simkins, 2010).

Impact	V High					
	High					
	Med					
	Low					
	V Low					
		V Low	Low	Med	High	V High
		Probability				

Source: Vose (2008)

As shown in the above Table, the estimates of event likelihood and consequence for each risk attribute may be provided qualitatively as follows: High, Medium, and Low. Each of these word scales may be matched to a scale value. The probability and impact scale values, an arbitrary integer, an alphabet, or a combination of all three may be multiplied to get the P-I score for each cell in the grid. Consequently, Tah and Carr point out that it is crucial to adopt a consistent language when describing them in order to achieve a uniform assessment of risk likelihood of occurrence and risk magnitude (2001).

2.2.6 Risk Response and Monitoring

Hazards are not disregarded throughout the execution phase of the construction project after they have been recognised and evaluated. The outcomes of risk analysis enable accountable parties to comprehend the consequences of risk before planning and putting appropriate risk mitigation measures into place to lessen the impact either before or after it happens. Risk response, as defined by Ghasemi et al. (2018), is a crucial part of the risk management process that determines if any action will be taken in relation to the risks that were identified, qualified, and quantified during the stages of identification, qualification, and quantification. Risk responses are created by outlining several options for eliminating or reducing a forecasted risk and selecting the most effective substitute as a response (Nnadi et al., 2018). Olamiwale (2014) defines risk response as the process of identifying or creating alternative responses to risk as well as the selection of actions for managing the risk, prioritising opportunities, and reducing pressures to meet project objectives. Choosing an appropriate policy to lessen a risk's negative effects is thus an issue.

Some businesses use a variety of strategies to prepare for uncertainty, which might influence the system that governs the building construction process. The effectiveness of current mitigation strategies is what determines how much adverse events may interfere with building project performance. The interaction of risk-mitigation tactics for different parts has also been shown using the concept of the risk-reward relationship. Consequently, it should be noted that one of the most important ideas for systemic risk modellers is understanding prospective risk-mitigation efforts.

According to Vose (2008), threats cause the following reactions:

1. Risk avoidance entails changing a portion of the project such that the danger is either eliminated or rendered impossible to occur.
2. Risk transfer is a different kind of "reduce" response that just seeks to lessen the consequence, which is often largely the cost (a third party takes this responsibility). Risk transfer often involves signing contracts that guarantee a certain level of performance and set penalties for when the contractor doesn't meet it. Insurance becomes a desirable option when the cost of a negative event is greater than the cost of insurance.
3. Taking proactive steps to lessen the possibility of an event occurring or its effects is known as risk reduction. However, this must be done at the strategic level owing to the significant expenditure involved. This method is ideal for any level of risk that is not too high by weighing benefits and costs (high likelihood and high effect).
4. Risk reserve/flexibility attempts to increase responsiveness by employing a redundancy plan or adding a reserve (buffer) to address hazards. For hazards with a moderate to medium impact, this risk-reserved alternative is suitable.
5. Because certain risks are not large, it may be more expensive to get insurance against them than it would to sustain a loss should the unfavourable event occur. Self-insurance is what is meant here. In other words, it is a conscious decision to maintain the risks. When compared to the cost of control, small hazards have a low likelihood and impact, making this technique ideal for them.

And the following are the responses to opportunities:

1. **Exploit**: Taking advantage of a situation to make it happen and have an impact.

2. **Enhance**: A purposeful action taken to raise the possibility of an event occurring or to raise its impact.
3. **Reject**: Making a deliberate decision not to take advantage of or improve a situation.
4. **Share**: The parties divide the benefit when the cost is lower than the cost plan (within pre-agreed restrictions).

Given the risk-reward trade-off, decision-makers could be happy with the degree of risk they are now exposed to. In other words, some decision-makers can feel that they have spent too much time, money, or effort managing risks that may or may not materialise. As a result, they might decide to reduce the level of risk protection they provide (Vose, 2008). However, this tactic could damage the building company's brand and image by lowering its public credibility. Another strategy is to gather more data to reduce unknown uncertainty (epistemic uncertainties) in order to get a reliable conclusion (Ellegaard, 2008). Knowledge generation is advantageous in addition to the direct risk management method since it may help to effectively reduce either the probability or the impact of risk.

2.2.7 Benefits of Construction Risk Management Practices

Building construction projects will be more profitable if risk management is properly controlled, increasing project success. According to Toader et al. (2010), the risk management method has the following major advantages:

- It is effective because project managers are aware of the hazards that affect project operations and take precautions to prevent them.
- Risk analysis is used throughout the bidding process to get a more accurate project pricing.

- Effective risk management increases the project's chances of success despite the unknowns in the project environment.
- In the existence of risk information, risk assessments may be more thorough and precise. Future planning and risk information will benefit greatly from the availability of risk knowledge. Errors made in earlier projects might be avoided.
- The likelihood that construction companies will continue working for the same project owner will rise due to their proven track records and proven risk management techniques.
- The risk management strategy may improve project participants' ability to communicate.

2.3 Review of related Empirical Studies

Three factors—team members' experience, judgement, and intuition—are the foundation for risk analysis and management in the construction industry, according to Akintoye and Macleod (1997). Regrettably, formal risk analysis and management procedures are seldom used in the construction industry. The primary techniques of this are project teams' misconceptions about these techniques and the resulting belief that they cannot be used in the construction industry.

Uher and Toakely (1999) looked at instances where risk management was used during the conceptual stage of project development in the Australian construction industry. Despite their intention to adopt these techniques, they found that even while most respondents were aware of risk management procedures and techniques, they were seldom applied during the conceptual phase of projects.

In 1999 research on foreign joint ventures in construction, Lei Bing classified the risk factors into three groups: internal, external, and project specific. The risk focused on instances when East Asian construction industry experts effectively used risk management measures to mitigate risks. In a global survey of contractors, the financial components of joint ventures, governmental rules,

economic conditions, and project links emerged as the most important risk factors. By carefully choosing partners and crafting strict contracts, risks may be reduced when a local business enters a global construction market via a joint venture with a foreign company. Fair construction contracts with customers must be reached, the right personnel and subcontractors must be employed, and outstanding relationships must be made.

Construction risks were divided by Hastak and Shaked (2000) into three main categories: project, market, and national level hazards. Country risks are linked to the macroeconomic stability of the nation, its monetary and fiscal policies, and its capacity to withstand economic turbulence. Market level risks result from foreign dangers and include the firm's technical advantage over regional competitors, the accessibility of resources for construction, and local and global government support for the construction industry. Project level risks are specific to project operations and include factors like inadequate quality control, logistical limitations, bad project design, and environmental protection, among others.

Wand and Dulami (2004) identified 28 risks connected to construction projects in poor nations. They divided the risks into three groups: projects, markets, and nations. 22 risks were rated as critical or very serious on a seven-point scale. The top eleven major risks are (in no order): permit approval, interest and inflation rates, cost overruns, political instability of the nation, joint venture termination, government influence over disputes, government policies, cost overruns, interest and inflation rates, government policies, cost overruns, and cost overruns. Project risks are the least serious, market risks are in the middle, and risk hazards are the most significant. Respondents rated the success of feasible risk-mitigation measures for hazards on a seven-point rating scale. The measures that will increase efficacy should be prioritised in order to successfully minimise a task, according to the respondents. The risk mitigation measures should take advantage of this

prioritisation because the risks at higher levels of the hierarchy are more significant. Risks at higher levels (such as nation and market level) must be mitigated before moving on to risks at lower levels, such as project risks.

Architectural, engineering, and construction (AEC) firms based in Singapore faced risks in India, according to Ling and Hoi's (2006) evaluation. They also examined the risk response techniques employed by these firms. In-depth interviews with Singaporean experts working on AEC projects in India revealed that the main risks faced by AEC firms included significant cultural differences between expats and Indians, fluctuating currency exchange rates, high finance costs, and political and social risks. The techniques used to respond to hazards included getting good insurance and meticulously organising and managing all risk-reduction initiatives.

2.4 Summary of Literature Review

This chapter covers broad risk management language and concepts, as well as the categorization of risks and risk variables present in building construction projects. According to one definition, risk management is a continuous process that starts with risk identification, develops solutions via risk definitions, risk probability control, and risk reduction plan design, and then controls risks through continuing project monitoring. Key terms for risk management have been presented, including risk identification, risk probability analysis, risk monitoring, and risk control. Research has also been done on probability analysis and risk identification techniques.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter describes research design, area of study, population, sample, instrument for data collection, validation of instrument, administration of instrument, method of data analysis and decision rule.

3.1 Research Design

The study made used of survey research design to investigate risk management practices in building construction sites in Minna metropolis. Survey design according to Nworgu, (2012) is the type of design that samples the opinion of respondents on a particular issue. Therefore, the survey design was considered suitable since it seeks information for this study.

3.2 Area of Study

This study was carried out in building construction site in Minna metropolis,

3.3 Population

The targeted population for this study consisted of a total of 50 respondents comprising 25 Builders, and 25 Contractors in the construction industries in Minna metropolis.

3.4 Instrument for data collection

The instrument for data collection was structured questionnaire developed by the researcher from extensive review off related literature. The questionnaire consisted of items which are divided into four sections, A-D. Section A: consisted of instruction and personal data of respondents. Section B: dealt with the risks and risk management perceived on construction project. Section C: dealt with risk management process used in practice. Section D: dealt with solutions to managing risk factors in construction building in Minna metropolis.

3.5 Validation of the Instrument

The instrument for data collection was validated by project supervisor and other research and measurement expert in the Department of Industrial and Technology Education, Federal University of Technology, Minna. The comment of the validators will be used in the final production of the instrument before it will be administered to the respondents.

3.6 Administration of the Instrument

The instrument was administered to the respondents by the research and a research assistant. The filled instrument will be collected for subsequent data analysis.

3.7 Method of Data Analysis

In analyzing the data for the study, mean, standard deviation and t-test was used for the analysis. Mean and standard deviation will be used to answer the research question and t-test will be used to test the hypothesis between the two groups of respondents at 95% confidence limits. Four-point rating scale will be used as shown below.

Strongly agree (SA)	-	4
Agree (A)	-	3
Disagree (D	-	2
Strongly disagree (SD)	-	1

To determine the mean value the formula was be used.

$$X = \frac{\sum fx}{f}$$

Therefore, the mean value = $\frac{4+3+2+1}{4} = \frac{10}{4}$ = 2.50

Decision Rule

The mean of 2.50 was used as decision point for every questionnaire item. Consequently, any item with mean response of 2.50 and above are considered agreed and any item with a mean below 2.50 was considered disagreed. Also, on inferential statistic t-test was used to test the hypothesis at 0.05 level of significance to compare the man response of the two groups relative to four-point rating scale.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

4.1 Research Question 1

What are the risks and risk management perceived in construction project?

Table 4.1: **Mean response of risks and risk management perceived in construction project.**

N_1 =25 N_2 =25

S/N	ITEMS	$\bar{X}$	SD	Remark
1	Supplies of defective materials	3.64	.563	Agreed
2	Varied labor and equipment productivity	3.76	.657	Agreed
3	Not coordinated design (structural, mechanical, electrical, etc.)	3.68	.653	Agreed
4	Lack of consistency between bill of quantities, drawings and specifications	3.46	.613	Agreed
5	Financial failure of the contractor	3.20	1.178	Agreed
6	Unmanaged cash flow	3.22	.708	Agreed
7	Legal disputes during the construction phase among the parties of the contract	3.76	.555	Agreed
8	No specialized arbitrators to help settle fast	2.86	1.195	Agreed
9	Gaps between the Implementation and the specifications due to misunderstanding of drawings and specifications	3.52	.646	Agreed
10	Lower work quality in presence of time Constraints	3.60	.535	Agreed
11	Actual quantities differ from the contract quantities	3.74	.633	Agreed
12	Resource management	3.76	.625	Agreed
13	Changes in management ways	3.74	.527	Agreed
14	Poor management communication	3.60	.571	Agreed
15	Poor safety procedures	3.60	.670	Agreed

N=50

$\bar{X}$**=** mean of the respondents

N_1 = Builders

N_2= Contractors

SD = standard deviation of the respondents

Table 1 showed that both the contractors and builders agreed on all items from 1 to 15. This is because none of the mean response was below 2.50 which was the beach mark of agreed on the 4-

points response options. The standard deviation score ranged between 0.513 and 1.195. This showed that the responses of the builders and contractors on the items were not divergent.

4.2 Research Question 2

What is risk management process used in practice?

Table 2: **Mean response of risk management process used in practice.**

N_1 =25 N_2 =25

S/N	ITEMS	$\bar{X}$	SD	Remark
1	Utilize quantitative risk analyses techniques for accurate time estimate.	3.66	.557	Agreed
2	Depend on subjective judgment to produce a proper program.	3.70	.580	Agreed
3	Produce a proper schedule by getting updated project information	3.72	.536	Agreed
4	Plan alternative methods as stand-by.	3.48	.580	Agreed
5	Consciously adjust for bias risk premium to time estimation	3.70	.647	Agreed
6	Transfer or share risk to/with other parties	3.54	.503	Agreed
7	Refer to previous and ongoing similar projects for accurate program	3.72	.607	Agreed
8	Increase manpower and/or equipment	3.02	1.253	Agreed
9	Increase the working hours	3.32	.794	Agreed
10	Change the construction method	3.56	.541	Agreed
11	Change the sequence of work by overlapping activities	3.54	.813	Agreed
12	Coordinate closely with subcontractors	3.48	.886	Agreed
13	Close supervision of subordinates for minimizing abortive work	3.72	.497	Agreed
14	Use of specialty subcontractor to handle unexpected risk	3.60	.535	Agreed
15	Enhance construction project quality and improving the program plan of the construction project	3.36	.827	Agreed

N=50

$\bar{X}$= mean of the respondents

N_1 = Builders

N_2= Contractors

SD = standard deviation of the respondents

Table 4.2 showed that both the Builders and contractors agreed on all items from 1 to 15. This is because none of the mean response was below 2.50 which was the beach mark of agreed on the 4-points response options. The standard deviation score ranged between 0.497 and 1.253. This showed that the responses of the builders and contractors on the items were not divergent.

4.3 Research Question 3

What are the solutions to managing risk factors in construction building in Minna metropolis?

Table 4.3: Mean responses of solutions to managing risk factors in construction building in Minna metropolis.

		N_1= 25		N_2=25
S/N	ITEMS	$\bar{X}$	SD	Remark
1	Availability of qualified decision makers	3.82	.629	Agreed
2	Stability in project governance	3.70	.647	Agreed
3	Transparency of construction companies	3.48	.614	Agreed
4	Political orientation	2.92	1.322	Agreed
5	Enacting new governmental acts or legislations	3.06	.767	Agreed
6	Adequate resource management	3.78	.545	Agreed
7	Use of contractor's pre-qualification system	2.76	1.135	Agreed
8	Proper site management and supervision	3.54	.646	Agreed
9	Proper communication between involved parties	3.58	.538	Agreed
10	Training for personnel involved in areas such as technical studies, estimating, scheduling etc.	3.76	.625	Agreed
11	Use of information technology and decision-making techniques	3.06	.767	Agreed
12	Use of insurance policy	3.78	.545	Agreed
13	Eliminating gaps between the Implementation and the specifications of drawings and specifications.	2.76	1.135	Agreed
14	Creation of risk management organization/agency	3.50	.678	Agreed
15	Development of Risk management index by government.	3.58	.538	Agreed

N=50
$\bar{X}$= mean of the respondents
N_1 = Builders
N_2= Contractors
SD = standard deviation of the respondents
Table 4.3 showed that both the builders and contractors agreed on all items from 1 to 15. This is because none of the mean response was below 2.50 which was the beach mark of agreed on the 4-points response options. The standard deviation score ranged between 0.538 and 1.322. This showed that the responses of the builders and contractors on the items were not divergent.

4.4 Hypothesis 1

There is no significant difference between the mean response of contractors and builders on the risk and risk management perceived in a construction project in construction company in Minna metropolis.

Table 4.4 T-test Analysis of the respondent regarding the risk and risk management perceived in a construction project in construction company in Minna metropolis.

$N_1 = 25$ AND $N_2 = 25$

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Builders	25	3.84	.554	48	2.665	0.04	NS
Contractors	25	3.44	.507				

N=50

$\bar{X}_1$**=** mean of builders

$\bar{X}_2$ = mean of contractors

N_1 = Builders

N_2= Contractors

SD_1 = standard deviation of Builders

SD_2 = standard deviation of contractors

NS=Not Significant

Table 4.4 showed that there was no significant difference in the responses of Builders and contractors on all the items risk and and risk management perceived in a construction project in construction company; therefore, the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.5 Hypothesis 2

There is no significant difference between the mean response of contractors and builders on risk managements process used in practice in Minna metropolis.

Table 4.5 T-test on risk managements process used in practice in Minna metropolis
$N_1 = 25$ AND $N_2 = 25$

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Builders	25	3.60	.816	48	1.095	0.017	NS
Contractors	25	3.80	.408				

N=50
$\bar{X}_1$**=** mean of Builders
$\bar{X}_2$ = mean of contractors
N_1 = Builders
N_2= Contractors
SD_1 = standard deviation of Builders
SD_2 **=** standard deviation of contractors
NS=Not Significant
Table 4.5 showed that there was no significant difference in the responses of Builders and Contractors on risk managements process used in practice in Minna metropolis; therefore, the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.6 Hypothesis 3

There is no significant difference between the mean response of contractor and builders on what are the solution to managing risk factors in construction building in Minna metropolis.

Table 4.4 T-test Analysis of the respondent regarding solution to managing risk factors in construction building in Minna metropolis.

$N_1 = 25$ AND $N_2 = 25$

Respondents	N	X	SD	Df	Tcal	P-value	Remark
Builders	25	3.54	.563	48	2.665	0.04	NS
Contractors	25	3.44	.506				

N=50

$\bar{X}_1$= mean of Builders

$\bar{X}_2$ = mean of Contractors

N_1 = Builders

N_2= Contractors

SD_1 = standard deviation of Builders

SD_2 = standard deviation of contractors

NS=Not Significant

Table 4.4 showed that there was no significant difference in the responses of Builders and contractors on solution to managing risk factors in construction building in Minna metropolis; therefore, the null hypothesis of no significant difference was upheld at 0.05 level of significance.

4.7 Findings of the Study

The following are the main findings of the study. They are prepared based on the research question and hypothesis tested.

Risks and risk management perceived in construction project in Minna metropolis include the following.

- Supplies of defective materials
- Varied labor and equipment productivity
- Not coordinated design (structural, mechanical, electrical, etc.)
- Lack of consistency between bill of quantities, drawings and specifications
- Financial failure of the contractor
- Unmanaged cash flow
- Legal disputes during the construction phase among the parties of the contract
- No specialized arbitrators to help settle fast.
- Gaps between the Implementation and the specifications due to misunderstanding of drawings and specifications.
- Lower work quality in presence of time Constraints
- Actual quantities differ from the contract quantities.
- Resource management
- Changes in management ways
- Poor management communication
- Poor safety procedures

Risk management process used in practice in Minna metropolis include the following:

- Utilize quantitative risk analyses techniques for accurate time estimate.
- Depend on subjective judgment to produce a proper program.
- Produce a proper schedule by getting updated project information.
- Plan alternative methods as stand-by.
- Consciously adjust for bias risk premium to time estimation
- Transfer or share risk to/with other parties.
- Refer to previous and ongoing similar projects for accurate program.
- Increase manpower and/or equipment.
- Increase the working hours.
- Change the construction method.
- Change the sequence of work by overlapping activities.
- Coordinate closely with subcontractors.
- Close supervision of subordinates for minimizing abortive work
- Use of specialty subcontractor to handle unexpected risk.
- Enhance construction project quality and improving the program plan of the construction project.

The strategies to managing risk factors in construction building in Minna metropolis include:

- Availability of qualified decision makers
- Stability in project governance
- Transparency of construction companies
- Political orientation
- Enacting new governmental acts or legislations
- Adequate resource management

- Use of contractors' pre-qualification system
- Proper site management and supervision
- Proper communication between involved parties
- Training for personnel involved in areas such as technical studies, estimating, scheduling etc.
- Use of information technology and decision-making techniques
- Use of insurance policy
- Eliminating gaps between the Implementation and the specifications of drawings and specifications.
- Creation of risk management organization/agency
- Development of Risk management index by government.

4.8 Discussion of Findings

The result from table 4.1 shows the findings on Risks and risk management perceived in construction project in Minna metropolis. The findings of the study among others reveal that Supplies of defective materials, Varied labour and equipment productivity, Not coordinated design (structural, mechanical, electrical, etc.), Lack of consistency between bill of quantities, drawings and specifications, Financial failure of the contractor, Unmanaged cash flow, Legal disputes during the construction phase among the parties of the contract, No specialized arbitrators to help settle fast, Gaps between the Implementation and the specifications due to misunderstanding of drawings and specifications, Lower work quality in presence of time Constraints, Actual quantities differ from the contract quantities, Resource management, Changes in management ways, Poor management communication and Poor safety procedures as risk and perceived risk identified with construction industry in Minna.

The findings of the study are in line with Wand and Dulami (2004) who identified 28 risks connected to construction projects in poor nations. They divided the risks into three groups: projects, markets, and nations. 22 risks were rated as critical or very serious on a seven-point scale. The top eleven major risks are (in no order): permit approval, interest and inflation rates, cost overruns, political instability of the nation, joint venture termination, government influence over disputes, government policies, cost overruns, interest and inflation rates, government policies, cost overruns, and cost overruns. Project risks are the least serious, market risks are in the middle, and risk hazards are the most significant. Similarly, Abraham and Maroof (2018) found that lack of teamwork, no past experience on similar project, improper project planning and budgeting, internal management problem, poor relation and disputed with partner, time constraint, poor relation with government department are among risk factors in construction industry in Nigeria.

The result of the hypothesis on response of contractors and builders on the risk and risk management perceived in a construction project in construction company in Minna metropolis shows that there was no significant difference in the responses of Builders and Contractors on all the items as risk and perceived risk management in Minna Metropolis.

Table 4.2 shows the result of the findings on Risk management process used in practice in Minna metropolis. The finding of the study among others revealed that utilization of quantitative risk analyses techniques for accurate time estimate, dependence on subjective judgment to produce a proper program, production of a proper schedule by getting updated project information, planning alternative methods as stand-by, conscious adjustment for bias risk premium to time estimation, transfer or share risk to/with other parties, reference to previous and ongoing similar projects for accurate program, increase in manpower and/or equipment, increasing the working hours, changing the construction method, changing the sequence of work by overlapping activities,

coordinating closely with subcontractors, close supervision of subordinates for minimizing abortive work, use of specialty subcontractor to handle unexpected risk and enhancing construction project quality and improving the program plan of the construction project are all part of risk management techniques utilize by construction companies in Minna Metropolis. This finding corroborates Adeleke *et al.,* (2018), who noted that there are four significant steps in the risk management practice they include risk identification, analysis, response and control. These practices were analysed one after the order to determine the major form of risk management practice utilised in each step. The study adopted principal component analysis to examine the level at which the construction industry of Nigeria follows the risk management best practices of identification, assessment/analysis, responses and control.

The result of the hypothesis on response of contractors and builders on risk managements process used in practice in Minna metropolis shows that there was no significant difference in the responses of Builders and Contractors on all the items as on risk management process used in practice in Minna metropolis.

The result from table 4.3 reveal the findings on strategies to managing risk factors in construction building in Minna metropolis. The findings of the study revealed availability of qualified decision makers, Stability in project governance, Transparency of construction companies, Political orientation, Enacting new governmental acts or legislations, Adequate resource management, Use of contractors pre-qualification system, Proper site management and supervision, Proper communication between involved parties, Training for personnel involved in areas such as technical studies, estimating, scheduling etc., Use of information technology and decision making techniques, Use of insurance policy, Eliminating gaps between the Implementation and the specifications of drawings and specifications, Creation of risk management organization/agency

and Development of Risk management index by government are effective strategies or solution to managing risk factors in construction building in Minna metropolis.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Study

The focus of this research study was to find out Risk management practice in building construction site in Minna metropolis.

Chapter 1 of the study discussed the background of the study, the statement of problem, purpose, significance, scope and the research questions were all stated and discussed for the conduct of this research.

The review of related literature investigated Nigerian Construction Industry, Risk and Risk Management in Construction, Risk Management Process, Risk Identification, Risk Assessment/Analysis, Risk Response and Monitoring, Benefits of Construction Risk Management Practices. The study theoretical framework was Probability theory. Various views of different authors concerning the topic were harmonized in a comprehensive literature review and empirical studies.

A survey approach was used to developed instrument for the study; the respondents identified as the population of the study were the Builders and Contractors. The entire respondents were used. A total 50 questionnaires were administered. The instrument used was analysed using frequency count, and mean scores. The research questions were discussed based on the findings from the responses and results of the instrument used.

Implication of the study and conclusions were also drawn from the findings discussed. Recommendations and suggestions for further study were formulated and stated according to the findings of the study.

5.2 Implication of the Study

The findings of the study had implications for government, construction industries, Builders and Contractors. From the outcome of the study, it implies that, Formal risk analysis and management techniques are of high importance in construction industry because time and resources are saved, and target are met by effective risk management practice. Hence risk management practices inn construction industry must be indoctrinated as part of the standard practice in the construction industry in Nigeria just has other industries have their standards. Hence, the perception of risk by contractors and consultants should not just be based on their intuition and experience but rather on a formalize system of risk management.

This is because a formalize risk management in the construction industry will helps the key project participants – client, contractor or developer, consultant, and supplier to meet their commitments and minimize negative impacts on construction project performance in relation to cost, time and quality objectives. An effective risk management method can help to understand not only what kinds of risks are faced, but also how to manage these risks in different phases of a project.

5.3 Contribution to Knowledge

1. There should be advancement in the understanding of the world that would enables the development of new solutions to complex problems.

2. Through this project and with the approach, The contractor and builders should be updated in tackling risk management practices in construction industries.

3. Government, general public, building clients, the construction industries, should be able to evaluate the risk management continuously and upgrad in order to maximize its risk in building construction site.

5.4 Conclusion

Based on the findings of the study, the study concludes that among the various perceived risk in construction industry are supplies of defective materials, varied labour and equipment productivity, not coordinated design (structural, mechanical, electrical, etc.), lack of consistency between bill of quantities, drawings and specifications, financial failure of the contractor, unmanaged cash flow. This risk factors can be effective management when risk management practice such as utilization of quantitative risk analyses techniques for accurate time estimate, dependence on subjective judgment to produce a proper program, production of a proper schedule by getting updated project information, planning alternative methods as stand-by, conscious adjustment for bias risk premium to time estimation, transfer or share risk to/with other parties, reference to previous and ongoing similar projects for accurate program are put to use.

Also there is need for project participant to availability of qualified decision makers, Stability in project governance, Transparency of construction companies, Political orientation, Enacting new governmental acts or legislations, Adequate resource management, Use of contractors pre-qualification system, Proper site management and supervision, Proper communication between involved parties, Training for personnel involved in areas such as technical studies, estimating, scheduling etc., Use of information technology and decision making techniques , Use of insurance

policy, Eliminating gaps between the Implementation and the specifications of drawings and specifications

5.5 Recommendations

Based on the findings of the study, the following recommendations were made:

1. Contractors (especially indigenous contractors) should create risk management organisation (people saddled with responsibilities of Risk Management) e.g., Project Managers. This will allow the responsibility of risk management not to be handled by technical (site engineers/builders) personnel who are usually not trained in such areas.

2. There should be frequent training of contractors‟ Risk Management personnel which will allow top management of the contractors have a deep understanding of what risk management entails.

3. When planning for site organisation and work schedule in relation to risks, other factors like capability of bearing the risk, insurance coverage and contract procurement methods should be considered.

4. Contracting companies should maintain a satisfactory level of communication between the home office and field offices and apply appropriate management practices.

5. Government needs to ensure the development of a risk management system that will serve as a guide for the successful completion of building construction projects in Nigeria.

5.6 Suggestion for Further Study

The following are suggested for further studies:

1. This study is limited to Minna metropolis; hence this study should be carried out in other part of Niger state and Nigeria as whole in order to have a holistic view of risk management practice in the state and country.

2. Further study can be carried out on factors mitigating effective risk management system in Nigerian construction industry.

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APPENDIX

INDUSTRIAL TECHNOLOGY EDUCATION DEPARTMENT

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

FEDERAL UNIVERSITY OF TECHNOLOGY

PMB 65, MINNA, NIGER STATE

QUESTIONNAIRE

Dear Sir/Madam,

This questionnaire is designed to obtain information on the Risk Management Practices in Building Construction site in Minna Metropolis. The main purpose is to enable the researcher to achieve the objectives of the research as required in the fulfillment for the award of Bachelor of Technology in Industrial Technology Education.

Any information obtained is purely for academic research and shall be so treated. The outcome of this research will be of immense important to the upliftment of academic research and to the general public. Based on this, it would be appreciated if you provided information demand of you with utmost sincerity.

Thank you

_____

Olufe Victor

Researcher

SECTION A: DEMOGRAPHIC DATA

Gender: Male ( ) Female ( )

Status: Labourer ( ) Contractors ( )

Years of Experience: less than 5years ( ) 5-10years ( ) 11-15 years ( ) above 15years( )

SECTION B

In the table below, please indicate the perceived constructional risk factors in your opinion.

S/N	ITEMS	SA	A	SD	D
1.	Supplies of defective materials				
2.	Varied labor and equipment productivity				
3.	Not coordinated design (structural, mechanical, electrical, etc.)				
4.	Lack of consistency between bill of quantities, drawings and specifications				
5.	Financial failure of the contractor				
6.	Unmanaged cash flow				
7.	Legal disputes during the construction phase among the parties of the contract				
8.	No specialized arbitrators to help settle fast				
9.	Gaps between the Implementation and the specifications due to misunderstanding of drawings and specifications				
10.	Lower work quality in presence of time Constraints				
11.	Actual quantities differ from the contract quantities				
12.	Resource management				
13.	Changes in management ways				
14.	Poor management communication				
15.	Poor safety procedures				

SECTION C

In the table below, please indicate the relative use of each risk management practice in your site

S/N	ITEMS	Rarely	Sometimes	Often	Always
1.	Utilize quantitative risk analyses techniques for accurate time estimate.				
2.	Depend on subjective judgment to produce a proper program.				
3.	Produce a proper schedule by getting updated project information				
4.	Plan alternative methods as stand-by.				

5.	Consciously adjust for bias risk premium to time estimation				
6.	Transfer or share risk to/with other parties				
7.	Refer to previous and ongoing similar projects for accurate program				
8.	Increase manpower and/or equipment				
9.	Increase the working hours				
10.	Change the construction method				
11.	Change the sequence of work by overlapping activities				
12.	Coordinate closely with subcontractors				
13.	Close supervision of subordinates for minimizing abortive work				
14.	Use of specialty subcontractor to handle unexpected risk				
15.	Enhance construction project quality and improving the program plan of the construction project				

SECTION D

In the table below, please tick your responses to means of mitigating poor risk management practices.

S/N	ITEMS	SA	A	SD	D
1.	Availability of qualified decision makers				
2.	Stability in project governance				
3.	Transparency of construction companies				
4.	Political orientation				
5.	Enacting new governmental acts or legislations				
6.	Adequate resource management				
7.	Use of contractors pre-qualification system				
8.	Proper site management and supervision				
9.	Proper communication between involved parties				
10.	Training for personnel involved in areas such as technical studies, estimating, scheduling etc.				

11.	Use of information technology and decision making techniques				
12.	Use of insurance policy				
13.	Eliminating gaps between the Implementation and the specifications of drawings and specifications.				
14.	Creation of risk management organization/agency				
15.	Development of Risk management index by government.				