CRITICAL RISK FACTORS, EXTERNAL RISK FACTORS AND PERFORMANCE OF BUILDING PROJECTS IN KENYA: A CASE OF NAIROBI COUNTY

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DECLARATION

Student's Declaration

I declare that this applied research project is my original work and that it has not been presented in any other university for academic credit.

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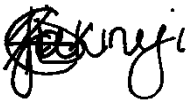
Signature:  Date: 12th June, 2023

Supervisor's Declaration

This applied research project is submitted for examination with my/our approval as the university supervisor(s).

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EXAMINERS' SIGNATURES

We have examined this document and the research has met or exceeded the requirement for the degree sought, in addition, the candidate has sufficiently defended the material presented to merit the awarding of the degree of Master of Business Administration.

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DEDICATION

I dedicate this research to the Almighty God, my husband Kevin Musiega and my dear children Angel Esther, Maya Vusha and Tamika Sankara.

ACKNOWLEDGEMENTS

Firstly, I would like to acknowledge the Almighty God for sustaining me and giving me the gift of life. I would also like to sincerely thank my supervisors Dr. Kimani Gichuhi and Dr. Titus Mwanthi for their guidance and support during the entirety of the research process. I also take this opportunity to thank my colleagues at the National Construction Authority for their support, input and encouragement that enabled me to push through and complete this project.

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ABSTRACT

The construction sector provides immense benefits to the public due to employment opportunities it offers both directly and indirectly. Globally, the need for infrastructure is based on the rising levels of the population, thus increasing the demand for necessities such as housing. Building projects in Kenya continue to experience poor performance with regard to schedule delays, cost overruns, and poor quality. The general objective for this study was to investigate the influence of critical risk factors on the performance of building projects in Nairobi City County. The specific objectives were to establish the effect of management risk factors, technical risk factors, financial risk factors, and human resource risk factors on the performance of building projects in Nairobi City County. Further, the study sought to assess the moderating effect of external factors on the relationship between critical risk factors and the performance of building projects in Nairobi City County. The target population of this study was all the registered construction projects in Nairobi County as per the National Construction Authority database in the year 2021, totalling 698 projects. A representative sample was calculated using the Yamane formula, giving 253 building projects that were used in data collection. Primary data was collected through a semi-structured questionnaire that was physically and virtually administered to respondents. The findings showed that management risk factors, technical risk factors and financial risk factors had a statistically significant effect on the performance of building projects in Nairobi City County. However, the variable on human resource risk factors did not have a statistically significant effect on the performance of building projects in Nairobi City County. The external factors were found to have a moderating effect on the relationship between the performance of building projects and the identified independent variables in this study. The research recommended the development of policies to streamline the adoption and application of risk management strategies in construction projects to reduce potential damage and losses accompanied by any failures. Further, increasing awareness of the need to adopt risk management as a prerequisite for construction projects through capacity building of involved players will significantly enhance the building construction sector. The expected beneficiaries of this study include contracting firms in the construction industry, construction professionals, policy makers, government and the academic community.

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ABBREVIATIONS AND ACRONYMS

CAK	Competition Authority of Kenya
GDP	Gross Domestic Product
HR	Human Resource
KNBS	Kenya National Bureau of Statistics
KPI	Key Performance Indicators
NACOSTI	National Commission for Science, Technology and Innovation
NCA	National Construction Authority
SPSS	Statistical Package for Social Sciences

DEFINITION OF TERMS

Contractor a firm registered by the National Construction Authority as per the NCA Act of 2012 to undertake the construction, installation or erection of any structure situated below, on or above the ground, or other work connected therewith.

Critical Risk Factor threats or hazards that pose a significant danger to the strategic objectives of a firm/project due to their related consequences on occurrence. In this study, these factors include management factors, technical factors, financial factors, and external factors

External Risk Factor naturally occurring or manmade events that directly affect the success of construction projects

Financial Risk Factor aspects that lead to the volatility or unpredictability in construction resulting in price fluctuations

Human Resource Risk Factor labour related aspects in construction that are likely to affect productivity and overall project success

Management Risk Factor aspects related to the inability of top firm leadership to effectively manage construction projects

Project Performance measure of the progress/milestones of a project with regard to dimensions including time, cost, quality, health and safety.

Risk refers to the possibility of a negative effect occurring with respect to something of value

Risk Management the process of identifying, analysing, and creating appropriate responses to ensure project success and mitigate the adverse effects of possible losses

Technical Risk Factor issues associated with the capabilities of implementers of projects from the design to the execution phase

CHAPTER ONE: INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

The following section covers the aspects of the background of the study, the problem statement, objectives, research questions, significance, scope, limitations, delimitations and conceptual framework.

1.2 Background of the Study

The real estate formed as a result of the construction process forms an essential part of national wealth in many countries. Infrastructure, specifically buildings are considered fixed assets and form a significant share of non-financial assets. Khaertdinova, Maliashova and Gadelshina (2021) state that the development of construction activity is important in the development of economies. Further, this is the case in Russia where the sector has an average share of five to six percent of the country's GDP, making it one of the largest sectors of the economy. Further, Fulford (2018) reiterates the marked contribution of construction activities to the overall wealth of nations. By creating the built environment through which businesses and social components of society comprise, there is a direct link with economic growth through investments in the sector. The construction industry in Europe accounts for approximately 10% of GDP while also contributing to the improvement and development of other sectors through its direct linkages with them (Fulford, 2018). Therefore, development of infrastructure is considered a significant factor in raising and advancing economies.

Additionally, Alaloul, Musarat, Rabbani, Iqbal, Maqsoom, & Farooq (2021) state that the construction industry is considered one of the largest contributors of Gross Domestic Product (GDP) to the economies of industrialized countries. Data collected from Malaysia

between 1970 and 2019 shows that the Malaysian economy is moving towards sustainable production with more emphasis on the construction. Globally, the need for infrastructure is based on the rising levels of population globally thus increasing demand for necessities such as housing and road networks. Consequently, with individuals spending a considerably huge amount of their time in such infrastructure, their importance cannot be underplayed. More so, the dependence of the world on completed construction projects outlines the significant risks they pose to individuals if not taken seriously.

In the African context, Abubakar, Abdullahi and Bala (2018) highlight that in the Nigerian construction industry contributes approximately 3% of the annual GDP. Moreover, the sector is further responsible for a third of the total fixed capital investment in the country. Its significance to the country's development is however underplayed hence making it difficult for the country to achieve sustained economic growth. The linkage of the country's GDP and the construction sector shows evidence of the bidirectional relationship between the two. Consequently, government efforts directed towards the sector can significantly improve economic growth showing the importance of the sector.

Consequently, the contributions of the construction sector cannot be underplayed. With the public requiring homes and other buildings for many productive activities such as services, commerce, utilities and other industries, construction works are projected to continue growing to fill the rising demands. The construction sector thus provides immense benefits to the public not only for the above-mentioned functions but also due to the immense employment opportunities they offer both directly and indirectly. In the long run, the impact of construction can be felt all through the economies of countries.

1.2.1 Risk Management in Construction

Risk management in construction projects forms an essential and systematic mode of identifying, analysing, and creating appropriate responses to ensure project success. Project risks are defined as any uncertainty caused by events that will negatively affect the outcome of the construction project (Siraj & Fayek, 2019). In this case, risk management is delimited as the process through which risk elements are identified and analysed as a result of management factors, technical factors, financial factors, human resource risk factors and external factors. Consequently, solving for these risks will significantly improve project completion within the set objectives and timelines, thus achieving targets.

The use of inappropriate risk management practices leads to poor project performance in terms of cost, quality, time and health, and safety. The construction industry, especially in the developing world, has been noted to systematically fail to apply the appropriate risk management strategies (Willumsena, Oehmena, Stingla & Geraldi, 2019). This has ultimately led to negative consequences for the industry, including building failures, cost overruns, and the loss of lives. More so, the emergence of claims and contractual disputes in construction projects further outlines the lack of integration of risk management by either clients, contractors, or consultants.

In Africa, the implementation of risk management strategies in construction is limited. As a result, construction projects face a number of challenges including poor performance. ALSaadi and Norhayatizakuan (2021) reiterate that poorly performing construction projects are characterized by cost and time overruns, as evident in the high cost of construction, low quality work, and time escalations. McDermot, Agdas, Díaz, Rose & Forcael, E. (2020) further highlight that project performance is an important indicator in

construction projects. Performance in construction is usually measured using variables of time, cost, and quality of the project in the long run.

1.2.2 External Risks in Construction

The construction industry operates in a dynamic and challenging environment, where numerous external risks can significantly impact project timelines, costs, and overall success. External risks refer to any unplanned or unexpected events that directly affect the success of construction projects and may be due to pandemics, geological disruptions, meteorological aspects or civil war or political unrest.

Pandemics, such as the global outbreak of COVID-19, have emerged as one of the most prominent external risks affecting the construction industry. The unprecedented nature of a pandemic can disrupt construction activities through various channels, including labor shortages, supply chain disruptions, government-imposed restrictions, and changes in project demand. The COVID-19 pandemic, for example, led to widespread project delays, reduced productivity, increased material costs, and heightened health and safety concerns. Construction companies have since recognized the need to incorporate pandemic response plans into their risk management strategies to mitigate the impact of future health crises.

On the other hand, weather conditions also pose significant external risks to construction projects, as they can cause delays, damage to infrastructure, and safety hazards. Extreme weather events such as hurricanes, floods, blizzards, and heatwaves can disrupt construction activities, hinder transportation of materials, and compromise the safety of workers. Rising concerns over climate change have heightened the frequency and intensity of these weather-related risks, necessitating proactive measures such as climate modeling, site-specific risk assessments, and resilient design strategies to mitigate their impact.

Apart from that, natural disasters such as earthquakes, tsunamis, landslides, and wildfires can result in substantial damage to construction sites, infrastructure, and equipment, leading to significant financial losses and potential safety hazards. Therefore, construction projects must constantly consider the geographical location of projects and implement appropriate engineering and design practices to enhance resilience against potential natural disasters.

Lastly, the issues of political unrest and civil wars are external risks that can profoundly impact the construction industry. In regions experiencing political instability or armed conflicts, construction projects often face disruptions in the form of project suspensions, resource scarcity, damage to infrastructure, and the displacement of workers. More so, political unrest can lead to regulatory uncertainties, changes in government policies, and increased security concerns, making it challenging for construction companies to operate efficiently and safely.

Ultimately, proactive risk management strategies, comprehensive contingency plans, and adherence to industry best practices are crucial for mitigating these external risks and ensuring successful project delivery within this dynamic and challenging environment.

1.2.3 Construction Industry in Kenya

According to the Economic Survey 2021 conducted by the Kenya National Bureau of Statistics (KNBS), the construction industry registered a growth of 11.8% in 2020 compared to growth of 5.6% in 2019. More so, cement consumption rose significantly from 6.1 million tonnes in 2019 to 7.4 million tonnes in 2020 representing an increase of 21.3% (Kenya National Bureau of Statistics, 2021). This highlights the continued increase in

infrastructure investment and development in the country making it one of the critical pillars of the country's economy as shown in Table 1.1 below. With affordable housing further being a major pillar of the President's Big 4 Agenda, the building sector is a critical area of interest as espoused in this study. More private and public entities continue to engage the sector to meet the complex demand and supply problem that has ravaged the country since independence.

Table 1.1: Contributions of the construction industry to the economy

YEAR	2016	2017	2018	2019	2020
Contribution To GDP (%)	5.1	5.4	5.8	6.0	7.0
Growth (%)	5.8	6.3	6.1	5.6	11.8

Source: KNBS (2021)

Kirira et al. (2019) states that the multifaceted nature of road construction projects in Kenya has led to significantly low performance that leads to delays and cost overruns that ultimately lead to litigation. More so, the country further has weak legal and institutional frameworks to enhance enforcement mechanisms with regard to risk management especially in such high value public projects. Apart from that, Mwangi & Ngugi (2018) highlight that most prevalent risks facing projects funded by the Nairobi County Government included costing of projects, land disputes and project designs. These risks further affected the performance of projects resulting in delays and significant cost implications. This shows that many projects in the country do not employ appropriate risk management strategies to combat the possible risks that may occur during the building construction phase.

1.2.4 Building Construction Sector in Kenya

Building construction entails the development of residential construction undertaken by individual land-owners or large-scale non-residential building construction that is to be procured by a wide range of private and public organisations. Usually, the process involves a number of phases including detailed planning, design, construction and ultimate handover of the completed work. Each stage involves a number of practitioners and specialists conversant with the necessary requirements and distinct roles including architects, quantity surveyors, engineers and contractors (Tan, Zaman & Sutrisna, 2018). Therefore, the proper coordination of all these individuals encompasses the process of building construction.

Despite the recent slowdown in the world economy caused by the coronavirus pandemic, Kenya's construction sector has persisted as reflected in increased investment in both commercial and residential buildings over the past few years. However, Kenya is still reported to have a shortage of housing units amounting to two million units, with this number increasing by approximately 200,000 units annually (The World Bank, 2017). In line with the President's Big 4 Agenda, there is an increased investment in housing to try and bridge this deficit by construction 500,000 affordable housing units by the year 2022 (State Department for Housing and Urban Development, 2018). As a result, the increase in activities in the building sector due to the changing dynamics can lead to poorly constructed houses increases that put the lives of citizens at risk.

Construction in the country's capital, Nairobi City County, has continued to rise with demand for housing units increasing. According to the Competition Authority of Kenya (2018), the value of building works in the county rose by Kshs. 6 billion from 2015-2016. Private buildings in the county further rose from 9,054 in to 10,002 in the same period

while new public residential buildings rose from 45 to 1,062 (CAK, 2018). This shows the continued investment in the construction of buildings in Nairobi County being a major hub in East Africa. With the trend projected to continue, Nairobi provides the best case study for the elements under this study.

1.3 Statement of the Problem

For the performance of projects to be deemed successful, all individuals linked to the project have to play their part. Therefore, the proper identification and management of any potential risks to the project can significantly improve their performance while putting into consideration unforeseen aspects such as the business environment, and economic and political stability. Building projects in the country continue to experience poor performance with regard to schedule delays, cost overruns, and poor quality. Babu, Oswald and Masu (2019) established that project performance in Kenya over the period of study (1963-2018) is considered poor. The findings further show that 35-60% of projects in the country had cost overruns with delays accounting for the largest effect on performance with approximately 35-73% of projects overrunning their schedule. This shows the minimal or lack thereof appropriate risk management strategies to limit their impact on local construction projects.

While several studies have previously attempted to outline the various issues in the construction industry with regard to risk management, limited information was available on the effect of critical risk factors on the performance of construction projects. Masril and Rahman (2020) identified project management risk, material risk, design risk, equipment and safety risk as the critical factors likely to affect project performance. However, their focus was geographically limited to projects executed in the West Sumatera region of Iran.

Locally, Githere and Sang (2021) found that design danger, legal risk, construction risk, and contract management risk affected the performance of road construction projects in Nairobi County. Kirira et al. (2019) also conducted a study on the influence of risk management strategies on road construction project performance in the Coast region. These studies focussed on project risk management practices in road projects as opposed to the individual critical risks as espoused in this study. Further, Mwangi and Ngugi (2018) also assessed the risk management practices and performance of construction projects in Nairobi City County Government. Their study was similar to that by Githere and Sang (2021) but with an emphasis on projects funded by the county government. As a result, the application of the findings in the previous studies in the researcher's area of study was limited.

It is notable that, the moderating effect of external factors, with the COVID-19 pandemic being a key aspect, had not been studied in depth in relation to its impact in the Kenyan context. This would provide a better understanding of how such far-reaching risks can affect the industry. Additionally, it would ensure that contractors and other stakeholders put in place the necessary risk management strategies.

Consequently, risk management is an essential part in enhancing construction project performance. However, there existed a contextual and knowledge gap on the significance of critical risk factors on building project performance, specifically in Kenya. Therefore, this study aimed to fill this knowledge gap by analyzing the effect of management, technical, financial, and human resource risk factors on the performance of building projects.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of this study was to investigate the influence of critical risk factors on the performance of building projects in Nairobi County of Kenya.

1.4.2 Specific Objectives

The specific objectives were:

1. To establish the role of management risk factors on the performance of building projects in Nairobi County
2. To determine the impact of technical risk factors on the performance of building projects in Nairobi County
3. To establish the effect of financial risk factors on the performance of building projects in Nairobi County
4. To establish the influence of human resource risk factors on the performance of building projects in Nairobi County
5. To find out the moderating effect of external factors on the relationship between critical risk factors and performance of building projects in Nairobi County

1.5 Hypotheses

The study was guided by the following hypotheses:

H_1: Management risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

H_2: Technical risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

H_3: Financial risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

H_4: Human resource risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

H_5: External risk factors do not moderate the relationship between critical risk factors and performance of building projects in Nairobi County

1.6 Significance of the Study

With Kenya being a developing country that is increasingly increasing its spending on infrastructure development, the construction industry is considered a significant contributor to the economy. As a result, the knowledge of risk management provides an avenue for knowledge dissemination in a critical area that can significantly improve the performance of projects not only during the construction phase but also throughout the lifetime of buildings. Consequently, by demonstrating the influence of critical risk factors including human resource, management, technical and financial factors, this study contributes significant data and knowledge to the industry. Furthermore, the research has practical implication for construction firms engaging in building projects since it provides a model framework that can facilitate improved performance through identification and mitigation of critical risk factors during construction.

1.7 Scope of the Study

The study was carried out in Nairobi County and included contractors registered by the National Construction Authority (NCA) within the financial year 2021/2022 that were engaged in building projects. This was because there was a higher likelihood that these building projects were ongoing and the respondents would be available on the project site.

Additionally, the building construction sector was selected to be the focus of this study due to its huge role in the country's development and the significant risk it poses to human life when conducted improperly. The study findings were thus intended to capture the awareness of risk factors and their effect on project performance in the construction industry.

1.8 Delimitations of the Study

While there were several risk factors likely to affect the performance of building projects, this study was limited to studying the effects of four critical risk factors on the performance of building projects in Nairobi City County namely, human resource factors, management factors, financial factors and technical risk factors. These were considered to be the main risk factors likely to affect building projects in the area under study. It would further be unfeasible to conduct a study on all the possible risk factors experienced in building projects as variables.

1.9 Limitations of the Study

It was expected that some respondents would unwilling to respond to some questions of the questionnaire due to the sensitivity of the information required. However, the researcher countered this by emphasizing the anonymity and confidentiality of the information provided. Furthermore, the continuing COVID-19 pandemic limited physical meetings and, in such cases, the researcher sought for alternative methods of sending the questionnaire to the respondent such as email.

1.10 Assumptions of the Study

The researcher intended to administer questionnaires to key construction personnel implementing building projects including contractors, site supervisors and consultants.

Therefore, the study assumed that all these respondents would respond to the questionnaire truthfully and transparently regarding the issues under investigation. More so, it was also assumed that the research instrument would elicit reliable information while the respondents would fully understand the questions being asked by the researcher.

1.11 Theoretical Framework

According to Kivunja (2018), theories are described as the elements that provide a grounded basis for the understanding of relationships and development of problem-solving capabilities in research. They further assist in providing the salient assumptions and predictions when looking at current studies since they offer valid reasons for looking into phenomena that are yet to be investigated. Additionally, theories assist researchers to classify and determine the most important aspects that can help them understand the application of research into real-life scenarios hence explaining behaviour and solving for problems (Adom, Hussein & Adu-Agyem, 2018). Therefore, theories set the stage for developing an appropriate context for research especially in social sciences.

The contingency theory was postulated by Fred Fieldler in 1964 using principles of past projects implemented in present and future projects. According to the theory, there is no single appropriate method to manage different institutions hence the need for differentiation in the management methods applied to firms (Fieldler, 1964). The contingency theory further recognizes the range of contextual risk factors that influence project objectives differently hence affecting their mode of implementation. Therefore, projects must be evaluated to determine the relevant and specific risk factors that directly affect them. As a result, contingency theory was used in this study to describe a risk management approach for building projects that is most suitable for the given Kenyan

scenario. Construction risks have different effects on particular building project objectives and so the contingency theory is relevant for this research.

Apart from that, the goal-setting theory as espoused by Locke and Latham (2002) highlights the mechanisms that work to connect difficult and specific goals to performance outcomes. All construction projects have specific goals that must be met in order for them to be considered successful. Therefore, the setting up of specific goals such as risk management to prevent future problems is considered an important goal of the project. More so, the goal setting theory tends to look at the priority areas of individuals with difficult goals maintaining a sustained performance. This theory is thus an important aspect of performance measuring through the prioritization of appropriate goals in building construction.

1.12 Conceptual Framework

The figure 1.1 below shows a diagrammatical representation of the relationships between the dependent and independent variables of the study.

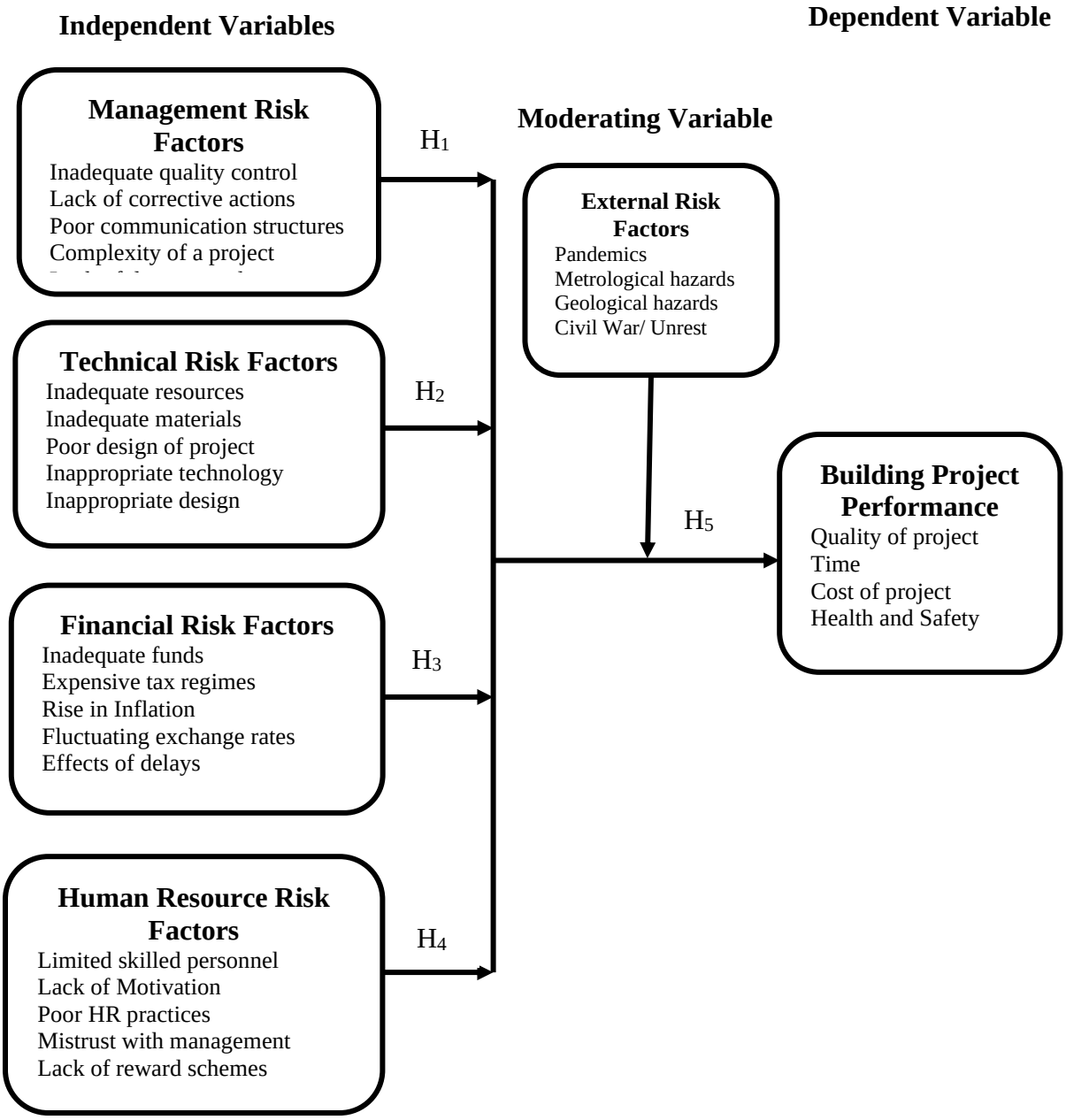

Figure 1.1: Conceptual Framework

The identified critical risk factors were hypothesized to interact and affect the performance of building projects as shown in figure 1.1 above. The management, technical, financial and human resource risk factors were expected to have individual effects on building projects performance. However, it was expected that external factors can have an impact

on the relationship between the other four risk factors (management, technical, financial and human resource risk factors) and building project performance. Therefore, each hypothesis ($H_1 – H_5$) would be tested to determine the effect of each critical risk factor on building project performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This section outlines the analysis of literature in the area of study to properly outline the arguments as per the objectives of the study. The dependent variable is analysed first followed by the independent variables. The section is concluded by outlining the identified gaps in literature.

2.2 Empirical Review of Literature

The following section presents a review of the literature related to the problem under study. The section is organized in accordance with the identified variables in order to ensure relevance to the overall research objectives.

2.2.1 Concept of Project Performance in Construction

According to Ingle and Mahesh (2020), performance measurement varies based on the different contexts in which the individual countries operate. Their study intended to develop the appropriate performance measurement areas for the Indian construction industry. In this case, the perspectives of construction personnel in the country were considered. Their findings showed that performance can be measured by a variety of variables based on the different dimension of the project. Ten important performance areas were identified with the main ones identified through factor analysis to be safety, schedule, cost, quality, environment and stakeholder satisfaction. Consequently, it is thus evident that the significant performance areas captured above form key indicators for construction professionals for better project success in the Indian construction industry.

Bhuinyan et al. (2019) state that measurement of performance determines project success with aspects of timely completion and the satisfaction of the clients being major

components. Further, due to the intricacies involved in the construction industry due to the involvement of various stakeholders, building projects suffer complexities and problems that affect their performance. The most critical performance measures identified in the study included quality and scope which were deemed to be the most essential. Safety, functionality and client satisfaction were also identified as important factors to determine project success. Apart from that, time, cost and quality form a tripartite measure widely accepted in literature as the Key Performance Indicators (KPI's) for construction industry performance.

Yap and Lee (2020) identify poor safety performance as a critical factor in project performance. The authors examined the level of awareness of safety standards and requirements in construction in Malaysia. The findings showed that the primary issues identified included the use of personal protective equipment (PPE), attitude, communication procedures and the work environment. It was thus essential to develop appropriate communication strategies, install safety backups such as fall systems and initiate regular inspections to prevent failure in safety that would impact the project. Further, increasing the awareness of safety issues can improve performance in this area thus reducing the number of incidents during the construction project.

Appropriate measurement of performance reflects the benefits incurred by projects through the evaluation of work to be done, available resources and other pertinent data point. Zamim (2021) states that performance indicators put in place the measurable evidence that is required to ensure that a planned project has accomplished the required results as projected in the objectives. Therefore, the proper assessment of these performance indicators with a high level of accuracy designates them as performance measures. Being

quantitative or numerical indicators, these measures can be quantified to give a scale of the level of efficiency of the project. The study examined performance measurement systems used in the Iraqi construction industry during the implementation of projects. The findings showed that the most significant measures included client satisfaction, profitability, viability, end-user satisfaction and quality aspects.

Sinesilassie, Tabish, and Jha (2018) further identified a striking common feature of cost overruns in the Ethiopian construction industry and globally. Their study aimed to determine the salient factors impacting the cost performance of public construction projects in Ethiopia. Developing countries are majorly affected with cost overruns that highly surpass anticipated costs. With a majority of publicly funded projects having increased costs estimated to run upwards of 80% of the original contractual sum, the government loses a lot of money based on incompetence and poor performance of the projects. The results analysed using stepwise regression showed that the factors with the most significant impact on cost performance included manager competence and projects scope clarity. Further, the increase of conflicts, ignorance by supervisors and lack of knowledge in the project negatively impact the cost performance of public construction projects in the country. This was corroborated by Molla et al. (2020) who identified factors such as the firm's liquidity, experience and expertise of staff and material/equipment quality in the project, to influence the performance of government projects in Ethiopia.

Locally in Kenya, building projects have been identified to perform poorly based on the increased and constant schedule delays, poor quality and cost overruns. Babu et al. (2019) established that project performance in Kenya over the period of their study (1963-2018) was considered poor. Their findings showed that 35-60% of projects in the country had

cost overruns with delays accounting for the largest effect on performance with approximately 35-73% of projects overrunning their schedule. This shows the great importance put on measuring the performance of building construction projects based on their ability to stay within budget, time limits and maintain acceptable quality standards locally.

Githere and Sang (2021) sought to analyse the effects of risk management practices on performance of road construction projects in Nairobi City County. Their findings showed that design danger, legal risk, construction risk, and contract management risk affected the performance of road construction projects in Nairobi County. This was similar to a study by Kirira et al. (2019) who sought to find the influence of risk management strategies on road construction project performance in the Coast region. In their findings, risk identification was found to have the greatest influence on performance of road construction projects followed by implementer perception of risk appraisal. Further, Mwangi and Ngugi (2018) also assessed the risk management practices and performance of construction projects in Nairobi City County Government. They state that the most prevalent risks facing projects funded by the County Government included costing of projects, land disputes and project designs.

Consequently, performance measurement has previously been a contentious debate with regard to the appropriate metrics to be used in the construction industry. It is however widely accepted to use to use the tripartite measures of time, cost and quality as seen in a majority of previous studies (Ingle & Mahesh, 2020; Bhuinyan et al., 2019). An important aspect of health and safety has been ignored but is considered essential in building projects

(Yap & Lee, 2020). Consequently, this study will build up on these studies by also including health and safety as part of the measures of project performance of buildings.

2.2.2 Critical Risk Factors in Construction

2.2.2.1 Management Risk Factors and Performance of Building Projects

Schedule delays are considered to be major concerns and affect projects globally. Ahmed, Hussain and Philbin (2021) state that the lack of appropriate senior management support can greatly affect project outcomes. From their empirical study, the moderating effect of senior management support was analysed to determine its impact on the relationship between project performance and schedule delays. The findings indicated that schedule delays are mostly caused by aspects such as the lack of commitment, lack of clarity in the project, improper planning, lack of two-way communication and poor coordination in the project site. These are determined to be functions of senior management in construction projects due to their leadership and role in providing direction. Further, senior management was identified to moderate the relationship between project performance and schedule delay. Consequently, the role of senior management in providing resources, communication, required expertise and structural arrangements form important features that directly affect project performance.

Management plays a crucial role in construction projects since they provide the required leadership to drive it to completion. The lack of proper leadership can thus significantly affect the project's success. Vinodh and Therese (2017) highlight the most pertinent issues affecting management of building projects to include lack of quality control, late corrective actions, poor communication structures, the complexity of a project, lack of documented processes and procedures, wrong project team selection, and incompetence of project lead

teams and members. The management of the construction firm must thus make sure that all aspects likely to affect the performance of the projects are appropriately catered for to ensure that they do not directly impact the running of the site. Ultimately, project success is directly linked to the ability of management to guide and provide leadership to other stakeholders in the projects they undertake.

One of the most critical factors that contribute to project success is top management support. In this case, top management requires to nominate a project champion who provides the requisite link between project stakeholders. The management can thus help the project manager to understand the specific objectives and goals of the project that must be achieved as specified by the developer and top management (Hasan et al., 2018). Further, the access to the resources for the project lies with the top management, with functional managers supervising it. Therefore, support from top management resonates with increased support for the functional manager in charge of a specific aspect of the construction project. Consequently, the organizational structure is considered an important aspect in project performance. In cases of mixed organizational form with limited access to top management, the distribution of resources can become cumbersome and problematic due to bureaucracies. As a result, this would require extra negotiation and positional power among other managers to ensure that financial resources and other supportive functions can be accessed during each stage of the project.

Support by management in a construction project entails two main aspects which include provision of leadership and provision of resources. Successful project implementation requires these two functions to be implemented concurrently in an efficient manner. Management thus has to constantly monitor implementation and the capabilities towards

providing consistent progress and adequate direction to meet milestones (Keers & Fenema, 2018). Therefore, being rigid at any point of the project can lead to stalling since construction projects are highly dynamic and require constant changes to keep up. In this case, there should be open minded individuals in the top management that support a learning process throughout the organization to keep up with changing needs. More so, management should also aid in the development of risk management strategies and procedures during the project life cycle. Putting enough resources into a risk management department can significantly reduce the challenges brought about during project implementation.

Apart from that, conflict resolution requires input by top management to reduce instances of them affecting the daily operations of the construction project. Their input can be felt through directed mediation between the conflicting parties, providing overall cooperation among the different stakeholders and ensuring all parties are involved in the decision-making processes (Willumsena et al., 2019). Ultimately, effective decision making can aid in the management of risks and inculcating the continued need for risk management in projects since it is a critical aspect of determining project success.

The role of management has been previously determined to have an influence on construction project performance (Keers & Fenema, 2018; Hasan et al., 2018). More so, previous studies have been done with a focus on identifying the role of management in enhancing the overall project performance with regard to the time aspect (Ahmed et al., 2021). This study will build up on this by outlining the significance of management risks as conceptualized for project managers in the construction industry as a whole to building projects which are considered technically complex in nature.

2.2.2.2 Technical Risk Factors and Performance of Building Projects.

In this research, technical factors are conceptualized as the issues that directly affect the construction process with regard to the project consultants, technology, design, and supply chain. Jayasudha and Vidivelli (2016) discuss the most common risks, including the uncertainty of resources required, the unavailability of adequate materials and supplies, lack of consultant supervision and input, incomplete design of project, failure of technology, design errors, omission in the design and changes in project scope or requirements.

Dua (2021) states that project scope and project requirements constitute the most important aspects of a construction project. While the scope defines all the work and activities required to be completed to meet the objectives and goals of the project, requirements consist of the capabilities and requirements to be satisfied in accordance with all the stakeholders needs. The identified risks in this case include reduction in scope, slips in forecasted numbers, non-involvement of required specialists and introduction of additional elements in the project. Ultimately, such challenges have immense effects in the overall performance of the projects due to their time, quality and cost implications.

Change is considered a necessary aspect in any construction project due to their dynamic nature. Design changes are considered as any forms of change that necessitate a deviation in the planning, scheduling or budgeting of the project. While design changes are inevitable, inadequate planning can affect overall operational performance. Design changes such as modifications of the original design or the scope of work can lead to possibilities of claims and disputes that can lead to delays and cost overruns. Therefore, design changes are considered high risks in the construction projects due to the

uncertainties that they pose. These changes that occur across different stages have substantial effects on the project. This is due to factors leading up to and after the intended changes have been implemented. These include the lack of timely communication to the involved stakeholders, uncertainty, increased complexity of the project and the change of environment (Jamil & Adeleke, 2020). Their direct impact in the performance aspects including time, direct and indirect costs and the project contract make them a significantly high risk for the project. Therefore, the slow identification and resolution of the design changes can lead to greater impacts on the project in the long run. It is thus critical to introduce design change management in the construction project to ensure any forms of conflict brought about by such changes do not have overarching effects on the achievement of the project goals.

Technical risks are some of the most dangerous risks since they may require longer time or costs to manage and overcome in building projects. These include aspects such as specifications, technology, design and engineering that are all required to complete structurally sound buildings. Siraj and Fayek (2019) found that the most cited causes of technical problems were design errors and inadequacies in engineering accounting for 46.92%. Further, inadequate detailing of the building design (16.92%) and unplanned design changes/specifications (36.92%) formed the most prevalent issues affecting the technical aspects of construction. This outlines the need for appropriate strategies to mitigate the effects of possible technical risks that could affect project completion.

Clients or developers of projects are considered the leading causes of changes in projects due to the huge dependence of the projects on them with regard to resources. Changes in the economic climate have a direct effect on the project implementation since they are the

financiers. Additionally, the project must meet the initial client demands with regard to functionality aesthetics and cost efficiency. This means that the client has the ability to halt progress if they feel that it is not heading in the expected direction. Apart from that, delays in the approval of design also have a direct impact on the progress of the construction project since it has to pass all the required checks by the project consultants to ensure it meets requisite standards (Yap et al., 2018). Therefore, the availability of an adequate price for variations in the contract can help mitigate some of the challenges brought about by changes in the cost dimension. This is an important aspect of the project management process where cost estimates and changes in the project are updated as the design continues to evolve throughout the project cycle. Ultimately, aspects such as non-conformance to appropriate standards, defects in specific areas, failure in quality of materials and deviations from the initial designs all result in changes during the project.

The implementation of technologies such as BIM in construction projects are projected to reduce the effects of design errors and properly manage the different phases of the project (Ahmad, Thaheem & Maqsoom, 2018). Therefore, despite their acceptability as a standard practice, adequate monitoring has to be implemented in the project to ensure that they do not escalate to unsalvageable levels since its effect on the performance of the project is undesirable. Therefore, it is essential for any types of changes in the project must consider aspects of cost and time which are affected easily to ensure that they can be managed and reduce any interruptions in the achievement of the project goals.

Consequently, the role of technical aspects as espoused in previous studies cannot be underplayed. However, a majority of the focus of these studies has been on the time and cost aspects (Siraj & Fayek, 2019; Yap et al., 2018; Ahmad et al., 2018) neglecting the

health and safety aspect. This study will therefore aim to build up on this gap by analysing the role of individual technical aspects on overall performance of building projects, including health and safety, which should be an essential goal of the project team.

2.2.2.3 Financial Risk Factors and Performance of Building Projects.

Finance directly affects performance of projects due to the need to have adequate resources to maintain the continuity of a project. Therefore, the lack of appropriate and adequate funding sources poses a great risk to project success. Lin and Chen (2021) highlight the main issues posing significant risks including the unavailability of funds, changes in tax regimes and structure, inflation, fluctuations in exchange rates and the rundown effects of delays and cost overruns.

According to Abassi et al. (2020) the main sources of conflicts in Iran's construction industry are schedule delays. This is mainly due to the lack of an appropriate baseline and methodology aimed at identifying the root causes of the delays. As a result, there are limited perspectives on the factors causing construction project delays thus leading to the compounding of the problem in the industry. The study aimed to identify the factors leading to construction delays and rank them based on their root causes. The findings led to the grouping of identified causative factors into eight distinct groups including contractor, owner, procurement and labour. The results showed that the contractor category was leading as a major cause of construction delays mainly due to financial problems. This means that financial matters are an essential aspect of project performance in Iran and lead to delays if not handled effectively. Consequently, it is recommended that clients must ensure the financial viability of the contractors they chose to undertake their projects. More so, there is a need to define and phase their construction projects based on their financial

resources thus determining an efficient financial plan for payments during the course of the project.

Durdyev and Hosseini (2020) further identified financial problems and delay in payments as the most commonly cited factors affecting project performance in construction. Their review showed that financial problems are mainly caused by aspects such as lack of sufficient resources, poor cash flow management, and instability of the financial markets. More so, delays in payments are mainly caused by failures by involved stakeholders to emit the required funds as agreed upon in the contract. Apart from that, it was further identified that large scale infrastructure projects in developing countries are constantly affected by these financial problems due to the insufficiency of funds. Additionally, projects that depend on funding from external sources can be severely affected by late remittance of payments for completed milestones. This significantly affects project performance caused by the resultant schedule delays.

According to El-Kholy and Akal (2021), financial viability in both firms and projects they undertake is critical for project continuity. Public Private Partnerships (PPP) require financial muscle since the developer is required to provide funding for the project initially. The authors investigate the waste water treatment plants in Egypt to determine their financial viability risk factors and to further assess their severity on project outcomes. The findings indicated that aspects of inflation and foreign exchange fluctuations are key factors affecting financial viability in projects. Further, projects with cost overruns and late handover of sites result in financial distress. Consequently, the context plays an important role with economic and political circumstances having an effect of increasing the financial risks experienced in the projects.

Further, Perera, Samarakkody, and Nandasena (2020) analysed the economic and financial risks that affect building projects in Sri Lanka. Finance affects project delivery due to its linkages to all other project milestones. Therefore, the ability to manage the risks associated with finance can effectively minimize the aftereffects such as schedule delays and cost overruns. The study involved the analysis of literature and collection of primary data to determine the salient risk factors associated with financial/economic aspects during the construction of high-rise buildings. From the findings, it is evident that errors during estimation are a leading factor in the development of financial problems likely to affect project completion. More so, the poor management of contract further results in unnecessary variations of costs that can hinder timely and cost-efficient project delivery. Therefore, contractors face these challenges when working in long-term building projects which increase the risk of stalling in the long run.

Studies in the area of financial risks in construction projects identify schedule delays as the most recurring aspect of project performance (Abassi et al., 2020; Durdyev & Hosseini, 2020). As a result, understanding the attendant effect of extended financial risks on the aspect of quality in building projects becomes important for any company bearing the financial burden. This study will therefore assess the significance of financial risks on both quality and cost aspects, in addition to time to provide a better picture of its impact on the overall performance of building projects.

2.2.2.4 Human Resource Risk Factors and Performance of Building Projects.

Human resource management (HRM) is an important aspect of any organization since it involves the management of the manpower required for operations. The processes and structures under HRM determine the relationship between individuals and the overall

organizational context. Therefore, while individuals provide the requisite knowledge, experience and labour force, the organization is expected to fairly compensate the individuals. This can be done through payments, training or personal development that all add value to the individual's life (Ifediora and Keke, 2019). The management of this exchange can ensure maximum effectiveness and efficiency especially in projects such as construction that are time based and limited by a number of internal and external factors.

Gholizadeh and Moradinia (2020) recognize that human resource risks have a significant impact on the performance of an organization. Consequently, identifying and managing risks becomes essential in ensuring they can be appropriately managed. Their research identified risks in human resource (HR) management of construction projects based on their likelihood, the severity of the impact, and the rate of occurrence. These included risks caused by the shortage of skilled personnel, lack of motivation, stress on the job, discriminatory HR practices, lack of trust with management, and lack of reward schemes.

Apart from that, Muntu et al. (2021) identify the growth of personnel involved in construction projects as an essential aspect in improving performance. It is further notable that the ability of the project construction team to achieve the project objectives is ultimately as the combined efforts of human resource management. As a result, the authors highlight that human resource management can be measured by analysing the competence of the workforce, identifying the role of project managers, recognition of superb work, rewarding of excellence and the ability of personnel to learn lessons during the project.

Productivity of the workforce and equipment are essential for the maintenance of project operations at the required standard productivity. The lack of adequate human resources can therefore significantly affect project time and costs due to the lack of adequate productivity

on a daily basis. According to Venkatesh and Natarajan (2018), human resources remain a critical aspect of any project and a key variable for project success. The project leads must therefore adopt the proper strategies in the supervision, recruitment, firing and maintenance of human resource to ensure that they are always adequate for the amount of work available during the project cycle. Any form of shortages during the project implementation directly lead to project delays since milestones cannot be achieved as expected. Consequently, the lack of proper mechanisms to handle the various challenges associated with human resource management can negatively affect project performance.

According to Amoah and Bikitsha (2021), the proper handling of business risks is essential in preventing liquidation projects in construction firms. The skills and strategies employed by contractors to ensure business continuity were studied to identify the risk factors. It was shown that new and emerging contractors constantly faced a variety of factors that immensely affected the execution of their projects. The most important aspects that mitigate these risks as espoused by the respondents include the development of human resources, quality management and communication management. This means that firms must invest in training and employing skilled labour for their projects while setting and communicating the right goals. Additionally, ensuring that supervision is undertaken using the right methods prevents the occurrence of mistakes likely to affect project timelines.

This is further supported by Alaghbari, Al-Sakkaf & Sultan (2019) who relayed the importance of efficient labour in the construction industry. Since projects rely on the labour-intensive practices, reduced productivity can lead to time and cost overruns which affect profitability and performance. The study conducted in Yemen collected views from architects and engineers from different projects regarding human resource factors. The

findings indicated that aspects of the skills and experiences of the workforce ranked first followed by aspects of leadership and efficiency across the site. These are essential in enhancing the productivity of labour to ensure that milestones are constantly achieved thus increasing performance of the projects. The importance of human resources cannot be underplayed and are the most critical aspects that determine success of projects.

Studies on the issue of risk factors in human resource provide a basis for this study since it is evident that labour plays an important role in any construction project. It is notable that HR risks have a direct impact on both cost and time aspects of performance (Ifediora & Keke, 2019; Muntu et al., 2021; Alaghbari, Al-Sakkaf & Sultan, 2019). Consequently, it is important for firms to identify the risks involved with their human resource practices to ensure that project success is not hindered. Furthermore, planning for any potential disruptions in the labour requirements can not only save costs but ultimately improve the efficiency of the construction project.

2.2.2.5 External Risk Factors and Performance of Building Projects.

In this study, external risks are conceptualized as any unplanned or unexpected events that directly affect the success of construction projects. These may be due to extreme weather conditions, pandemics or results of political turmoil in an area that led to civil disruptions. The risks include those arising from weather events such as floods, earthquakes or landslides while widespread disease may lead to epidemics or pandemics. Apart from that, political instability may lead to civil unrest or war in a country (Mohammed, 2016). These risks directly affect the construction environment hence ultimately leading to the decline in performance of such projects.

The onset of the Coronavirus Disease 2019 (COVID-19) affected various aspects of the global economies. The construction industry was not spared and had to adjust accordingly to persevere. According to Rehman, Shafiq, and Afzal (2021), the construction industry in the UAE was affected by significant delays and cost overruns with the government implementing a raft of measures to counter its effects. The findings of the research showed that several challenges affected the industry including schedule delays, cash flow disruptions, delays in receiving permits, travel restrictions for human resources, material and equipment shortages, and serious health and safety concerns. As a result, the pandemic caused a significant impact on the timely delivery of planned and ongoing construction projects.

Chaudhary and Piracha (2021) highlight the role of natural hazards in the world today. Further, they provide a classification of the natural hazards in accordance to the specific effects on earth. Geophysical hazards include those that result in movement of the earth such as earthquakes and volcanic eruptions while hydrological hazards involve the movement of water such as floods and landslides. On the other hand, biological hazards include exposure to organisms such as viruses or other toxic substances while meteorological hazards involve extreme weather including extreme temperatures or storms. Lastly, extra-terrestrial hazards include any objects from space such as asteroids or meteorites that may affect the earth. Any one or combination of these hazards can have significant effects on the world including loss of lives or property. The built environment is rather vulnerable to such hazards due to its link to the earth hence the need for disaster preparedness by initiating risk management strategies.

Pamidimukkala, Kermanshachi, and Karthick (2022) highlight the effects of natural disasters on construction projects sites based on severity. For instance, wind forces with higher magnitude are likely to throw heavy objects such as construction materials and equipment thus causing losses and damages. More so, projects that use wooden frames that are lightweight in nature can also be immensely affected by such huge forces. Additionally, storms such as Hurricane Sandy experienced in some parts of America showed the impact of waves in buildings located near the shores that lead to failure. Aspects of fire safety and earthquake resistant elements are also not present during the construction phase hence increasing the risks to human life in case of emergencies. Further, such buildings are also prone to destruction due to weakened structural elements. Therefore, the impact of natural disasters and weather elements pose a significant risk to construction sites that can result in scheduling problems and increased costs for the project affecting their success.

Therefore, while risk management involves the planning for unexpected events, external factors form a special case since they rarely occur on a regular basis but have devastating consequences for building projects. The COVID-19 pandemic has provided a great lesson for planning for such uncertainties due to their prolonged effect on the construction industry and the economy at large. Consequently, taking measures to plan for such factors can provide a leeway for firms to survive through such periods without interruptions likely to affect the ongoing projects in the long term. As a moderating variable, the study aims to establish whether they alter the perceived relationship between the select critical risk factors identified in this study and the performance of the building projects.

2.3 Summary and Research Gap

In this study, management risk factors, technical risk factors, financial risk factors and human resource risk factors (independent variables) are expected to influence building project performance (dependent variable). It is therefore expected that appropriately managing these risks is crucial to maintaining successful performance of building projects.

Firstly, the moderating effect of external risk factors, with the COVID-19 pandemic being a key aspect, has not been studied in depth in relation to the Kenyan context. It is notable that the extended reach of the pandemic affected construction projects globally leading to reduced performance (Rehman et al. 2021). Consequently, by analyzing how such factors influence performance, developers, contractors and other stakeholders can initiate the necessary strategies to ensure that the projects they undertake can meet professional standards and prevent unwarranted delays or cost overruns that affect overall performance.

Additionally, it is notable that there is limited information on the influence of risk factors on the building sector, which forms a significant portion of the construction industry. It is further noted that a number of studies have only focussed on the impact of risk management strategies and practices on performance of construction projects (Kirira et al., 2019; ALSaadi & Norhayatizakuan, 2021). More so, studies on risk management and project performance have majorly been done in other countries in Africa and overseas (Masril and Rahman, 2020). As a result, there is a contextual gap with regard to the applicability of the current findings in literature regarding the role of risk management on construction project performance in Kenya.

Furthemore, local studies have focussed on the road sector (Githere & Sang, 2021; Kirira et al., 2019) and government funded infrastructure projects (Mwangi & Ngugi, 2018) that

limit the generalizability of the findings to other infrastructure projects, based on the importance of building projects and their contribution to the country's economy. Consequently, this study aims at filling these gaps by analyzing the inherent effect of management, technical, financial, and human resource risk factors on the performance of building projects. These risk factors have been compiled and grouped appropriately based on an extensive literature review that aimed at having a comprehensive classification of the individual risks in building projects.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the aspects of the methodology chosen to conduct the research. These entailed the design, population and sample of the study, collection of data, methods of analysis and the ethical and legal considerations for this study.

3.2 Research Design

This research employed a cross-sectional research design, which involved collection and analysis of data drawn from a population at one specific point in time. According to Zangirolami-Raimundo, Echeimberg & Leone (2018), cross-sectional studies are important when observing variables or types of data from a single point. This allows the identification of salient features of the observations while further allowing the collection of data in a short time. This means that there is no need for follow ups of the respondent to get additional data hence lowering the overall data collection costs and reducing the time required. Therefore, the cross-sectional design offers useful attributes for studying the prevalence of the variables under this study based on its characteristics in the defined population. This research was thus used to describe and establish relationships of critical risk factors characteristics in the population with regards to project performance in the construction industry.

3.3 Research Site

The research site in this study was the individual project construction sites in Nairobi City County as identified in the 2021 project register as obtained from the National Construction Authority database. The project site was considered the unit of analysis since performance

of projects was determined at the project site and the critical risk factors were likely to affect the project site.

3.4 Target Population

The target respondents were construction firms engaging in building projects within Nairobi City County. The sampling frame was drawn from the list of ongoing building projects in the National Construction Authority (NCA) database, registered during the year 2021. A representative sample was drawn from the population to ensure the generalizability of the results obtained in the research. The total number of projects, as captured in the NCA database for building projects, was 689 projects.

3.5 Study Sample

A study sample is a group of individuals taken from a population with the goal of assessing the population's attributes. The researcher's expectations of the response trend are an important consideration when selecting a sample size; the higher the trend, the smaller the recommended sample size, and vice versa (Williamson & Johansen, 2017). To determine the appropriate sample size, the goal of the study and population size, the level of precision, the level of confidence or risk, and the degree of variance in the qualities being measured must all be defined. In this case, the sample size was calculated scientifically using the Yamane formula to provide an appropriate sample that could be generalized for the entire population under study. Ultimately, a correctly chosen sample displays the exact characteristics of the entire population thus reducing the need for extensive data collection procedures.

3.5.1 Study Sample Size

The study sample size was drawn from the population of all building projects registered by the National Construction Authority in Nairobi City County in the year 2021 (January 1st – December 31st) which included 689 projects. This sampling frame was considered because it was assumed that these projects were ongoing and the respondents would be available on the projects sites to respond to the questionnaire. More so, Nairobi County was chosen since it is the capital city of the country and the researcher would be available to access a suitable number of respondents. More so, construction projects are concentrated in the capital city as compared to other counties across the country.

3.5.2 Sampling Procedure

A simple random sampling technique was used to select the respondents from the NCA database of registered projects in the year 2021. Random sampling was used because the researcher assumed that for every group of respondents, they were knowledgeable about the topic under study and therefore had an equal chance of being selected. In this case, the unit of observation was the contractor (company), which was selected to perform the works on site. Consequently, a representative of the firm (project manager, clerk of works etc.) was chosen to participate as the respondent in the study. Thereafter, a proportionate allocation of sample size was used to allocate the sample size across the eight NCA categories (NCA 1 – NCA 8).

The Yamane formula (Adam, 2020) was used to calculate the total sample size required in this study at 95% confidence level. The formula was presented as follows:

$$n = \frac{N}{1 + N * (e)2}$$

The proportional sampling equation for allocation of sample size was as follows:

$$n_h = (N_h/N) * n$$

Where:

N – the total number of registered projects in Nairobi City County (689)

n – the total number of registered projected selected to participate as respondents

e – the acceptable sampling error (0.05).

$\mathbf{n_h}$ - the sample size of registered NCA projects selected to participate as respondents, distributed across the 8 NCA categories;

$\mathbf{N_h}$ - the total number of registered NCA projects in Nairobi City County

In this case, the sample size was:

$n = N/ [1 + N (e)^2]$

$n = 689/[1+689(0.05)^2]$

$n = 689/[1+ 689(0.0025)]$

$n = 689/[1+ 1.7225]$

$n = 689/2.7225$

$n = 253.076$

$n \approx 253$

Therefore, the sample size (n) was 253 projects.

Further, the projects were proportionally distributed across the 8 NCA categories (NCA1 - NCA8) as follows:

Table 3.1: Proportion of sample as per NCA Categories

CATEGORY	POPULATION	PROPORTION (%)	SAMPLE
NCA 1	138	20.0	51
NCA 2	75	10.9	28
NCA 3	60	8.7	22
NCA 4	148	21.5	54
NCA 5	98	14.2	36
NCA 6	80	11.6	29
NCA 7	59	8.6	22
NCA 8	31	4.5	11
TOTAL	689	100.00	253

3.6 Data Collection

The study implemented both secondary and primary data to ensure that the objectives of the study were achieved. Secondary data from the desk study entailed the analysis of information from the literature in addition to all other relevant data in the study touching on risk management. This data was sourced from journals, books and available internet sources to gain in-depth knowledge of critical risk factors and their roles in building project performance in the construction industry. On the other hand, primary data was collected through a questionnaire distributed to the respondents.

3.6.1 Data Collection Instruments

Primary data was collected through a semi-structured questionnaire survey that was administered to respondents physically and through email. The questionnaire consisted of both open and closed-ended questions that aimed at understanding the perceptions, attitudes and views of respondents on the critical risk factors influencing building projects. Questionnaire surveys were chosen due to their relative ease of distribution to potential

respondents. More they were also cost effective and could be distributed to a fairly large sample size in a given population.

3.6.2 Pilot Testing of Research Instruments

A pilot study is a preliminary stage that tries to determine if crucial components of the main study will be viable. It attempts to improve upon numerous aspects of the study design such as research instruments, sampling techniques and other research strategies in preparation for the ultimate study. In this research, a pilot study was done for a predetermined number of respondents in Kiambu County. According to Connelly (2008), extant literature suggests that a sample of 10% is sufficient to conduct a pilot study. Therefore, for this research 10% (25 projects) will be selected as the sample. The purpose of the pilot project was to examine the reliability and validity of the research instruments.

The pilot study was pivotal in understanding respondent perception and understanding of the questionnaire. As a result, it was noticed that a number of the questions asked were not clear and required clarification during data collection. This prompted the researcher to redesign the questions in order for respondents to easily answer them.

3.6.3 Variables of the Study

The explanatory variables were used to measure the level of building project performance in the individual projects undertaken by the respondents. These group factors included management risk factors, technical risk factors, financial risk factors and human resource risk factors. Each factor had a number of surrogates as drawn from the reviewed literature and was explained in detail in chapter two.

3.6.4 Measurement of Variables

Respondents were requested to provide a rating of agreement of the dependent variable in a column measured on a five-point Likert scale regarding the level of building project performance, ranging from '1 = Strongly Disagree' to '5 = Strongly Agree'. The results from this column were used to determine the importance of each factor.

On the other hand, the measurement of the critical risk factors sought to ascertain the respondent's perception of the risk management strategies in their construction environment, based on their experiences in their projects. The scale of these columns ranged from '1 = Strongly Disagree' to '5 = Strongly Agree'.

Finally, the measurement of the moderating variable sought to assess its influence on the relationship between the critical risk factors and the building project performance. This was measured through a Likert scale with columns ranging from '1 = No Impact' to '5 = Very High'.

3.6.5 Instrument Reliability

A reliability analysis was undertaken to determine the internal consistency of the questionnaire. In this case, the analysis was carried out on all the variables (dependent, independent and moderating) each on a Likert scale of between 0 - 5. The Cronbach alpha was calculated to determine the level of reliability of each question included in the questionnaire under each variable. A Cronbach alpha (α) above 0.700 would indicate that each variable has reached acceptable reliability levels. The table below shows the summary of the analysis of the Cronbach alpha for each variable.

Table 3.2: Summary of Reliability analysis

No.	Variable	Cronbach's Alpha	No. of Items
1	Construction Project Performance	.890	4
2	Management Risk Factors	.920	5
3	Technical Risk Factors	.937	4
4	Financial Risk Factors	.928	5
5	Human Resource Risk Factors	.930	5
6	External Risk Factors	.927	5

Source: Researcher (2022)

The above results indicated that all the variables had an average Cronbach alpha of above .890, hence indicating that all the questions were fit to be retained in the questionnaire for data collection.

3.6.6 Instrument Validity

Validity in research refers to the ability of the data collection instrument to measure the intended purpose (Mugenda & Mugenda, 2003). A validity test is an important indicator to ascertain consistency of data obtained from the questionnaires and whether we may rely on such data for this study. The study used face construct validity to ascertain the ability of the questionnaire to measure the intended aspects. To check this, the questionnaire was subjected to experts on the study topic for review. Based on their assessment, the data collection tool was adjusted appropriately before exposing it for purposes of the final data collection exercise.

3.6.7 Data Collection Procedure

The data collection procedure refers to the process of collecting the relevant data from respondents identified under the sampling frame. In this case, the data was collected through a questionnaire that was physically delivered or sent through email to potential respondents. The data collection was estimated to take approximately three weeks with follow ups through email and phone call undertaken after the elapse of the first week. A final follow up was conducted at the end of the second week to ensure the maximum possible response rate could be achieved for this study.

3.7 Data Analysis

Raw quantitative data collected from the questionnaires was cleaned, sorted, coded, and entered into a data analysis software (Statistical Package for Social Sciences – SPSS version 28) for further analysis. The coding process involved identifying and assigning values to the different variables used in the questionnaire for easier entry into SPSS. Descriptive statistics were analysed, after which the data was presented in form of tables and charts. Additionally, inferential statistics was also analysed to establish relationships among the research variables and presented in terms of tables and a regression model, as highlighted below. Hypothesis testing was also done using the *p*-value obtained from the statistical tests. Consequently, the null hypothesis would be rejected if its *p*-value was less than the pre-determined level of significance identified as 0.05. However, if in any case, the *p*-value would be less than 0.05, then the researcher would fail to reject the null hypothesis.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_i X_i + \varepsilon_1$$

Where: Y represents the dependent variable,

β_0, β_1, β_2… β_i represent the regression coefficients,

X_1, X_2,… X_i represent the independent variables, and;

$\boldsymbol{\varepsilon_1}$ represents the constant term

To test for moderation, the relationship could be explained by using the equation below:

$$\mathbf{Y = \beta_0 + \beta_1 (X_1 \ldots X_i) + \beta_2 (MOD) + \ldots + \beta_i (X_1 \ldots X_i) (MOD) + \varepsilon_2}$$

Where: Y represents the dependent variable,

β_0, β_1, β_2… β_i represent the regression coefficients,

X_1, X_2… X_i represent the independent variables, and;

MOD represents the moderating variable

$\boldsymbol{\varepsilon_2}$ represents the constant term

The coefficient β_i measures the moderating effect i.e., the interaction of explanatory variables and the moderating variable.

Lastly, with regard to qualitative data, a thematic analysis was undertaken to derive any similar or outlying aspects from the data. This would build upon the results of the quantitative analysis conducted by the researcher.

3.8 Legal and Ethical Considerations

The research was conducted in accordance to internationally accepted standards aimed at ensuring the integrity of the information collected. The researcher ensured that a permit was obtained from the National Commission for Science, Technology, and Innovation (NACOSTI). Additionally, the researcher also ensured that guidelines set by the Africa Nazarene University (ANU) were followed strictly during the data collection phase. Respondents chose to participate in the study voluntarily after all their rights and all pertinent information was shared with them. Further, respondents were informed of the

anonymity and confidentiality of the data collection process, with the data safely secured and stored after the process. All reasonable precautions were therefore taken to ensure the ethical collection of data for the purposes of this study.

CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

4.1 Introduction

This section presented the analysis of data collected in the field and the findings of the research. The results are presented through descriptive statistics and inferential statistics that are displayed in the form of charts and tables.

4.2 Response Rate

The response rate for this study was found to be 71.5%, where 181 questionnaires were filled and returned to the researcher out of the intended sample of 253 respondents.

4.3 Demographic Information and Background Data

4.3.1 Gender

Analysis of data showed that males (93.4%) were the majority followed by females (6.6%) from the respondents.

4.3.2 Highest Education Level Achieved

The data indicated that a majority of the respondents had a Bachelor's degree (50.3%) followed by those with a Diploma (18.8%) and those with a Master's Degree (17.7%). This was considered an appropriate indicator of the knowledge level of the respondents and their ability to comprehend the issues under study.

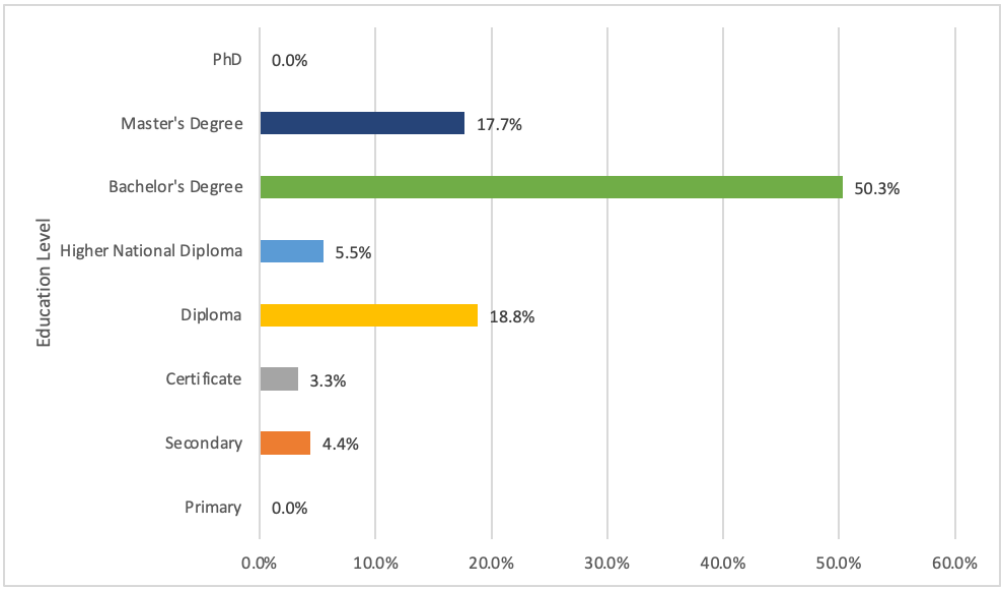

Figure 4.1: Highest level of education achieved

4.3.3 Age Bracket

A significant number of the respondents were between the age of 35-44 years (42.5%) followed by those between the ages of 25-34 years (25.4%). This also forms an appropriate basis for the study showing that a majority of the respondents are mature and at reasonable stages of the careers in construction.

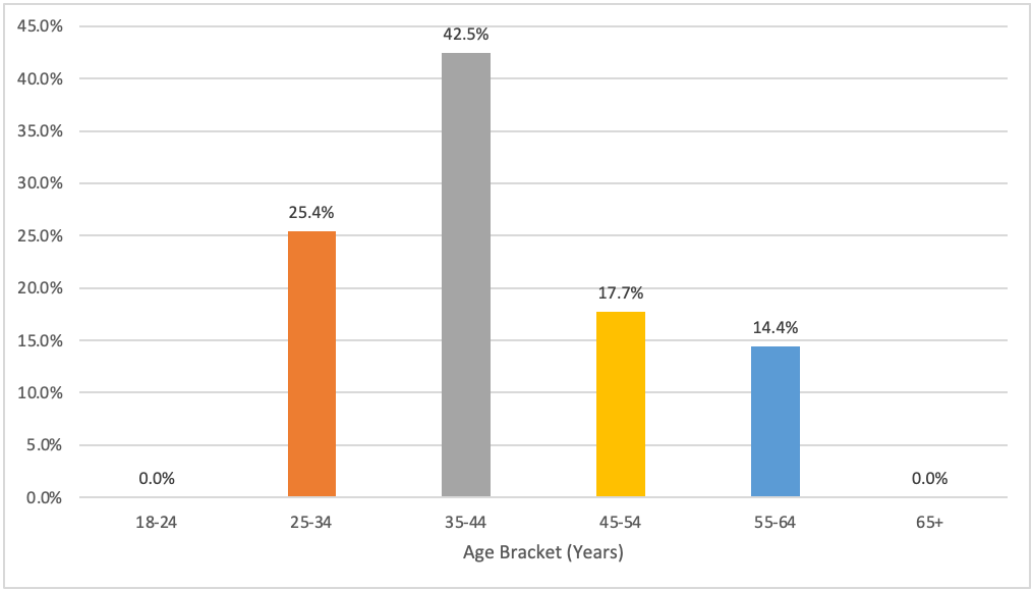

Figure 4.2: Age bracket

4.3.4 Designation in Project

A majority of the respondents were designated as project managers (79%) with other designations (11.0%) following which included managing director, architect, engineer and quantity surveyor. These respondents were considered essential due to their intimate knowledge of the happenings on the project site.

4.3.5 Length of Firm Operations

From the analysed data, 38.0% of the respondents were in firms that had been in operation for over 10 years, followed by those in operation between 4-7 years (29.6%). Generally, approximately 82% of the firms had operated for over 4 years showing that they had the necessary experience in the industry.

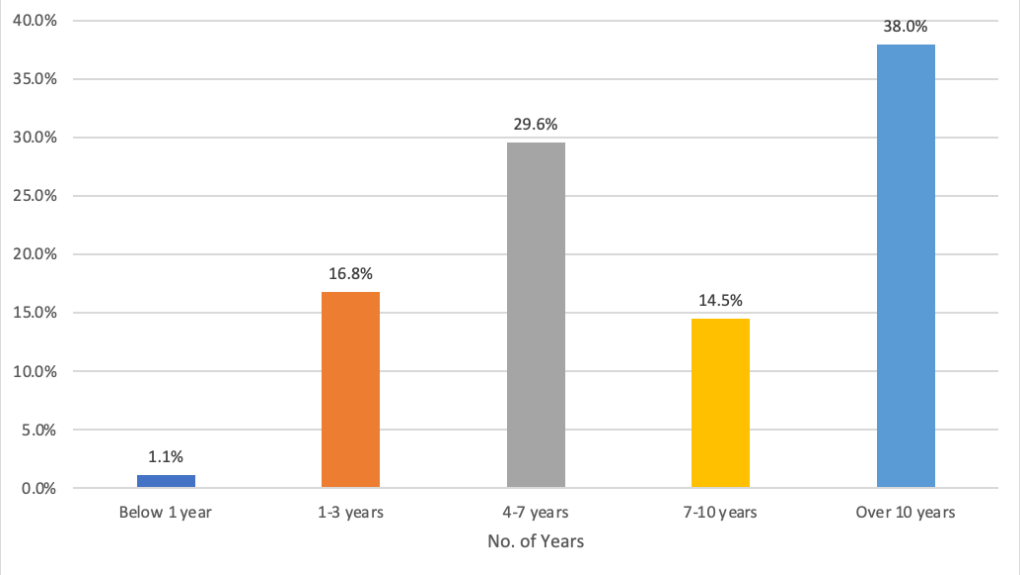

Figure 4.3: Length of Firm Operations

4.3.6 Duration worked in the Firm

A majority of the respondents have worked in their respective firms for between 4-7 years (33.7%). More so, at least 80% of the respondents have worked in their forms for over 4 years further showing the level of expertise gained and knowledge in the construction sector.

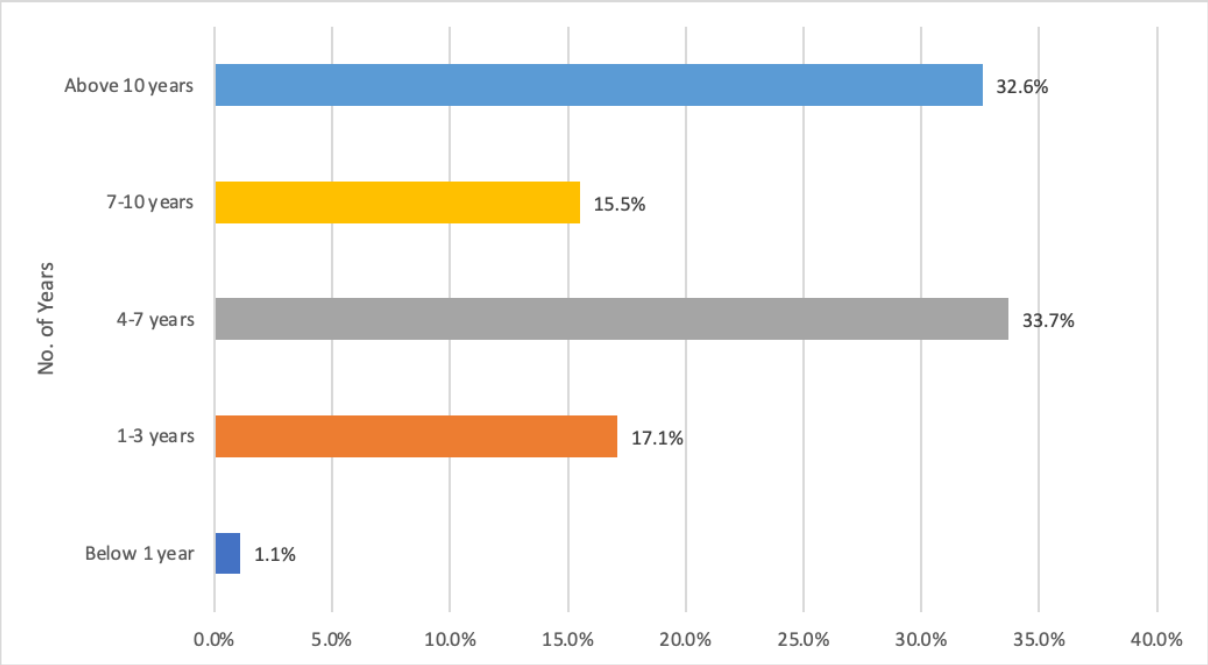

Figure 4.4: Duration Worked in the Firm

4.4 Descriptive Statistics

The descriptive statistics for each of the variables were calculated and presented in the form of charts. The independent variables were management risk factors, technical risk factors, financial risk factors and human resource risk factors. On the other hand, the dependent variable was the project performance while the moderating factor was external risk factors. The tables below presented the variables in terms of percentages, mean and the standard deviation of each surrogate in relation to the level of agreement shown by each respondent on the level of influence they hold. The scale is based on a 5-point Likert scale ranging from 1 – strongly disagree to 5 – strongly agree. As such, the descriptive statistics provide an average (percentage) of the respondent's selection of the scale on each statement provided.

4.4.1 Management Risk Factors

From summary shown in table 4.1 below, the complexity of a project can affect the effective implementation of the project was ranked highest with a mean score of 4.27. This surrogate further had a standard deviation of .736 meaning that the responses were clustered near the mean. Apart from that, the surrogates of properly documenting all the processes in the building project enhances overall efficiency (3.96) and quality control is critical in reducing the possibility of building failure (3.94) were ranked second and third respectively. These three indicators of management risk factors therefore were considered highly significant aspects by the respondents.

Table 4.1: Descriptive statistics of management risk factors

Statement/Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
1. Quality control is critical in reducing the possibility of building failure	4.2%	4.2%	22.5%	31.0%	38.0%	3.94	1.081
2. Corrective actions can significantly reduce the impact of mistakes in the building project	5.6%	16.7%	15.3%	33.3%	29.2%	3.64	1.225
3. Communication structures influence the ability of employees to raise concerns with management	4.2%	8.3%	15.3%	41.7%	30.6%	3.86	1.079
4. Complexity of a project can affect the effective implementation of the project	0.0%	1.4%	12.7%	43.7%	42.3%	4.27	.736
5. Properly Documenting all the processes in the building project enhances overall efficiency	1.4%	5.6%	16.9%	47.9%	28.2%	3.96	.901

4.4.2 Technical Risk Factors

The data analysis showed that the surrogate of availability of resources during the building project support project implementation success was ranked first with a mean of 4.04. It further had a standard deviation of .965 showing that the responses were close to the mean. Availability of requisite technology influences the performance of the project (3.86) and availability of resources during the building project support project implementation success (3.85) were ranked second and third respectively as shown by their means.

Table 4.2: Descriptive statistics of technical risk factors

	Statement/Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
1	Availability of resources during the building project support project implementation success	4.0%	2.7%	12.0%	48.0%	33.3%	4.04	.965
2	Availability of adequate materials reduces instances of time wastage	10.8%	17.6%	24.3%	35.1%	12.2%	3.20	1.193
3	Proper design of the building project enhances quick implementation of the building project	4.0%	13.3%	26.7%	40.0%	16.0%	3.51	1.045
4	Availability of requisite technology influences the performance of the project	1.4%	2.7%	24.3%	51.4%	20.3%	3.86	.816
5	Availability of resources during the building project support project implementation success	5.3%	2.7%	18.7%	48.0%	25.3%	3.85	1.009

4.4.3 Financial Risk Factors

The data analyzed indicates that the surrogate of availability of funds for the project is essential for efficient project completion was ranked first with a mean of 4.27 and a

standard deviation of 0.820. Further, the surrogate on the exchange rates can affect the valuation of the building project during implementation was ranked second with a mean of 4.04 and a standard deviation of 0.783. This indicates that the respondents perceived these to be significant aspects with regard to financial risk factors likely to affect their projects.

Table 4.3: Descriptive statistics of financial risk factors

	Statement/Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
1	Availability of funds for the project is essential for efficient project completion	1.2%	1.8%	31.2%	40.8%	25.0%	4.27	0.820
2	Appropriate tax regimes reduce the burden on building projects	1.2%	10.9%	16.4%	41.2%	30.3%	3.88	1.002
3	Inflation can significantly affect the pricing of materials and equipment used in the project	10.0%	1.2%	18.9%	38.5%	31.4%	3.84	0.680
4	Exchange rates can affect the valuation of the building project during implementation	0.0%	6.0%	10.8%	56.9%	26.3%	4.04	0.783
5	Delays can affect the cost estimates of the building project	0.0%	4.2%	27.2%	29.7%	38.9%	3.83	0.760

4.4.4 Human Resource Risk Factors

As shown in table 4.4 below the indicator on skilled personnel are essential for effective implementation of the building project was ranked first with a mean of 3.81 and a standard deviation of 1.159. Furthermore, motivation is required to enhance the morale of employees (mean of 3.78 and S.D. of 1.281) and human resource practices affect the working conditions of employees in the building project (mean of 3.71 and S.D. of 1.234)

were ranked second and third respectively. This shows that these aspects were considered significant with respect to human resource risk factors likely to affect the project.

Table 4.4: Descriptive statistics of human resource risk factors

	Statement/Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
1	Skilled personnel are essential for effective implementation of the building project	0.0%	0.0%	13.0%	67.5%	19.5%	3.81	1.159
2	Motivation is required to enhance the morale of employees	0.0%	2.8%	15.3%	55.6%	26.4%	3.78	1.281
3	Human Resource practices affect the working conditions of employees in the building project	2.6%	0.0%	14.3%	63.6%	19.5%	3.71	1.234
4	Employee trust with management is important to ensure smooth running in the building project	0.0%	0.0%	18.7%	60.0%	21.3%	3.65	1.341
5	Reward schemes can affect the efficiency of the building project	3.9%	2.6%	20.8%	57.1%	15.6%	3.43	1.381

4.4.5 External Risk Factors

As a moderating variable, external factors were considered to have an effect on the relationship between the dependent and the independent variable. Consequently, analysis of the responses showed that pandemics (COVID 19) was perceived to have the highest impact on the project with a mean of 4.17 and standard deviation of 0.878 as shown in table 4.5 below. This meant that responses were close to the mean showing the effect of this surrogate. Apart from that political unrest was ranked second with a mean of 3.98 and

standard deviation of 1.006 while metrological hazards were ranked third with a mean of 3.86 and standard deviation of 3.86.

Table 4.5: Descriptive statistics of external risk factors

Statement/Scale	No Impact	Very Low	Low	High	Very High	Mean	Standard Deviation
1. Pandemic (COVID-19)	2.40%	1.20%	13.20%	43.10%	40.10%	4.17	0.878
2. Geological hazards (earthquakes etc.)	4.70%	5.80%	22.20%	33.90%	33.30%	3.85	1.094
3. Metrological hazards (floods, storms etc.)	3.50%	4.70%	24.00%	38.00%	29.80%	3.86	1.014
4. Political unrest	3.60%	3.60%	19.50%	38.50%	34.90%	3.98	1.006
5. Civil war	8.30%	11.80%	10.70%	24.90%	44.40%	3.85	1.326

4.4.6 Construction Project Performance

The analysis shows that the maintenance of a high quality of outputs in the building project enhances overall performance (4.19) was ranked first with a standard deviation of .833. Ensuring cost efficiency can result in successful project implementation (4.06) and time management is an important aspect during the building project process (4.01) were ranked second and third respectively. With their standard deviations outlined in table 4.6 below, it is notable that the responses under each of the mentioned surrogates were close to the mean in each instance.

Table 4.6: Descriptive statistics of construction project performance

	Statement/Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
1	Time management is an important aspect during the building project process	1.4%	2.9%	17.4%	49.3%	29.0%	4.01	.849
2	Ensuring cost efficiency can result in successful project implementation	1.4%	1.4%	17.4%	49.3%	30.4%	4.06	.820
3	Maintenance of a high quality of outputs in the building project enhances overall performance	1.5%	1.5%	13.2%	44.1%	39.7%	4.19	.833
4	Effective health and safety measures can reduce probability of accidents that may affect project performance	0.0%	6.1%	30.3%	42.4%	21.2%	3.79	.851

4.5 Inferential Statistics

Determining the relationships between the dependent variable and the independent variables attempt to highlight possible explanations to the different scenario presented by the data. In this case, relationships were determined using inferential statistics including a correlation analysis of all the variables and a regression analysis.

4.5.1 Regression Analysis

Regression analysis refers to the statistical method of determining the impact of different variables on a phenomenon under study. In this case, the study tries to understand or predict the dependent variable (building project performance) while the independent variables (management, technical, financial, and human resource risk factors) are suspected to have an effect on the dependent variable.

Multiple linear regression was used to investigate the relationship between the multiple predictor variables. Additionally, it further allowed the modelling of the relationship between variables, which enables the making of predictions about what one variable will do based on the scores of some of the other variables.

i. Test for Normality

To test for normality, the Kolmogorov-Sminorv test is used in this case since the sample size is fairly large i.e., greater than 100. The table below shows the results of the test for normality under the Kolmogorov-Sminorv columns. From the results, p = .212 at the 0.05 level of significance, hence the null hypothesis that the data are normally distributed was not rejected. This implied that the data was considered to be normally distributed thus suitable for further investigation.

Table 4.7: Kolmogorov-Smirnov test for normality

	Kolmogorov-Smirnov[a]			**Shapiro-Wilk**		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Building_Project_Performance	0.086	181	0.212	0.976	181	0.134

a Lilliefors Significance Correction

More so, a histogram was plotted to provide a visualization of the distribution of the data over which a normal curve was superimposed. From the chart below, the data was considered to be approximately normally distributed, although some outliers were identified.

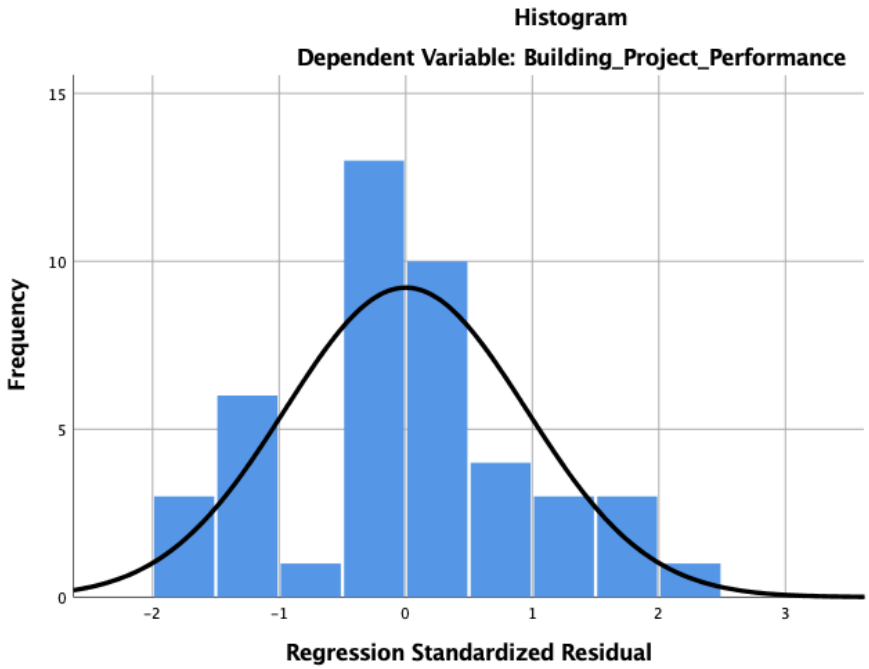

Figure 4.5: Histogram Plot for normality

ii. Test for Multicollinearity

The table 4.8 below shows the collinearity statistics of the variables with the Variance Inflation Factor (VIF) used to measure the amount of multicollinearity between the independent variables. VIF values between 1 - 5 indicate little to no correlation between the variables while values above 10 indicate significant multicollinearity that could affect the results. In this case, the VIF values ranged between 1.063 and 1.289 thus indicating that there was no multicollinearity between the independent variables.

Table 4.8: Collinearity Statistics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	0.251	0.526		0.477	0.636		
	Management_Risk_Factors	0.343	0.08	0.406	4.275	0	0.896	1.116
	Technical_Risk_Factors	0.368	0.08	0.468	4.585	0	0.776	1.289
	Financial_Risk_Factors	0.189	0.078	0.243	2.436	0.02	0.813	1.230
	Human_Resource_Risk_Factors	0.120	0.100	0.011	1.121	0.062	0.940	1.063

a Dependent Variable: Building_Project_Performance

iii. Test for Homoscedasticity

To test for homoscedasticity (the variance of the residuals is constant), the residual values were plotted as depict in a random distribution as shown in the scatter plot below in figure 4.9. The distribution of the values above and below the set line is approximately equal hence indicating constant variance among them thus satisfying the assumption of homoscedasticity.

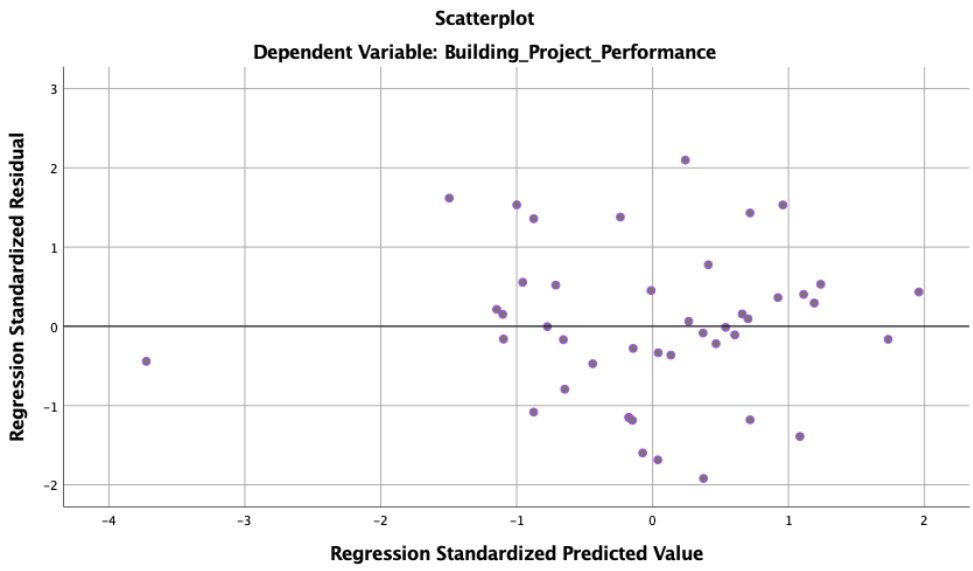

Figure 4.6: Scatter plot for homoscedasticity

From the model produced in this case, R = 0.827, which signifies a strong relationship between the variables. This suggests the model is a relatively good predictor of the outcome. Furthermore, with $R^2 = 0.684$ we can conclude that 68.4% of the variance in the dependent variable (building project performance) can be explained by the predictor variables (human resource risk factors, management risk factors, financial risk factors, and technical risk factors) as shown in table 4.9 below.

Table 4.9: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.827a	0.684	0.652	0.32776

a. Predictors: (Constant), Human_Resource_Risk_Factors, Management_Risk_Factors, Financial_Risk_Factors, Technical_Risk_Factors

Moreover, the results in the ANOVA table indicated that the model was a significant predictor of the level of building project performance as shown below:

F(4,177) = 21.148, p = .000

As the significance value (p = .000) is less than p = 0.05, we can conclude that the regression model significantly predicts the level of building project performance in this study.

Table 4.10: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.087	4	2.272	21.148	.000b
	Residual	4.19	177	0.107		
	Total	13.277	181			

a Dependent Variable: Building_Project_Performance

b Predictors: (Constant), Human_Resource_Risk_Factors, Management_Risk_Factors, Financial_Risk_Factors, Technical_Risk_Factors

With the regression summary and ANOVA tables completed above, the coefficients of the model can be determined to develop the regression equation for this study. These are shown in the table 4.11 below:

Table 4.11: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	0.251	0.526		0.477	0.636
	Management_Risk_Factors	0.343	0.08	0.406	4.275	0.000
	Technical_Risk_Factors	0.368	0.08	0.468	4.585	0.000
	Financial_Risk_Factors	0.189	0.078	0.243	2.436	0.020
	Human_Resource_Risk_Factors	0.120	0.100	0.011	1.121	0.062

a. Dependent Variable: Building_Project_Performance

From the above table 4.11, from the data, the Beta coefficients (β values) are linear parameters in the model. For example (β_1) indicates that as the management risk factor increases by one unit, the performance of building projects increases by 0.343 units.

From table 4.9 above, the results of the regression analysis are presented highlighting the effect of the independent variables. The data shows that management risk factors, technical risk factors, and financial risk factors are all significant at the 0.05 significance level. This is evident from the p-values obtained for each coefficient of the independent variables. However, it is notable that the variable of human resource risk factors was not statistically significant at the 0.05 level hence did not contribute much to the model, resulting in its exclusion.

The model used in this regression analysis is presented below:

$$\mathbf{Y = \varepsilon_1 + \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_i X_i}$$

Where: Y represents the dependent variable,

$\beta_0, \beta_1, \beta_2 \ldots \beta_i$ represent the regression coefficients,

X_1, X_2,… X_i represent the independent variables, and;

$\boldsymbol{\varepsilon_1}$ represents the constant term

Plugging in the beta coefficients as derived from the coefficients in table 4.9 above, the model for this study is:

BPP = 0.251 + 0.343MRF + 0.368TRF + 0.189FRF

Where: BPP represents the building project performance (Y)

MRF represents the management risk factors (β_1)

TRF represents the technical risk factors (β_2)

FRF represents the financial risk factors (β_3)

As per the study's research hypothesis, the p-value was calculated to be used as the test statistic. The p-value is important since it measures the ability of the evidence available to support the null hypothesis presented in the study. As a result, any instances of the p-value being less than the significance level selected will result in the rejection of the null hypothesis. Consequently, if the p-value < α, then the coefficient in this case is considered to be statistically significant against the null hypothesis, hence the null hypothesis is rejected while the alternate hypothesis in adopted. On the other hand, if the p-value > α then the coefficient is not statistically significant against the null hypothesis, thus the researcher fails to reject the null hypothesis.

In this case, the null hypothesis developed were:

H_1: Management risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

H_2: Technical risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

H_3: Financial risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

H_4: Human resource risk factors have no significant influence on performance of building projects in Nairobi County, Kenya.

In H_1, the p-value, p = 0.000, which is less than the adopted significance level of p = 0.05 thus, we reject the null hypothesis in this case and take up the alternative hypothesis.

In H_2 the p-value, p = 0.000, which is less than the adopted significance level of p = 0.05. thus, we reject the null hypothesis in this case and take up the alternative hypothesis.

In H_3, the p-value, p = 0.020, which is less than the adopted significance level of p = 0.05 thus, we reject the null hypothesis in this case and take up the alternative hypothesis.

In H_4, the p-value, p = 0.062, which is greater than the adopted significance level of p = 0.05 thus, we fail to reject the null hypothesis in this case.

From the above, three of the four hypotheses as conceptualized were rejected, with the researcher failing to reject one. Management risk factors, technical risk factors, and financial risk factors were statistically significant at the 0.05 level of significance. This indicates that they are key aspects to be considered in the risk management process during the construction process of buildings. However, while the researchers failed to reject the hypothesis on Human resource risk factors, it is evident that it is nonetheless important to risk management practices in building construction, but it did not portray enough evidence to be included in the model.

It is notable that due to the intricacies involved in the construction industry due to the involvement of various stakeholders, building projects suffer complexities and problems

that affect their performance (Bhuinyan et al., 2019). The above results show that management risk factors, technical risk factors and financial risk factors had a significant effect on the performance of building projects in Nairobi City County. This showed that these variables pose a risk of project failure if not taken into consideration. Consequently, they remain to be crucial and require adept risk management strategies applied by contractors in their building projects (Durdyev & Hosseini, 2020; Yap et al., 2018; Hasan et al., 2018). Ultimately, by enhancing these factors, the performance of building projects can be enhanced thus leading to better time management, the reduction of time wastage and the prudent use of resources in the course of the project.

4.5.2 Moderation Analysis

The analysis of moderation is used to determine whether a moderating variable has an effect on the relationship between a dependent variable and independent variables. This can be conducted through a regression analysis that includes the independent variables and the moderator variable in addition to the interaction effect caused by the moderator (multiplication of the moderator with the independent variables) (Jose, 2013).

In this case, the variables were standardized after each the interaction effect was calculated for each of the independent variables. This enabled easier interpretation of the coefficients and reduced the instances of multicollinearity that could otherwise affect the results. Consequently, the following model presented in table 4.12 below was produced.

Table 4.12: Moderation Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.832a	0.692	0.656	0.33612	0.692	19.081	4	34	0.000
2	.877b	0.769	0.697	0.31515	0.077	1.935	5	29	0.019

a Predictors: (Constant), Human_Resource_Risk_Factors, Management_Risk_Factors, Financial_Risk_Factors, Technical_Risk_Factors

b Predictors: (Constant), Human_Resource_Risk_Factors, Management_Risk_Factors, Financial_Risk_Factors, Technical_Risk_Factors, External_Risk_Factors, Interaction_ZMRF_ZERS, Interaction_ZHRRF_ZERS, Interaction_ZFRF_ZERS, Interaction_ZTRF_ZERS

The model summary shows the R and R^2 values of the model first without the moderating variable and secondly with the inclusion of the moderating variable with the resultant interaction effects. The R^2 change after inclusion of the moderating variable is .077 which equates to a 7.7% change in the R^2 value for the model. This is considered the percentage increase in variation that can be explained by the addition of the interaction effects. It is notable that the F change was statistically significant at $p = 0.05$ level of significance ($p = 0.019$)

Table 4.13: Moderation Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.269	0.591		0.455	0.652
	Management_Risk_Factors	0.329	0.084	0.395	3.933	0.000
	Technical_Risk_Factors	0.399	0.087	0.507	4.604	0.000
	Financial_Risk_Factors	0.165	0.083	0.212	1.979	0.029
	Human_Resource_Risk_Factors	0.137	0.104	0.127	1.167	0.068
2	(Constant)	0.629	0.612		1.028	0.312
	Management_Risk_Factors	0.429	0.092	0.516	4.649	0.000
	Technical_Risk_Factors	0.301	0.103	0.382	2.931	0.007
	Financial_Risk_Factors	0.197	0.084	0.254	2.353	0.026
	Human_Resource_Risk_Factors	0.065	0.118	0.062	0.547	0.069
	External_Risk_Factors	-0.156	0.082	-0.219	-1.904	0.047
	Interaction_ZMRF_ZERS	-0.112	0.08	-0.175	-1.406	0.000
	Interaction_ZTRF_ZERS	0.174	0.09	0.277	1.932	0.030
	Interaction_ZFRF_ZERS	-0.185	0.089	-0.275	-2.083	0.046
	Interaction_ZHRRF_ZERS	-0.044	0.079	-0.065	-0.559	0.070

a Dependent Variable: Building_Project_Performance

Apart from that, table 4.13 above shows the coefficients obtained from the two models, on without the moderating variable and the other with the interaction term. The moderating variable (external factors) as observed in the 2nd model, was statistically significant (p = 0.047) at the 0.05 significance level. Further, the interactions between the moderating variable and management risk factors (p = 0.000), technical risk factors (p = 0.030) and financial risk factors (p = 0.046) were statistically significant at the 0.05 significance level.

To test for moderation, the relationship could be explained by using the equation below:

$$\mathbf{Y = \beta_0 + \beta_1 (X_1 \ldots X_i) + \beta_2 (MOD) + \ldots + \beta_i (X_1 \ldots X_i) (MOD) + \varepsilon_2}$$

Where: Y represents the dependent variable,

β_0, β_1, $\beta_2 \ldots \beta_i$ represent the regression coefficients,

X_1, $X_2 \ldots X_i$ represent the independent variables, and;

MOD represents the moderating variable

$\boldsymbol{\varepsilon_2}$ represents the constant term

Therefore, plugging in the coefficients into the above model, the final regression model including the statistically significant interactions of the moderating variable will be:

$$\mathbf{BPP = 0.629 - 0.112(INT\_MRF\_ERS) + 0.174(INT\_\ TRF\_ERS) - 0.185\ (FRF\_ERS)}$$

Where: BPP represents the building project performance (Y)

MRF represents the management risk factors (β_1)

TRF represents the technical risk factors (β_2)

FRF represents the financial risk factors (β_3)

ERF represents the external risk factors (MOD)

Consequently, based on the hypothesis generated earlier in the research:

H_5: External risk factors do not moderate the relationship between critical risk factors and performance of building projects in Nairobi County

In this case, since the p-value, p = 0.047, was statistically significant at the 0.05 significance level, therefore we reject the null hypothesis above.

As noted in the literature, the construction industry, especially in the developing world, has been noted to systematically fail to apply the appropriate risk management strategies (Willumsena et al., 2019). However, the onset of the coronavirus pandemic in 2019 challenged both developed and developing countries that had never faced such a serious challenge before. This raises the important question of such unplanned risks that have long lasting and cross-cutting effects to industries such as construction. In this research, external risk factors were found to have a moderating effect on the relationship between the critical risk factors and building project performance. It is evident that the COVID-19 pandemic provided a great lesson for planning for such uncertainties due to their prolonged effect on the construction industry and the economy at large (Rehman, Shafiq & Afzal, 2021). Therefore, taking the right measures to mitigate against such factors can provide a leeway for firms to survive through such periods without interruptions likely to affect the ongoing projects in the long term.

4.6 Qualitative Analysis

The respondents were also asked open-ended questions that aimed at opening up the discussion and provide an avenue for additional details that could assist in understanding the phenomenon under the study. The findings from these questions were analysed through thematic analysis to derive any similar, underlying or outlying issues that could have been left out from the data.

With regard to alternative aspects that could be used to measure the performance of construction building projects the respondents suggested variables such as sustainability, customer satisfaction and innovation. With regard to sustainability, it was proposed that this could be measured by assessing the environmental impact of the project, such as its

carbon footprint, energy efficiency, and use of sustainable materials. On the other hand, measuring customer satisfaction could be done through feedback from the building owners or end users, as well as through surveys and other forms of feedback. Lastly, the aspect of innovation could be measured by assessing the level of new and innovative technologies, processes, or materials that were used in the project.

It was further noted that developing countries face several challenges when it comes to the development and implementation of risk management strategies for building projects. Some of the major challenges mentioned by the respondents included:

i. Lack of resources: Many developing countries have limited resources, making it difficult to implement effective risk management strategies for building projects. For example, there may be a lack of qualified personnel, funding, and access to technology.

ii. Weak institutional capacity: Institutions responsible for overseeing building projects in developing countries may lack the necessary capacity to develop and implement risk management strategies effectively. This can lead to inadequate enforcement of building codes and regulations.

iii. Limited awareness and understanding: Many stakeholders involved in building projects in developing countries may not have a clear understanding of the risks involved or how to manage them effectively. This can lead to a lack of planning and preparation for potential risks.

iv. Political instability: Political instability in some developing countries can make it challenging to implement effective risk management strategies for building

projects. For example, changes in government can lead to changes in policies and priorities, making it difficult to establish long-term risk management plans.

Consequently, addressing the challenges faced in the development and implementation of risk management strategies for building projects in developing countries requires a comprehensive and coordinated approach that involves multiple stakeholders, including government institutions, private sector actors, and civil society organizations. Some of the solutions suggested by the respondents to the above problems included:

i. Capacity building: Stakeholders in developing countries should invest in capacity building to improve the institutional and human resources required for effective risk management. This can include training programs for personnel responsible for overseeing building projects, as well as improving access to technology and funding.

ii. Improved enforcement of regulations: Developing countries should enforce building codes and regulations more rigorously to ensure that buildings are constructed to withstand potential risks. This can include conducting regular inspections and audits to identify potential risks and ensure compliance with regulations.

iii. Education and awareness-raising: Stakeholders involved in building projects in developing countries should be educated about the risks involved and how to manage them effectively. This can include providing training on risk management techniques, as well as raising public awareness about the importance of building safety.

iv. Political stability: Developing countries should strive to establish political stability to ensure continuity in policy and planning for risk management. This can involve improving governance structures and promoting stability through policies that promote economic development and social stability.

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter outlines the summary of the research findings and compares them with the information gathered in the literature review. Further recommendations are also provided for appropriate application of the findings to industry and guide further research in the area.

5.2 Discussions

The general objective of this study was to investigate the influence of critical risk factors on the performance of building projects in Nairobi County of Kenya. More so, the specific objectives of the study were to establish the role of management risk factors on the performance of building projects in Nairobi County, to determine the impact of technical risk factors on the performance of building projects in Nairobi County, to establish the effect of financial risk factors on the performance of building projects in Nairobi County, to establish the influence of human resource risk factors on the performance of building projects in Nairobi County, and to find out the moderating effect of external factors on the relationship between critical risk factors and performance of building projects in Nairobi County. A summary of the findings of the study relating to the individual research questions are presented below.

5.2.1 Management Risk Factors and Performance of Building Projects

The first objective of the study was to establish the role of management risk factors on the performance of building projects in Nairobi County. The findings showed that the most important aspects included the complexity of a project can affect the effective implementation of the project, properly documenting all the processes in the building project enhances overall efficiency and quality control is critical in reducing the possibility

of building failure. From the multiple regression analysis conducted, the findings showed that the beta coefficient of management risk factors was 0.343, with a p-value of p = 0.000 which was statistically significant at the 0.05 level. As a result, the null hypothesis was rejected thus implying that management risk factors had a significant effect on the performance of building projects in Nairobi City County.

The above findings are in line with the findings of Keers and Fenema (2018) that found the role of management to have an influence on construction project performance. Further, Hasan et al. (2018) highlighted that the management can thus help the project manager to understand the specific objectives and goals of the project that must be achieved as specified by the developer and top management. Consequently, it is evident that the role of senior management in providing resources, communication, required expertise and structural arrangements form important features that directly affect project performance. Management risk factors therefore pose a risk of project failure if not taken into consideration.

5.2.2 Technical Risk Factors and Performance of Building Projects

The second objective identified in this study was to determine the impact of technical risk factors on the performance of building projects in Nairobi County. The findings indicated that the most prevalent indicators related to technical risk factors included availability of resources during the building project support project implementation success, availability of requisite technology influences the performance of the project and availability of resources during the building project support project implementation success. The multiple regression analysis as conducted in chapter four showed that the beta coefficient of technical risk factors was 0.368, with a p-value of p = 0.000 which was statistically

significant at the 0.05 level. As a result, the null hypothesis was rejected thus implying that technical risk factors had a significant effect on the performance of building projects in Nairobi City County.

These findings correlate with those by Jamil and Adeleke (2020) that found the direct impact of technical aspects on the performance aspects including time, direct and indirect costs and the project contract make them a significantly high risk for the project. Additionally, Yap et al. (2018) further portrayed that delays in the approval of design also have a direct impact on the progress of the construction project. This has been directly shown in the findings that have identified proper and timely design of the building project as an important factor in enhancing the quick implementation of the building project.

5.2.3 Financial Risk Factors and Performance of Building Projects

The third objective of the study was to establish the effect of financial risk factors on the performance of building projects in Nairobi County. The most prevalent surrogates as identified from the findings were availability of funds for the project is essential for efficient project completion and exchange rates can affect the valuation of the building project during implementation. From the multiple regression analysis conducted, the beta coefficient of financial risk factors was 0.189, with a p-value of $p = 0.020$ which was statistically significant at the 0.05 level. As a result, the null hypothesis was rejected, implying that financial risk factors had a significant effect on the performance of building projects in Nairobi City County.

The findings of this study are in line with those of Durdyev and Hosseini (2020) who identified financial problems and delay in payments as the most commonly cited factors affecting project performance in construction. Furthermore, El-Kholy and Akal (2021),

also highlighted that financial viability in both firms and projects they undertake is critical for project continuity. It is notable that availability of funds was ranked high among respondents hence suggesting its importance for efficient project completion.

5.2.4 Human Resource Risk Factors and Performance of Building Projects

The study's fourth objective was to establish the influence of human resource risk factors on the performance of building projects in Nairobi County. The most prevalent surrogates as identified from the findings were skilled personnel are essential for effective implementation of the building project, motivation is required to enhance the morale of employees and employee trust with management is important to ensure smooth running in the building project. From the multiple regression analysis conducted, the beta coefficient of human resource risk factors was 0.120, with a p-value of $p = 0.062$ which was not statistically significant at the 0.05 level. As a result, the researcher failed to reject the null hypothesis, implying that financial risk factors had no significant effect on the performance of building projects in Nairobi City County.

The findings of this study contradicted those by Gholizadeh and Moradinia (2020) that recognized human resource risks having a significant impact on the performance. Additionally, the findings also contrast those by Alaghbari, Al-Sakkaf & Sultan (2019) who relayed the importance of efficient labour in the construction industry since projects rely on the labour-intensive practices thus reduced productivity can lead to time and cost overruns which affect profitability and performance. It is however noted that the high number of unskilled labour in construction projects in Kenya as outlined by Babu, Oswald and Masu (2019) could have had an impact on the management of risk factors in construction projects in the country. Therefore, while this research identified certain human

resource risks that could potentially affect building projects, they were not found to be significant enough under the circumstances.

5.2.5 External Risk Factors and Performance of Building Projects

The final objective of the study was to find out the moderating effect of external factors on the relationship between critical risk factors and performance of building projects in Nairobi County. From the analysis the most prevalent surrogate under this variable was pandemics (COVID 19) which was perceived to have the highest impact on the project performance as rated by the respondents. A moderation analysis was further conducted to determine the impact of this variable on both the dependent variable and the independent variables. The analysis showed that the R^2 change after inclusion of the moderating variable was .077 which equates to a 7.7% change in the R^2 value for the model. Further, the coefficient of the moderating variable as observed in the generated regression model, was statistically significant ($p = 0.047$) at the 0.05 significance level. Consequently, the researcher rejected the null hypothesis, which implied that external risk factors moderate the relationship between critical risk factors and performance of building projects in Nairobi County.

The above findings are in line with those of Rehman, Shafiq, and Afzal (2021), that highlighted the construction industry in the UAE was affected by significant delays and cost overruns. Further, the findings correlate with those by Pamidimukkala, Kermanshachi, and Karthick (2022) that showed the effects of natural disasters on construction projects sites based on their severity. Consequently, it is evident that the COVID-19 pandemic provided a great lesson for planning for such uncertainties due to their prolonged effect on the construction industry and the economy at large. Consequently, taking measures to plan

for such factors can provide a leeway for firms to survive through such periods without interruptions likely to affect the ongoing projects in the long term.

5.3 Summary of Findings

The methodology employed a cross sectional research design with the research instrument being a semi-structured questionnaire that was distributed to a selected sample of 253 respondents. From the data collection, a response rate of 71.5% was achieved. Additionally, a majority of the respondents were female (93.4%), majority of the respondents had a bachelor's degree (50.3%), most of the respondents were between the ages of 35-44 years (42.5%), and majority of the respondents were designated as project managers (79%). Lastly, a significant number of the respondents (approximately 80%) have worked in the firms for over four years.

This study also found that stakeholders in construction face significant challenges in developing and implementing risk management strategies for building projects, including limited resources, weak institutional capacity, limited awareness and understanding of risks, and political instability. To address these challenges, construction industry players should invest in capacity building, enforce building codes and regulations more rigorously, promote education and awareness-raising, and strive to establish political stability. A comprehensive and coordinated approach involving multiple stakeholders is necessary to effectively manage building project risks in developing countries.

The findings of this research show that management risk factors, technical risk factors and financial risk factors have a statistically significant effect on the performance of building projects in Nairobi City County. However, human resource risk factors variable was determined not to have a statistically significant effect on the performance of building

projects in Nairobi City County. Further, the external factors were found to have a moderating effect on the relationship between the performance of building projects and the identified independent variables in this study. This implied that risk factors, technical risk factors and financial risk factors are crucial factors that have an important role in the risk management strategies applied by contractors in their building projects. This means that by enhancing these factors, the performance of building projects can be enhanced thus leading to better time management, the reduction of time wastage and the prudent use of resources in the course of the project.

5.4 Conclusion

This study concludes that the aspects of management, technical capabilities and finances are considered high risk areas that have the potential to significantly affect the performance of building projects. Management of projects is important in providing direction and support to the projects and all involved parties to ensure smooth operations in its entire lifecycle. Further, the technical aspects of the project including design and implementation of the project can have significant repercussions if done incorrectly or delayed. Financial aspects are further considered crucial in supporting the project implementation process by offering resources as required hence forming a high-risk area. While human resource aspects in construction are considered important, it is notable that low-level labor is readily available and workers are mobile. As a result, it may be fairly easy to find replacements that could enable operations to continue in such projects. Consequently, projects should still ensure that they have long-term solutions to human resource issues that could easily disrupt the continuity of projects.

5.5 Recommendations

In relation to the findings of this study, there is a need to increase the application and implementation of risk management studies in the building construction sector. With building construction poised to increase in line with the government's affordable housing agenda, increased engagement with stakeholders can ensure that the requisite measures are put in place to support contractors to effectively run and manage their projects.

Additionally, professionals in the construction sectors should be trained on issues regarding risk management by relevant bodies. Such capacity building programs can support the extensive and widespread implementation of risk management that will ultimately optimize the benefits accrued from such practices. More so, increased compliance by contractors and clients of building projects will ensure a safe approach towards protecting the investments and the lives/wellbeing of those involved.

5.6 Areas of Further Research

The findings indicate that the critical risk factors used in this study explain only a partial level of variability observed in building project performance. This implies the existence of other variables, both internal and external to the project, which would need to be scrutinized in order to further elucidate the relationship between the dependent variable and independent variables.

Additionally, the research found that human resource risk factors were not significant as conceptualized in this study. Consequently, there is a need to conduct more research in this area to understand how human resource risk factors can be captured in construction projects to understand their impact.

More so, with the study localised to building projects alone, it would be prudent to examine the critical risk factors in other construction sectors including civil/road works and water works.

REFERENCES

Abbasi, O., Noorzai, E., Gharouni Jafari, K., & Golabchi, M. (2020). Exploring the causes of delays in construction industry using a cause-and-effect diagram: Case study for Iran. *Journal of Architectural Engineering*, *26*(3), 1–16. doi:10.1061/(ASCE)AE.1943-5568.0000431

Abubakar, M., Abdullahi, M. & Bala, K. (2018). Analysis of the causality links between the growth of the construction industry and the growth of the Nigerian economy. *Journal of Construction in Developing Countries*, *23*(1), 103–113. doi:10.21315/jcdc2018.23.1.6

Adam, A. M. (2020). Sample size determination in survey research. *Journal of Scientific Research and Reports 26*(5), 90-97.

Adom, D., Hussein, E. K. & Adu-Agyem, J. (2018). Theoretical and conceptual framework: Mandatory ingredients of a quality research. *International Journal of Scientific Research 7*(1), 438-441.

Ahmad, Z., Thaheem, M. J. & Maqsoom, A. (2018). Building information modeling as a risk transformer: An evolutionary insight into the project uncertainty. *Automation in Construction 92*, 103–119.

Ahmed, R., Hussain, A. & Philbin, S. P. (2021). Moderating effect of senior management support on the relationship between schedule delay factors and project performance. *Engineering Management Journal*. doi:10.1080/10429247.2021.1940033

Alaghbari, W., Al-Sakkaf, A. A. & Sultan, B. (2019). Factors affecting construction labour productivity in Yemen. *International Journal of Construction Management 19*(1), 79-91.

Alaloul, W. S., Musarat, M. A., Rabbani, M. B. A., Iqbal, Q., Maqsoom, A. & Farooq, W. (2021). Construction Sector Contribution to Economic Stability: Malaysian GDP Distribution. *Sustainability*, *13*(9). doi:10.3390/su13095012

ALSaadi, N., & Norhayatizakuan, N. (2021). The Impact of Risk Management Practices on the Performance of Construction Projects. *Studies of Applied Economics 39*(4). doi:10.25115/eea.v39i4.4164

Amoah, C. & Bikitsha, L. (2021). Emerging contractor's management and planning skills to overcome business risk factors. *International Journal of Building Pathology and Adaptation*. doi:10.1108/IJBPA-01-2021-0003

Babu, O. C., Oswald G. A. & Masu, S. (2019). Appraising the Performance of Construction Projects during Implementation in Kenya, 1963-2018: A Literature Review Perspective. *Journal of Construction Engineering and Project Management,* 1-24. doi:10.6106/JCEPM.2019.9.2.001

Bhuinyan, S., Gadekar, P., Agrawal, N., Basak, S. & Raut, Y. S. (2019). Measuring Project Performance and Success Factors of Construction Sites. *International Journal of Innovative Research in Technology 5*(11), 680-685.

Chaudhary, M. T. & Piracha, A. (2021). Natural Disasters - Origins, Impacts, Management. *Encyclopedia 1*, 1101–1131. doi:10.3390/encyclopedia1040084

Competition Authority of Kenya (2018). *The Construction Industry: Analysis of the State of Competition*, 1-43.

Connelly, L. M. (2008). Pilot studies. *Medsurg Nursing*, *17*(6), 411-2.

Dua, P. (2021). *Risks & deterrents in construction projects: For customers, contractors, suppliers & consultants*. Notion Press.

Durdyev, S. & Hosseini, M. R. (2020). Causes of delays on construction projects: a comprehensive list. *International Journal of Managing Projects in Business 13*(1), 20-46. doi:10.1108/IJMPB-09-2018-0178

Egwunatum, S. I. (2017). A Review of Construction Project Performance Estimators. *MOJ Civil Engineering 3*(4), 326-328. doi:10.15406/mojce.2017.03.00075

El-Kholy, A. M. & Akal, A. Y. (2021). Assessing and allocating the financial viability risk factors in public-private partnership wastewater treatment plant projects. *Engineering, Construction and Architectural Management 28*(10), 3014-3040.

Farid, W., Kureshi, N. I., Babar, S. & Mahmood, S. (2020). Critical Risk Factors of Construction Industry of Pakistan for Improving Project Outcome. *Mehran University Research Journal of Engineering and Technology 39*(1), 71-80. doi:10.22581/muet1982.2001.08

Fieldler, F. E. (1964). A contingency model of leadership effectiveness. *Advances in Experimental Social Psychology*. New York: Academic Press.

Fulford, R. G. (2018). The implications of the construction industry to national wealth. *Engineering, Construction and Architectural Management 26*(5), 779-793.

Gholizadeh, M., & Moradinia, S. F. (2020). Human resource risk management in construction projects based on the ANFIS method. *International Journal of Advanced Science and Technology 29*(7), 5309-5329.

Githere, J. & Sang, P. (2021). Effects of risk management practices on performance of road construction projects in Nairobi City County – Kenya. *International Journal of Academics & Research 2*(2).

Hasan, A., Baroudi, B., Elmualim, A. & Rameezdeen, R. (2018). Factors affecting construction productivity: a 30-year systematic review. *Engineering, Construction and Architectural Management 25*(7), 916-937.

Ifediora, C. O. & Keke, O. V. (2019). Human resources management practices and real estate project management success in Awka South L.G.A., Anambra State. *International Journal of Civil Engineering, Construction and Estate Management 7*(2), 1-15.

Ingle, P. V. & Mahesh, G. (2020). Construction Project Performance Areas for Indian Construction Projects. *International Journal of Construction Management*. 1-12. doi:10.1080/15623599.2020.1721177

Jamil, N. D. & Adeleke, A. Q. (2020). The relationship between team competency and design risk management among construction industries in Kuantan. *Journal of Advanced Research in Applied Sciences and Engineering Technology 10*(1), 77-81.

Jose, P. E. (2013). *Doing statistical mediation & moderation*. Guilford Press.

Keers, B. M. & Fenema, P. C. (2018). Managing risks in public-private partnership formation projects. *International Journal of Project Management 36*(6), 861-875.

Kenya National Bureau of Statistics. (2021). *Economic Survey 2021*. https://www.knbs.or.ke/wp-content/uploads/2021/09/Economic-Survey-2021.pdf

Khaertdinova, A., Maliashova, A., Gadelshina, S. (2021). Economic development of the construction industry as a basis for sustainable development of the country. *E3S Web of Conferences 274,* 1-11.

Kirira, D. K., Owuor, B., Liku, C. N. & Mavole, J. N. (2019). Risk Management Strategies Influence on Road Construction Project Performance: Implementer Insights of Kenya National Highway Authority (KENHA), Coast Region Projects. *International Academic Journal of Information Sciences and Project Management, 3*(4), 655-671.

Kivunja, C. (2018). Distinguishing between theory, theoretical framework, and conceptual framework: A systematic review of lessons from the field. *International Journal of Higher Education 7*(6), 44-53.

Lin, C.-L. & Chen, B.-K. (2021). Research for Risk Management of Construction Projects in Taiwan. *Sustainability 13*, 2034. doi:10.3390/su13042034

Locke, E. A. and Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist 57*, pp. 705–717.

Masril, D. K. and Rahman, A. (2020). Critical risk factor affecting project performance in West Sumatera. *IOP Conference Series: Materials Science and Engineering 849*, 012009.

McDermot, E., Agdas, D., Díaz, C. R., Rose, T. & Forcael, E. (2020). Improving performance of infrastructure projects in developing countries: An Ecuadorian case study. *International Journal of Construction Management.* doi:10.1080/15623599.2020.1797985

Mohammed, A. J. (2016). A study for significant risks and their effects on construction projects in Erbil City. *Journal of Engineering and Sustainable Development 20*(4), 96-115.

Molla, S., Quezon, E. T., Mekonnen, E., Ararsa, W., Gudissa, D. & Tibebu, A. (2020). Factors Affecting the Performance in the Implementation of Government Building Construction Projects: A Case Study in Bole Sub-City of Addis Ababa. *Journal of Xidian University 14*(11).

Mugenda, O., & Mugenda, A. (2003). *Research Methods: Qualitative and quantitative approaches*. Acts Press Nairobi.

Muntu, D., Setyawati, R., Riantini, L. S., & Ichsan, M. (2021). Effect of human resources management and advances to improve construction project performance. *Physics and Chemistry of the Earth*, 122. doi:10.1016/j.pce.2021.103000

Pamidimukkala, A., Kermanshachi, S. & Karthick, S. (2022). Impact of Natural Disasters on Construction Projects: Strategies to Prevent Cost and Schedule Overruns in Reconstruction Projects. *Creative Construction e-Conference 061*, 103-110.

Perera, B. A. K. S., Samarakkody, A. L. & Nandasena, S. R. (2020). Managing financial and economic risks associated with high-rise apartment building construction in Sri Lanka. *Journal of Financial Management of Property and Construction 25*(1), 143-162.

Rehman, S. U., Shafiq, M. T. & Afzal, M. (2022). Impact of COVID-19 on project performance in the UAE construction industry. *Journal of Engineering, Design and Technology 20*(1), 245-266. doi:10.1108/JEDT-12-2020-0481

Siraj, N. B. & Fayek, A. R. (2019). Risk Identification and Common Risks in Construction: Literature Review and Content Analysis. *Journal of Construction Engineering and Management 145*(9). doi:10.1061/(ASCE)CO.1943-7862.0001685

Sinesilassie, E. G., Tabish, S. Z. S. & Jha, K. N. (2018). Critical factors affecting cost performance: A case of Ethiopian public construction projects. *International*

Journal of Construction Management, 18(2), 108-119. doi:10.1080/15623599.2016.1277058

State Department for Housing and Urban Development (2018). Kenya Affordable Housing Programme: Development Framework Guidelines. https://www.housingandurban.go.ke/wp-content/uploads/2018/11/Development-Framework-Guidelines-Release-Version.pdf

Tan, A. Z. T., Zaman, A. & Sutrisna, M. (2018). Enabling an effective knowledge and information flow between the phases of building construction and facilities management. *Facilities 36*(4), 151-170.

The World Bank (2017). Kenya Needs 2 Million More Low-income Homes: Building Them Would Boost Its Economic Growth. https://www.worldbank.org/en/country/kenya/publication/kenya-needs-2-million-more-low-income-homes-building-them-would-boost-its-economic-growth

Williamson, K & Johansen, G. (2017). *Research Methods: Information, Systems, and Contexts*. Elsevier Science.

Willumsena, P., Oehmena, J. Stingla, V. & Geraldi, J. (2019). Value Creation through Project Risk Management. *International Journal of Project Management 37*(5), 731-749. doi:10.1016/j.ijproman.2019.01.007.

Vinodh, K. R. & Therese, A. V. (2017). Analysis of various types of risk in construction projects. *International Journal of Civil Engineering and Technology 8*(7), 401-409.

Yap, J. B. H., Abdul-Rahman, H., Wang, C & Skitmore, M. (2018). Exploring the underlying factors inducing design changes during building production. *Production Planning & Control 29*(7), 586-601.

Yap, J. B. H., Chow, I. & Shavarebi, K. (2019). Criticality of construction industry problems in developing countries: Analyzing Malaysian projects. *Journal of Management in Engineering 35*(5), 41-68.

Yap, J. B. H. & Lee, W. K. (2020). Analyzing the underlying factors affecting safety performance in building construction. *Production Planning & Control 31*(13), 1061-1076.

Zamim, S. K. (2021). Identification of crucial performance measurement factors affecting construction projects in Iraq during the implementation phase. *Cogent Engineering 8*(1). doi:10.1080/23311916.2021.1882098

Zangirolami-Raimundo J., Echeimberg J. O. & Leone C. (2018). Research methodology topics: Cross-sectional studies. *Journal of Human Growth and Development 28*(3), 356-360. doi:10.7322/jhgd.152198

APPENDICES

Appendix 1: Questionnaire

INFLUENCE OF CRITICAL RISK FACTORS ON PERFORMANCE OF BUILDING PROJECTS IN KENYA: A CASE OF NAIROBI COUNTY

SECTION 1: DEMOGRAPHIC INFORMATION

1. **Gender:** Male ☐ Female ☐
2. **Highest Level of Education completed:** Primary ☐ secondary ☐ Certificate ☐ Diploma ☐ HND ☐ Degree ☐ Other ☐
3. **Age Bracket (years):** 18 -24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ Above 55 ☐
4. **What is your designation in the project?** Project Manager ☐ Clerk of Works ☐ Site Supervisor ☐ Other ☐ Please specify …….

5. **Which NCA category is your firm?**

NCA 1 ☐ NCA 2 ☐ NCA 3 ☐ NCA 4 ☐ NCA 5 ☐ NCA 6 ☐
NCA 7 ☐ NCA 8 ☐

6. **Which class of works are you registered in?**

Building works ☐ Water works ☐ Roads/civil works ☐ Mechanical works ☐
Electrical works ☐

7. **How long has your firm been in existence?**

Below 1 yr ☐ 1-3 yrs ☐ 4-7 yrs ☐ 7-10 ☐ Above 10 yrs ☐

8. **How many years have you worked in the firm?**

Below 1 yr ☐ 1-3 yrs ☐ 4-7 yrs ☐ 7-10 ☐ Above 10 yrs ☐

SECTION 2: PERFORMANCE OF BUILDING PROJECT

9. Kindly rate **– on a scale of 1 to 5 –** your level of agreement with the following statements with regard to the performance of building projects.

Please tick with a [✓] *where appropriate*

	Scale	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Statements	**1**	**2**	**3**	**4**	**5**
1.	Time management is an important aspect during the building project process					
2.	Ensuring cost efficiency can result in successful project implementation					
3.	Maintenance of a high quality of outputs in the building project enhances overall performance					
4.	Effective health and safety measures can reduce probability of accidents that may affect project performance					

10. In your opinion, what other aspects can be used in measuring the performance of construction building projects? Why?

……

……

……

……

……

SECTION 3: CRITICAL RISK FACTORS

11. Kindly rate – **on a scale of 1 to 5** – your level of agreement with the following statements with regard to the influence of **management risk factors** on building project performance.

Please tick with a [✓] *where appropriate*

	Scale	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Statements	**1**	**2**	**3**	**4**	**5**
1.	Quality control is critical in reducing the possibility of building failure					
2.	Corrective actions can significantly reduce the impact of mistakes in the building project					
3.	Communication structures influence the ability of employees to raise concerns with management					
4.	Complexity of a project can affect the effective implementation of the project					
5.	Properly Documenting all the processes in the building project enhances overall efficiency					

12. Kindly rate **– on a scale of 1 to 5 –** your level of agreement with the following statements with regard to the influence of **technical risk factors** on building project performance.

Please tick with a [✓] *where appropriate*

	Scale	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Statements	**1**	**2**	**3**	**4**	**5**
1.	Availability of resources during the building project support project implementation success					
2.	Availability of adequate materials reduces instances of time wastage					

3.	Proper design of the building project enhances quick implementation of the building project					
4.	Availability of requisite technology influences the performance of the project					

13. Kindly rate **– on a scale of 1 to 5 –** your level of agreement with the following statements with regard to the influence of **financial risk factors** on building project performance.

Please tick with a [✓] *where appropriate*

	Scale	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Statements	**1**	**2**	**3**	**4**	**5**
1.	Availability of funds for the project is essential for efficient project completion					
2.	Appropriate tax regimes reduce the burden on building projects					
3.	Inflation can significantly affect the pricing of materials and equipment used in the project					
4.	Exchange rates can affect the valuation of the building project during implementation					
5.	Delays can affect the cost estimates of the building project					

14. Kindly rate **– on a scale of 1 to 5 –** your level of agreement with the following statements with regard to the influence of **human resource risk factors** on building project performance.

Please tick with a [✓] *where appropriate*

	Scale	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Statements	**1**	**2**	**3**	**4**	**5**
1.	Skilled personnel are essential for effective implementation of the building project					

2.	Motivation is required to enhance the morale of employees					
3.	Human Resource practices affect the working conditions of employees in the building project					
4.	Employee trust with management is important to ensure smooth running in the building project					
5.	Reward schemes can affect the efficiency of the building project					

15. Kindly rate **– on a scale of 1 to 5 –** the level of impact that the following **external risk factors** can have an effect on building project performance.

Please tick with a [✓] *where appropriate*

	Scale	**No Impact**	**Very Low**	**Low**	**High**	**Very High**
	Statements	**1**	**2**	**3**	**4**	**5**
1.	Pandemic (COVID-19)					
2.	Geological hazards (earthquakes etc.)					
3.	Metrological hazards (floods, storms etc.)					
4.	Political unrest					
5.	Civil war					

SECTION 4: CHALLENGES AND PROPOSED SOLUTIONS

16. In your opinion, what are the major challenges faced in the development and implementation of risk management strategies for building projects and how can they be addressed?

No.	CHALLENGE	PROPOSED SOLUTION
1.		
2.		
3.		
4.		

17. Do you have any additional comments? Please write them below.

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Thank you for your Cooperation!

Appendix 2: Research Authorization

7th, September, 2022

E-mail: researchwriting.mba.anu@gmail.com

Tel. 0202711213

Our Ref: 20JS01DMBA017

The Director.
National Commission for Science,
Technology and Innovation (NACOSTI),
P. O. Box 30623, 00100
Nairobi. Kenya

Dear Sir/Madam:

RE: RESEARCH AUTHORIZATION FOR: JULIANA AKINYI OTIENO

Miss. Juliana is a postgraduate student of Africa Nazarene University in the Master of Business Administration (MBA) program.
In order to complete her program, Miss. Juliana is conducting a research entitled:
"Influence of Critical Risk Factors on Performance of Building Projects in Kenya: A Case of Nairobi County"

Any assistance offered to her will be highly appreciated.

Yours Faithfully,

DR. Kimani Gichuhi,

MBA, Coordinator,

School of Business,

Africa Nazarene University.

Appendix 3: Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **548017**

Date of Issue: **16/January/2023**

RESEARCH LICENSE

This is to Certify that Ms.. JULIANA AKINYI OTIENO of Africa Nazarene University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: INFLUENCE OF CRITICAL RISK FACTORS ON PERFORMANCE OF BUILDING PROJECTS IN KENYA: A CASE OF NAIROBI COUNTY for the period ending : 16/January/2024.

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See overleaf for conditions

Appendix 4: Map of Study Area