UNIVERSITY OF NAIROBI

FACULTY OF THE BUILT ENVIRONMENT

DEPARTMENT OF REAL ESTATE, CONSTRUCTION MANAGEMENT & QUANTITY SURVEYING

AN INVESTIGATION OF THE EFFECTIVENESS OF THE NATIONAL CONSTRUCTION AUTHORITY (NCA) IN CURBING MALPRACTICES IN THE KENYAN CONSTRUCTION INDUSTRY

Submitted by

MAIRURA C. ONCHAGWA

STUDENT REGISTRATION NUMBER: B53/9003/2017

A Research Project Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Arts in Construction Management

November, 2021

DECLARATION

DECLARATION BY THE CANDIDATE

This research project is my original work and has not been presented for a degree in any other University. No part of this research project may be reproduced without prior permission from the author and/or the University of Nairobi

Mairura C. Onchagwa

Signature: .....

Date: 02.12.2021

DECLARATION BY THE SUPERVISORS

This thesis has been submitted for examination with our approval as the University supervisors.

Dr. Christopher Mbatha

Department of Real Estate, Construction Management & Quantity Surveying

University of Nairobi

Signature: .....

Date: 02.12.2021

Mr. Samuel K. Mungai

Department of Real Estate, Construction Management & Quantity Surveying

University of Nairobi

Signature: .....

Date: 03.12.2021

ACKNOWLEDGEMENT

I'm grateful to everyone who assisted me in the completion of this research project. These included members of the professional associations, developers' association and regulatory authorities whom oversee the practice of experts in the built environment in Nairobi who responded to my questionnaire.

I would like to express appreciation to my supervisors for the scholarly guidance, tireless support and patience through the process of planning, developing and completing this research project. In addition, I'm grateful for the constructive criticism and insightful comments which aided in shaping the material in this research project.

DEDICATION

This research project is dedicated to my parents Michael Mairura and Jane Mairura and my sisters; Lucy, Judy, Mercy and Sheila for their support and encouragement.

ABSTRACT

The research done was aimed at investigating the effectiveness of the NCA in curbing construction malpractices in the Kenyan Construction Industry. The main study objective was to establish whether the NCA has reduced building collapses in the construction industry. Specific objectives were to identify the extent to which the NCA has reducing substandard building materials, increased the quality of workmanship, reduced quack contractors and incompetent construction workers and supervisors. The independent variables were noted to be substandard building materials, poor workmanship, quack contactors and incompetent construction workers and supervisors whereas the dependent variable was the effectiveness of the NCA. The study tested the effect of these independent variable on the dependent variable. This was done by scrutinizing the null hypothesis that, NCA has not reduced the use of substandard building materials, poor workmanship and quack contractors, workers and supervisors in the construction industry.

The study employed the use of questionnaires drafted with the mixed approach of both quantitative and qualitative questions to collect data. The targeted population were fourteen members each from Kenya Property Developers Association (KPDA), National Environmental Management Authority (NEMA), Architectural Association of Kenya (AAK), Nairobi City County (NCC), Institute of Construction Project Managers of Kenya (ICPMK), Board of Registration of Architects and Quantity Surveyors (BORAQS) and Engineers Board of Kenya (EBK) resulting to 98 respondents. Nachimias (1996) formula was implemented resulting to 42 respondents as the sample size. Out of the 42 respondents targeted, 35 questionnaires were returned indicating 83% response rate.

The information from the questionnaires was then imported into Statistical Package for Social Sciences version 25, then cleaned, edited and coded. The data entered into SPSS was exposed to various statistical and graphical analysis. Descriptive statistics were used to define features/ characteristics of the population. Data analysis employed the use of means, cross tabulation, chi-square and Kruskal Wallis (KW) tests. The results from the articulated analyses were presented using tables and figures. The findings from the study indicate that, the National Construction Authority (NCA) has been able to reduce the use of substandard building materials, improved workmanship in the construction industry and reduced quack contractors. It has however failed to significantly reduce workers and supervisors incompetence.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ABBREVIATIONS & ACRONYMS

AAK - Architectural Association of Kenya

ANOVA - Analysis of Variance

BORAQS - Board of Registration of Architect and Quantity Surveyors (Kenya)

CAGR - Compound annual growth rate

CIDB - Construction Industry Development Board

CORBON - Council of Registered Builders of Nigeria

EBK - Engineers Board of Kenya

EPS - Expanded Polystrene

GDCF - Gross Domestic Capital Formation

GDP - Gross Domestic Product

GOK - Government of Kenya

ICPMK - Institute of Construction Project Managers of Kenya

KEBS - Kenya Bureau of Standards

KNBS - Kenya National Bureau of Statistics

KPDA - Kenya Property Developers Association

KRA - Kenya Revenue Authority

KW - Kruskal Wallis

LD - Linz Donawitz

NCA - National Construction Authority

NCC - Nairobi City County

NEMA - National Environmental Management Authority (Kenya)

PPR - Polypropylene Random Copolymer

SSPS - Statistical Package for Social Sciences

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The construction industry is a key driver to the economic growth of any nation. Historically, both the processes of development and industrialization are linked to the construction industry. Globally, the construction industry is estimated to be at USD 10.5 trillion and it accounts for 13% of the world's gross domestic product (Wood, 2021). According to Wood (2021) the global construction industry will grow at a compound annual growth rate (CAGR) of 4.2 % until 2023. The African construction market is estimated to be at around USD 5.4 billion (World Bank, 2018). According to the World Bank Report (2018) the construction industry is anticipated to record a compounded annual growth rate (CAGR) of 7.4% until 2026. In Africa, the construction industry contributes 27.1% of the gross domestic product.

KNBS (2021) highlights that the Kenyan construction industry in the third quarter of 2020 was valued to be approximately USD 0.7 billion. The construction industry contributes approximately 5.6% of the GDP. According to the Quarterly KNBS Report (2021) "The Kenyan construction sector recorded 16.2 per cent growth in third quarter of 2020 compared to 6.6 per cent growth in the corresponding quarter of 2019". This growth was evidenced by the volume of cement consumed. From this Quarterly KNBS Report (2021) cement consumption increased from 1,553.8 thousand metric tonnes in the third quarter of 2019 to 1,925.2 thousand metric tonnes in the period under review. This indicates an icrease of 23.5 per cent. The key drivers for the growth of the construction market in the different regions highlighted are increased demand for housing and rising infrastructure because of the growing population and increased urbanization.

Globally, the construction industry faces a myriad of malpractices. The major malpractices as advanced by Ifedolapo (2015) are as follows; negligence in the process of approving the layout and designs of construction projects, poor communication among the contractors, architects and structural engineers, poor workmanship in construction projects, failing to adequately/ properly interprete site conditions, failure to carry out soil investigation, engagement of inexperienced construction workers, supervisors, engagement of incompetent or ill-equipped contractors. In

addition, use of poor formwork and inadequate falsework, failure to adhere to requirements from regulatory bodies, failure to engage professional/ registered structural engineers in all the stages of execution of construction project also contribute to global construction malpractices. Ifedolapo (2015) further argues that desire and greed for profits, lack of know how of key principles and procedures which guide the construction of a particular project, hasty/ rushed construction, clients and contractors who collude to cut corners are also among global construction malpractices. Baiburin (2017) suggests that failure to pay regard to fire safety concerns is also among the construction malpractices experienced globally. A case example is the Grenfell Tower building in London.

In the African construction industry, the major construction malpractices are engagement of inexperienced construction workers, supervisors, incompetent or ill-equipped contractors, poor construction procedures, use of substandard building materials and implementation of construction projects without the relevant permits (Chendo & Obi, 2015). Other malpractices are use of poor architectural and engineering drawings which do not factor site and soil conditions, lack of proper supervision of construction works, poor inspection and monitoring of construction works and illegal conversion, alteration, and additions to existing structures. In the Kenyan context, construction malpractices according to Thuita (2020) are poor construction practices, poor workmanship, use of substandard building materials, use of faulty structural designs, engaging incompetent construction workers and supervisors and corruption.

Strategies to curb construction malpractices globally are; developing effective regulatory frameworks, developing proper building codes and ensuring proper building practices are adhered to in construction projects (Fernandez, 2014). Furthermore, Fernandez (2014) advises that registering contractors and construction supervisors, reporting negligent building construction workers, supervisors and contractors and ensuring only competent construction workers & supervisors are engaged in construction projects will assist in curbing construction malpractices on a global scale. In the African construction industry, methods to curb construction malpractices as advanced by Adeyemo & Amade (2016) are engaging registered/ certified construction professionals and using approved architectural and structural designs to eliminate possibilities of structural failure.

Windapo & Rotimi (2012) suggest an overhaul of the existing building codes and use of competent and qualified professionals will help in regulating construction malpractices in Africa. Akinbobola (2016) proposed engaging registered architects, structural engineers and contractors will mitigate construction malpractices. Furthermore, Akinbobola (2016) suggests it is necessary to comply with all consultants specifications, statutory building regulations and to conduct a soil test. In the Kenyan construction industry, curbing construction malpractices can be effected by use of only approved architectural and structural designs, ensuring only registered contractors undertake construction works and that these contractors comply to regulatory framework (Machuki, 2012). Additionally contractors should engage only competent construction workers and supervisors and they should adhere to proper construction procedures. Use of proper quality materials also helps to curb construction malpractices (Machuki, 2012).

Globally there exists many regulatory frameworks which regulate the construction industry in different parts of the world. By definition, a regulatory framework is the set of regulations and laws which stipulates the legal requirements to be complied with in a particular industry. These regulations and laws are usually complemented guidelines, standard directives and policies (Edinburgh, 2003). For example in Australia, the National Construction Code (NCC) is mandated by the Federal Government of Australia and the Australian building codes board to ensure contractors adhere to all technical requirements prior to undertaking any building works or plumbing works. The NCC further sets the basic requirements by which all design of buildings, construction projects and performance of buildings should adhere to (Doloi et al., 2017). In India, the Building & Other Construction Workers Act (2016) is a framework which seeks to cater for the welfare, health and safety concerns of construction workers, Additionally, it regulates he conditions of service and employment of construction workers (Doloi et al., 2017).

In the African context, the Construction Industry Development Board (CIDB) regulates construction projects in South Africa. The Construction Industry Development Board Act of 2000 (CIDB Act) stipulates that all the organs of the South African state should award construction projects only to contractors who are duly registered with this board. In addition, all tenders should be posted on the board's website. In Nigeria, the Council of Registered Builders of Nigeria (CORBON) is tasked with regulating construction of buildings. The council is mandated to establish and control/ oversee the construction industry. It is also mandated to coordinate the

development of the construction industry. To achieve development of the construction industry, the Council of Registered Builders of Nigeria (CORBON) co-ordinates training programs for construction site supervisors and skilled construction workers. It also encourages improvement and standardization of construction techniques and practices (Fadason et al., 2017).

Locally, there are various regulatory and professional bodies which govern the construction industry and the conduct of professionals in the construction industry. The Nairobi City County (NCC) established by the Constitution of Kenya 2010 is mandated with providing an array of services including; environment management, public works, inspectorate services, primary education infrastructure, social services and housing, public health and physical planning to all residents within Nairobi City County. The State Department for Housing and Urban Development is mandated with coordination of matters relating to housing and urban planning and provision of policy direction in relation to the same. The National Construction Authority (NCA) is the key regulator for the construction industry. The NCA is established under Act No. 41 of 2011 Laws of Kenya. The NCA's mandate is to build capacity, regulate and streamline the construction industry. The NCA is responsible for registering local and foreign contractors. It also regulates the performance of both local and foreign contractors. Furthermore, it accredits skilled construction workers and site supervisors. This aim of this study is to investigate the effectiveness of the NCA in curbing construction malpractices particularly by reducing substandard building materials, increasing the quality of workmanship, reducing quack contractors and incompetent construction workers and supervisors. The independent variables of this study are substandard building materials, poor workmanship, quack contactors and incompetent construction workers and supervisors. The dependent variable is the effectiveness of the NCA. The study tests the effect of these independent variable on the dependent variable which is the effectiveness of the NCA.

1.2 Problem Statement

The number of approved building plans in Nairobi City County during the first quarter of 2011 was 629 resulting to Ksh 38,901,854,724 worth of approved developments. Making comparison to the first quarter of 2019, a total number of 957 building plans were approved adding the county Ksh 59.54 billion worth of development (KPDA, 2019). This increase in approved building plans has significantly increased construction activities in Nairobi City County and thereby increased construction malpractices simultaneously. Being the key regulator of the construction phase of

projects in the Kenyan construction industry, the NCA is mandated to build capacity, regulate and streamline the construction industry. This study was aimed at determining the effectiveness of the statutory body (the National Construction Authority) in curbing construction malpractices through implementation of the regulatory framework - Act No. 41 of 2011 Laws of Kenya. The major cause of building collapses in the Kenyan construction industry according to NCA (2019) is poor workmanship which contributes 35% to building failure. Use of substandard materials in construction projects and poor structural design contributes 28% and 25% respectively to building collapses. Failure by contractors to adhere to statutory and safety requirements accounts for 9% of causes of building collapses. Inadequate maintenance contributes to 3% of building failure. Building collapses result to financial losses to developers since construction projects normally require huge financial investments. Furthermore collapse of buildings results to loss of lives. According to the NCA (2019), more than 200 lives has been lost since 1990 when the first incidence of building collapse was recorded. This has psychologically affected remaining families of those who lost lives. The economy has also lost more than Ksh 2.4 billion since the first case of building collapse was recorded.

According to the NCA Act No. 41 of 2011, the NCA is tasked with initiating research onto any matter relating to the construction industry and prescribing the requirements/ qualifications or other pre requisites required for registration as a contractor under the Act. The authority is again mandated with providing advice and making recommendations to the Minister on matters affecting or connected with the construction industry. Additionally it is tasked with promoting and stimulating the development, improvement and expansion of the construction industry. Section 5 of the Act (NCA Act, 2011) further postulates the authority is mandated to accredit and register contractors and regulate their professional undertakings. It initiates and maintains a construction industry information system, encourages the standardisation and improvement of construction techniques and materials and promotes and ensures quality assurance in the construction industry. The authority provides consultancy and advisory services with respect to the construction industry and assists in the exportation of construction services connected to the construction industry. The NCA according to Section 5 of the ACT (NCA Act, 2011) also develops and publishes a code of conduct for the construction industry. Moreover, it accredits and certifies skilled construction workers and construction site supervisors. Lastly, the authority is tasked with doing all other things that may be necessary for the better carrying out of its functions under the Act.

Among the functions the NCA is mandated to carry out, specific functions directly help to curb construction malpractices in the Kenyan construction industry. As defined in Section 5 of the Act (NCA Act, 2011), these functions are developing and publishing a code of conduct for the construction industry will aid in reducing construction malpractices, accrediting and certifying skilled construction workers and construction site supervisors, accrediting and registering contractors and regulating their professional undertakings, encouraging the standardisation and improvement of construction techniques and materials, and promoting and ensuring quality assurance in the construction industry. This study focused on the effectiveness of the NCA in curbing construction malpractices and has the effectiveness of the NCA as the dependent variable. The independent variables are poor workmanship, substandard building materials, quack contactors and incompetent construction workers and supervisors. These independent variables are drawn from the functions of NCA as drawn from NCA (2011). The dependent variable is the effectiveness of the NCA. The study tests the effect of these independent variable on the dependent variable which is the effectiveness of the NCA.

1.3 Study Questions

The main research question which the study aimed to answer was as follows;

Has the NCA through enforcement of its mandate led to a reduction in construction industry malpractices in the Kenyan construction industry ?

Specific study questions of this research were:

1. Has the NCA been able to reduce the use of substandard building materials ?
2. Has the NCA improved workmanship in the construction industry ?
3. Has the NCA reduced quack contractors in the construction industry?
4. Has the NCA reduced incompetent construction workers and supervisors?

1.4 Study Objectives

The main research objective which the study aimed to achieve was as below;

To establish whether the NCA has reduced construction malpractices in the kenyan construction industry.

The specific study objectives of this study are outlined below:

1. To establish the extent to which the National Construction Authority (NCA) has been able to reduce the use of substandard building materials
2. To establish the extent to which the National Construction Authority (NCA) has improved workmanship in the construction industry
3. To establish the extent to which the NCA has been able to reduce quack contractors in the construction industry
4. To establish the extent to which the NCA has been able to reduce incompetent construction workers and supervisors in the construction industry

1.5 Hypotheses of the Study

The study investigated the effectiveness of the National Construction Authority on the regulation of the construction industry and in particular curbing malpractices and had the following null and alternative hypothesis:

H_o: Null Hypothesis

The National Construction Authority through its operations has not significantly reduced the use of substandard building materials, poor workmanship, quack contractors and incompetent construction workers and supervisors.

H_a: Alternative Hypothesis

The National Construction Authority through its operations has significantly reduced the use of substandard building materials, poor workmanship, quack contractors and incompetent construction workers and supervisors in the construction industry.

1.6 Significance of the study

The study investigated the effectiveness of the National Construction Authority on the regulation of the construction industry and in particular curbing malpractices. Few studies have been done but not comprehensively on the action/ effect of the NCA in taming malpractices in the construction industry and whether it has improved and streamlined the industry. It is hoped that the findings of this study will benefit the Government of Kenya (GoK) and the Policy Makers. Through this study it is expected the Government of Kenya (GoK) and the policy makers will gain insight on the effectiveness of the NCA. By implementing the recommendations put forward the Government of Kenya (GoK) and the policy makers with thereby improve the functioning of the Authority. This research study is also expected to benefit academics by adding on to the existing literature in the field of regulation in the construction industry in Kenya more specifically for stifling malpractices. Future scholars can use this research as a basis for further research in the area of curbing malpractices. Similarly as the government of Kenya, the general public will be better aware of the effectiveness of the NCA. The economy stands to benefit positively by the reduction in use of substandard building materials, poor workmanship and reduction of quack contractors, incompetent construction workers and supervisors which will improve how investors view the construction industry and provide an impetus to invest in the construction industry.

1.7 Scope of Study

These research was focused on the National Construction Authority (NCA) operations to see how effectively it has carried out its operations with the intent of reducing building collapses, reducing quack contractors, incompetent construction workers and supervisors and promoting the

improvement of the construction industry. The scope of this research study has been divided to theoretical, methodological and geographical scope.

In relation to theoretical scope, this research study focused on construction malpractices and the statutory institutions implementing the regulatory framework aimed at taming/ curbing such malpractices. It was limited to the National Constuction Authority (NCA). This is because the NCA is the major regulator of construction in Kenya. This research study has the independent variables as substandard building materials, poor workmanship, quack contactors and incompetent construction workers and supervisors. The study tests the effect of these independent variable on the dependent variable which is the effectiveness of the NCA.

As regards methodological scope, the study was cross sectional sectional in nature. The data which went to analysis was collected from questionnaires sent to members of professional associations, developers' associations and regulatory authorities whom oversee the practice of experts in the built environment in Nairobi. They are as follows: developers drawn from Kenya Property Developers Association (KPDA), environmental experts in the built environment drawn out from National Environmental Management Authority (NEMA), architects from Architectural Association of Kenya (AAK), building regulations enforcement officers from Nairobi City County (NCC), construction project managers from Institute of Construction Project Managers of Kenya (ICPMK), quantity Surveyors from Board of Registration of Architects and Quantity Surveyors (BORAQS) and engineers drawn from Engineers Board of Kenya (EBK).

Geographically, the research study was premised in Nairobi County, Kenya. This is because Nairobi County has more construction professionals (Architects, Quantity Surveyors, Engineers, Project managers) which can be attributed to the fact that it is the capital city. In addition, the location was easily accessible by the researcher because it was near his place of stay in the course of the research study.

1.8 Assumptions of the Study

Below are the assumptions which the research study was premised on:

1. The dependent variable (effectiveness of the NCA) is only affected by the four independent variables (poor workmanship, substandard building materials, quack contactors and

incompetent construction workers and supervisors). Other variables do not have an effect on the dependent variable.

2. Construction professionals involved in building projects in Nairobi County are similar to other construction professionals in the other counties in Kenya.
3. The recommendations put forward by this study are applicable to the other Kenyan counties.

1.9 Limitations of the Study

Below are the limitations of this research study:

1. The research study was focused on perspectives of professionals from seven bodies; professional associations, developers' associations and regulatory authorities whom oversee the practice of experts in the built environment in Nairobi. They are as follows: Kenya Property Developers Association (KPDA), National Environmental Management Authority (NEMA), Architectural Association of Kenya (AAK), Nairobi City County (NCC), Institute of Construction Project Managers of Kenya (ICPMK), Board of Registration of Architects and Quantity Surveyors (BORAQS) and Engineers Board of Kenya (EBK).
2. Because of financial resources constraints and time constraints, the study focused on Nairobi City County. This is because it was the researchers' County of residence at the time of the study.
3. Due to the potential of many respondents and in light of time and financial constraints, the study did not include National Building Inspectorate (NBI) in population sample.

1.10 Organisation of study

This research is structured into five chapters which captures all the crucial elements of this research study. Chapter one has outlined the context and the background of this study. It has highlighted the size and contribution of the construction industry globally, continentally and locally. It mentions how historically, both the processes of development and industrialization are linked to the construction industry. It also describes construction malpractices and the regulatory frameworks globally, continentally and locally. The chapter further introduces the NCA, posits it's

mandates and explains why it's the main regulator of the construction industry in Kenya. It lists other researches done by other scholars in regards to the NCA's mandate. Causes of collapses of buildings in Nigeria and Kenya are mentioned in an attempt to outline whether the mandate of the NCA is aimed at curbing such causes. Functions of the Nairobi City County (NCC) and The State Department for Housing and Urban Development are also mentioned. This chapter in addition mentions the problem statement, research questions, study objectives and hypotheses. Moreover, it delineates the significance of the study, the scope of the study as well as assumptions and limitations of the study. Chapter two provides a literature review of researches done previously related to the study subject from; books, articles and journals. Furthermore, the theories and research concept forms a basis for identifying and understanding procedures involved in procurement and tendering processes. In addition it presents the conceptual frameworks and highlights the relationship between the independent variables and the dependent variable. Chapter three focuses on the methods used in actualization of the study, the type of data collected, the research design, sampling design, methods of data collection and the analyses approaches used in investigating the research objectives. Chapter four presents the research results in the format of figures and tables. Chapter five includes the discussion generated from the results presented in chapter four and the summary, conclusion and recommendations from the research study.

1.11 Definition of terms

Quack Contractors: According to Davies & Jokiniemi (2008), a quack contractor is an organization or an individual who falsely represents itself or himself as qualified and further proceeds to execute building construction works as per the terms of an agreement or a contract.

Curbing: Curbing refers to activities, actions or processes initiated to control or limit something in order to prevent it from having a harmful effect.

Effectiveness: According to the Oxford Dictionary, effectiveness is defined 'as the degree to which the research objectives are achieved/ degree of solving the targeted problems'. Effectiveness is resolute without reference to costs and, it further refers to "doing the right thing."

Malpractices: Can be defined as the negligence of professional responsibilities or failure to ensure professionalism in construction which can lead to injury, loss or damage.

Reducing: Citing the Merriam Webster, reducing refers to the process of diminishing in value. It could mean omitting (people or things that are not wanted) from a group so as to diminish the quantity. In the construction industry this means removing something or people who are substandard or not qualified from a batch or a pool of high quality materials or qualified people.

Construction: Section 2 of the Act (NCA Act, 2011), defines construction as demolition, dismantling, alteration, removal, renewal, maintenance, repair, installation or extension of a building either wholly or partly or a road or drainage works or electrical works.

1.12 Conclusion

This study is aimed at determining the effectiveness of the statutory body (the National Construction Authority) in curbing construction malpractices through implementation of the regulatory framework - Act No. 41 of 2011 Laws of Kenya. Construction malpractices as highlighted by NCA (2019) include failure to comply to statutory requirements, inadequate maintenance, poor structural design, use of substandard materials and poor workmanship. This chapter has outlined the context and the background of this study. It has highlighted the size and contribution of the construction industry globally, continentally and locally. It mentions how since time immemorial construction has been a key driver of economy. It also describes construction malpractices and the regulatory frameworks globally, continentally and locally. The chapter further introduces the NCA, posits it's mandates and explains why it's the main regulator of the construction industry in Kenya. Causes of collapses of buildings in Nigeria and Kenya are mentioned in an attempt to outline whether the mandate of the NCA is aimed at curbing such causes. This chapter in addition mentions the problem statement, research questions, study objectives and hypotheses. Moreover, it delineates the significance of the study, the scope of the study as well as assumptions and limitations of the study. The next chapter, chapter two, will focus on past literature on construction malpractices, their effects and how they can be controlled.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed literature related to construction malpractices which had been highlighted in chapter one to be the key causes of building collapses in the Kenyan construction industry. It also highlighted construction materials sources, categories and how they are specified in construction projects. In addition, it outlined the nature of substandard building materials as well as standards of materials quality and best practices on regulating building material standards. In relation to construction workmanship, similarly it delineated the categories of workmanship, how they are specified in construction projects and the nature of poor workmanship. Additionally, it highlighted the standards of workmanship and the best practice on regulating building construction workmanship. This chapter also reviewed reasons for engaging contractors/ sub contractors in construction projects and the categories of contractors/ sub-contractors. Consequently it reviewed how quack contractors arise and the reasons why some clients opt for quack contractors in construction projects. It further highlighted the best practice for dealing with quack contractors. Lastly, this chapter assessed workforce competency in the construction industry. It also reviewed the nature of workforce competency, causes and consequences of incompetent workforce and best practice on dealing with workforce incompetency in the construction industry. Moreover, this chapter presented the conceptual framework which illustrates the relationships/ intended associations of the dependent variable to the independent variable which guides the study in the succeeding chapters.

2.2 Construction Materials

2.2.1 An Overview of Construction Materials

In the Kenyan construction industry the most commonly used construction materials are timber (wood), concrete, cement, metals, fired bricks, sand, machine cut and manually cut stones. Additionally bamboo, glass, roofing tiles, roofing sheets, ceramic tiles and expanded polystyrene (EPS) panels are also commonly used. The normal practice in the industry is that the contractor

who wins a tender for a particular project will supply materials from his/ her own suppliers. In the event of a labour contract, the client will supply construction materials and the contractor will be responsible for the labour element. According to Davies & Jokiniemi (2008), construction materials are commodities or substances that are used in the assembling, fabrication or manufacture of products which are used in construction projects. As defined in Section 5 of the Act (NCA Act, 2011), the NCA is mandated to encourage the standardisation and improvement of construction materials. Standardisation and improvement of construction materials leads to the uptake of quality construction materials which will then improve the service life of building projects. Blok and Herwijnen (2001) argues that the functional lifespan of a building structure is the timeline/ duration in which the building project can perform as per the conditions of the purpose it was intended for. From the foregoing it can be deduced that the service life of a building is the minimum duration whereby the building is able to perform its intended functions and meet the user's demands and requirements. As such, the quality of materials is important to the service life of a building.

The type and category of construction materials usually falls into two key categories. These categories are naturally occurring construction materials and man-made construction materials (Wyk, 2009). Natural occurring construction materials are sand, stone, bamboo and wood. In the Kenyan construction industry sand is obtained from riverbanks, stone from quarries and wood is mostly imported. Man-made construction materials include roofing tiles, roofing sheets, ceramic tiles, expanded polystyrene (EPS) panels, steel, fired bricks, machine cut stones, manually cut stones, ballast, prefabricated concrete products and concrete. For example in the Kenyan construction industry, Kenya Builders & Concrete Co. Ltd manufactures concrete products such as coping, kerbs and window cills. The source of naturally occurring construction materials is nature and it includes trees, quarries and river banks. Man-made construction materials are mostly manufactured for example cement or achieved through mixing of different materials for example concrete. From the commencement to the completion of a construction project, materials of different sizes and shapes are used. In most construction projects, materials which are mainly used are timber, water, steel, aggregates, sand and cement. These materials are mostly mixed so as to produce different elements and components used in the construction process.

This study will be premised on the main construction materials used in construction projects in the Kenyan construction industry. The materials under consideration are timber, water, steel, aggregates, sand and cement as shown in the table 2.0. Timber refers to a certain kind of wood which is appropriate for carpentry, building or an array of other engineering uses for example assembling of shelves, cupboards, posts, beams, partitions, roofing, windows or doors. In building construction works, timber is majorly used for the following purposes; door leaves and door frames, window boards, roofing members, scaffolding works, paneling, ceiling and flooring works (Rao & Vishnukanth, 2006). In the Kenyan construction industry, timber is sourced from forests owned by the government and from neighbouring countries. The second construction material under consideration is water. According to Rao & Vishnukanth (2006) the recommended type of water for construction purposes is drinking water. Rao & Vishnukanth (2006) further mentions that water for construction use should be free from vegetable matter, alkalies, acids or oils. The third construction material under review in this study is steel. Rao & Vishnukanth (2006) highlights that steel occurs at an intermediate phase among wrought iron and cast iron with respect to the content of carbon. Rao & Vishnukanth (2006) further highlights that steel is manufactured through either of the following processes; open hearth, linz-donawitz (LD), electric, duplex, crucible steel, cementation or bessemen. Steel is classified into four classes in respect to the use; mechanical services, weathering use, non-structural use and structural use. Steel for structural purposes refers to reinforcement bars. They are used in lattice beams, trusses, beams and columns. Steel for structural use can either be mild steel or high yield steel. The commonly used steel for reinforcement is mild steel because of its tension and compression properties.

Aggregates are the fourth construction material under consideration in this study. Rao & Vishnukanth (2006) postulates that aggregates are extracted from metamorphic, sedimentary and igneous rocks. According to Ayodeji (2016) aggregates in construction are particles of chemically inactive and hard materials which are bound by cement to form concrete. Aggrerates are classified into three catergories; fine aggregates, coarse aggregates and all-in aggregates. The key difference between coarse and fine aggregates is that coarse aggregates particles are held back and cannot pass through a 4.75 mm sieve whereas particles of fine aggregates are not retained and can go though a sieve size of 4.75 mm. All in aggregates comprises of both fine and coarse aggregates. The last construction material under consideration in this study is cement. Rao & Vishnukanth

(2006), highlights that cement is any material which functions as a joining agent for other materials. Jagadala (2006) defines cement as a substance which hardens after setting and binds different un-adhesive materials together. Cement is classified into five types; high alumina cement, expansive cement, coloured portland, white portland cement, pozzolanic cement, sulphate resisting cement, low heat portland cement and ordinary portland cement. Portland cement is the commonly used type of cement in the Kenyan construction industry. The construction materials under consideration in this study are shown in table 2.0 below.

Table 2.0: Construction Materials

Material	**Description**	**Sources**
Timber	Timber possesses excellent characteristics which make it ideal for construction purposes as follows; it is strong in comparison to its weight, it's a great electrical and heat insulator and it's easy to fabricate it into different shapes and sizes. In the Kenyan construction industry, timber is sourced from forests owned by the government and from neighbouring countries	(Jagadala, 2006)
Water	Water for construction use should be clean drinkable water. Seawater or pondwater is not recommended since it has organic matter which can attack steel thereby compromising on the quality of steel. Water for construction purposes should be ideal for drinking, free from vegetable matter, alkalies, acids or oils. Rainwater is ideal for construction purposes.	(Rao & Vishnukanth, 2006)
Steel	Steel occurs at an intermediate phase among wrought iron and cast iron with respect to the content of carbon. Steel is manufactured through either of the following processes; open hearth, linz-donawitz (LD), electric, duplex, crucible steel, cementation or bessemen. Steel is classified into four classes in respect to the use; mechanical services, weathering use, non-structural use and structural use. Steel for structural purposes refers to reinforcement bars.	(Rao & Vishnukanth, 2006)

	They are used in lattice beams, trusses, beams and columns. Steel for structural use can either be mild steel or high yield steel. The commonly used steel for reinforcement is mild steel because of its tension and compression properties	
Aggregates	These are particles of chemically inactive and hard materials which are bound by cement to form concrete. Aggrerates are classified into three catergories; fine aggregates, coarse aggregates and all-in aggregates. Fine aggregates consists of particles which can go through 4.76 mm sieve. They are thus smaller than 4.76 mm in diameter. Coarse aggregates on the other hand cannot go through a 4.76 mm sieve. Coarse aggregates particles are greater than 4.76 mm in diameter. All-in aggregates is a mix of both coarse and fine aggregates.	(Ayodeji, 2006)
Cement	Cement is a material which binds and hardens different un-adhesive materials together. Cement is classified into five types; Portland cement, super sulphated cement, high alumina cement, Roman cement and natural cement. Portland cement is the commonly used type of cement in the Kenyan construction industry.	(Jagadala, 2006)

Source: Author (2021)

Table 2.1 Construction Materials Images

	Timber for roofing trusses.
	Image of aggregates

	Image of concrete and reinforcement steel.
	Image of cement

Source: Author (2021)

The standard and quality of construction materials used in construction projects in Kenya is of colossal importance and as such it is imperative that materials are sourced from proper suppliers. Materials used in construction projects are usually specified by the architect and the engineer enagaged for a particular construction project. Specification of construction materials is done to align with Section 32 of the Building Code (1968). The code as highlighted by the NCA (2019) stipulates that construction materials should be properly prepared, mixed and applied/ fixed. The manner of preparation, mixing, application or fixing should be proper/ appropriate in such a way which permits the material(s) to perform adequately the function(s) which it was intended for. Moreover, Section 32 of the Building Code (1968) specifies that materials used in construction projects should be of proper quality and nature to make them suitable for the purpose for which it was designed. Section 4 of Section 32 of the Building Code (1968) additionally states that any method of preparation, mixing, application or fixing of materials needs to conform to a British code of practice or British standards. This section further states that any type of construction material needs to conform to a British code of practice or British standards as well.

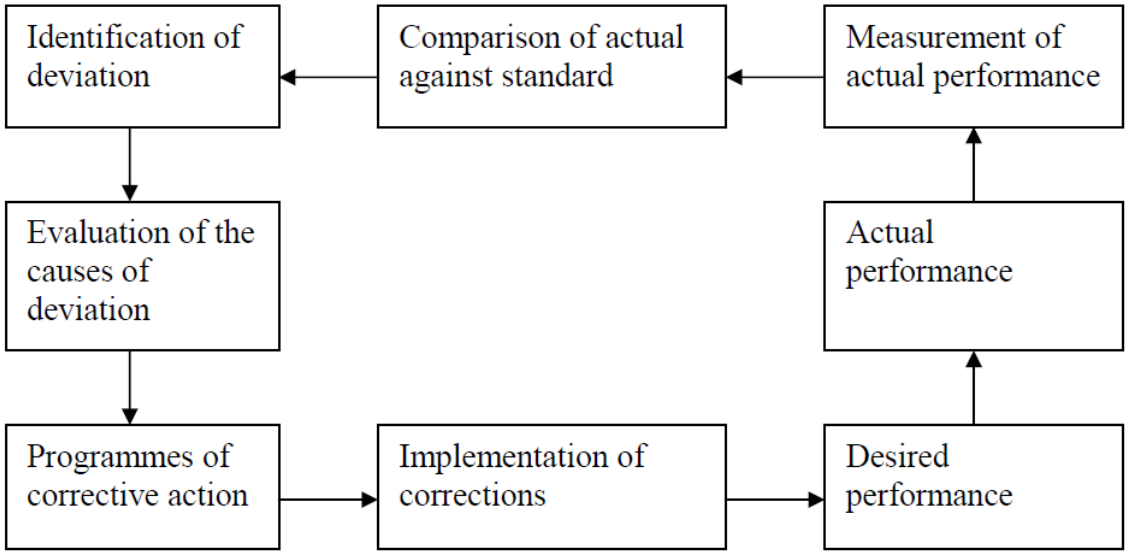
2.2.2 Substandard Construction Materials

According to NCA (2019) the use of substandard materials in construction projects contributes 28% to building collapses. The use of substandard construction materials reduces the quality of a building and results to quick deterioration of buildings as compared to buildings which were put up using quality materials Waziri et al. (2013). The result of this is that such buildings require frequent maintenance so as to maintain the building in a functional state over its lifespan. The NCA is mandated to encourage the standardization and improvement of construction materials as defined in Section 5 of the Act (NCA Act, 2011). Majority of substandard construction materials used in the Kenyan construction industry are brought into the market as counterfeit. The Kenya Revenue Authority (KRA) mentions that the most counterfeited material in the market is cement, roofing materials, fasteners, electric equipment, valves, pipes, pipe fittings and steel (Construction Kenya, 2018).

Globally, the best practice in dealing with substandard building materials is stringent quality assurance and quality control processes. Quality assurance is the systematic and planned process of ascertaining that a product will achieve the standards of quality (Olusola et al, 2002). Quality

assurance is aimed at proper control of quality and removal of non-conformance in all stages. Quality assurance of a material is determined by the material's level of conformance to requirements, fitness for purpose, achievement of excellence, recommendation from regulatory bodies, brand name of the material, utility derived and the cost of the product. Quality control on the other hand is a process which comprises routine checks aimed at measuring and controlling the quality of materials during the process of manufacturing or assembling (Mangino, 2006). Once manufacturing or assembling has been completed, the finished product is reviewed/ inspected for defects to ascertain if it meets the acceptable standards. Quality control process of construction materials is shown in Figure 2.0 below.

Figure 2.0: Quality Control Process of Construction Materials



Source: Alao (2005)

In the Kenyan construction industry, the Kenya Bureau of Standards (KEBS) certifies both locally manufactured construction materials and imported construction materials for example cement and steel. Checking for quality of naturally occurring construction materials such as timber, ballast or sand is usually a subjective exercise carried out by the contractor or the contractor's procurement agent based on past experiences of ascertaining the quality of timber, ballast or sand from different suppliers. Best practices in regulating construction materials in the Kenyan construction industry tie to the aforementioned stipulations by Section 32 of the Building Code. The code as highlighted

by the NCA (2019) stipulates that construction materials should be properly prepared, mixed and applied/ fixed. The manner of preparation, mixing, application or fixing should be proper/ appropriate in such a way which permits the material(s) to perform adequately the function(s) which it was intended for. Moreover, Section 32 of the Building Code (1968) specifies that materials used in construction projects should be of proper quality and nature to make them suitable for the purpose for which it was designed. Section 4 of Section 32 of the Building Code (1968) additionally states that any method of preparation, mixing, application or fixing of materials needs to conform to a British code of practice or British standards. This section further states that any type of construction material needs to conform to a British code of practice or British standards as well. In addition, Section 32 of the Building Code (1968) prohibits the use of second-hand materials to works referred under the by-law unless approved by the council. Contractors and clients purchasing construction materials should thus adhere to these stipulations as put forward by Section 32 of the Building Code (1968).

There exists several tests and strategies which are aimed at dealing with substandard building materials. The quality test to ascertain the standard of timber according to Jagadala (2006) are toughness test, cleavage test, hardness test, shear strength test, tensile test, compressive test and bending strength test. The recommended strategy to prevent procurement of substandard timber according to Rao & Vishnukanth (2006) is checking of timber delivered on site to ensure it is well cured and free from defects from conversion, defects from natural forces and defects from insects and fungi. In addition, changing of timber supplier with identified poor quality timber will assist to prevent substandard timber from being delivered on site. As regards water, the recommended water for construction purposes is drinking water (Rao & Vishnukanth, 2006). A change of water supplier is the identified method of dealing with poor water quality. The identified strategy in dealing with substandard steel reinforcement is change of supplier. The quality test to ensure steel is of proper quality is through carrying out compression and tension test to reinforcement steel supplied. Additionally, procurement of steel products should be done only from well known suppliers and the steel procured should bear the KEBS standardization mark of quality. Similarly as steel, procurement of aggregates and cement should be done from well known suppliers. The quality tests to ensure proper quality of concrete are flow table test, compacting factor test, cube test, vee bee test and slump tests (Jagadala, 2006). The recommended strategy to deal with

substandard concrete is batching by volume and not by weight. Quality tests and strategies identified to deal with substandard building materials are outlined in table 2.2 below.

Table 2.2: Quality Tests and Strategies identified for dealing with substandard building materials

Materials	Quality Test/ Recommended Strategy	Sources
Timber	**Quality Test**: Carrying out toughness test, cleavage test, hardness test, shear strength test, tensile test, compressive test and bending strength test. **Recommended Strategy:** Change of supplier & ensuring purchase of properly cured timber. Additionally check timber delivered on site to ensure timber is free from defects occurring from seasoning, conversion, defects from natural forces and defects from insects and fungi.	(Jagadala, 2006)
Water	**Quality Test**: Water for construction should be clean drinkable water free from oils, acids and alkalies. The use of seawater or pondwater for construction works is not recommended because vegetable matter is likely to cause adverse effects on concrete. The ideal water for construction is rainwater. **Recommended Action:** Change of water supplier.	(Ayedoji, 2006)
Reinforcement Steel	**Quality Check**: Carrying out compression and tension test to reinforcement steel supplied. Additionally, steel should bear the KEBS standardization mark of quality. **Recommended Action:** Change of supplier. Procurement of steel products should be done only from well known suppliers.	(Rao & Vishnukanth, 2006)

Aggregates	**Quality Test:** Carrying out crushing strength. **Recommended Action:** Change of supplier. Aggregates purchases should be done from well known suppliers who stock high quality aggregates.	(Ayedoji, 2006) and (Rao & Vishnukanth, 2006)
Cement	**Quality Check**: Cement should have the KEBS standardization mark of quality. Storage should be in stacks of not more than ten bags and in a moisture free environment. **Recommended Action**: Change of supplier. Procurement of cement should be done only from well known hardwares/ suppliers.	(Rao & Vishnukanth, 2006)
Concrete	**Quality Test**: Carrying out compacting factor test, slump test, flow table test, cube test and vee bee test. **Recommended Action**: Batching of concrete should be done by volume and not by weight.	(Jagadala, 2006)

Source: Author (2021)

2.3 Construction Workmanship

2.3.1 An Overview of Construction Workmanship

The major cause of building collapses in the Kenyan construction industry according to NCA (2019) is poor workmanship which contributes 35% to building failures. This puts poor workmanship as a major cause of building collapses and consequently construction malpractices. Construction workmanship is defined as an accepted, specified or required standard of work to be achieved on a construction project (Davies & Jokiniemi, 2008). Alternatively it is the accepted, specified or required standard of work which a craftsman needs to to attain in a construction project. The timely delivery of a construction project within the specified budget and quality is dependent on the workmanship (The Hindu, 2006). The personal ability, experience and skill of a construction worker goes a long way to determine/ ascertain whether the particular construction worker will deliver quality workmanship or poor workmanship in the works assigned. Ogunmakin (2005) highlights that a construction worker either skilled or unskilled is the principal factor of

production. This is attributed to the fact that a construction worker amongst all the factors of production is the only factor which sets the general productivity level and creates value.

Workmanship in construction projects can classified into two key categories; quality workmanship and poor workmanship. Quality workmanship in a construction project usually means that the acceptable, specified or desired standard of work has been achieved. Poor workmanship on the other hand alludes that the desired, specified or acceptable quality of works has not been achieved. Poor workmanship examples are poor compaction of concrete, improper plumbing or using incorrect ratio of water-cement. The nature of poor workmanship is that it will eventually reveal itself in a construction project. This could be through honey combs in casted concrete, irregularities on painted surfaces, misaligned columns, leakages on the roof, cracks in walls and foundations, irregularities on fixed gypsum surfaces and in some instances injuries.

Construction workmen can be categorized into three types as follows; skilled construction worker, semi skilled construction worker and unskilled construction worker. A skilled construction worker is an individual who posseses the required level of experience, qualification, knowledge and skill in one trade or more trades as required by different authorities in the construction industry (NCA, 2014). In the Kenyan construction industry skilled workmen can be classified into four categories; general foreman, trade forman, gang leader and time keeper who also doubles as wages clerk. The general foreman is answerable to the site agent and is a craftsman with the appropriate construction experience (Fadamiro & Ogunsemi, 1996). He makes sure all the construction work on site is executed seamlessly. The trade foreman on the other hand is responsible for a certain trade on site for example fixing of reinforcement, masonary walling or plastering. The trade foreman is answerable to the general foreman and is responsible for ensuring his/ her craftsmen productive and efficient. A gang leader is the head-gang and he/ she is responsible for unskilled operatives and semi-skilled workers on site. The wages clerk and time keeper is in charge of recoring attendance of site operatives/ workers and preparing wages of site workers. Classification of skilled workmen is shown on table 2.3 on the next page.

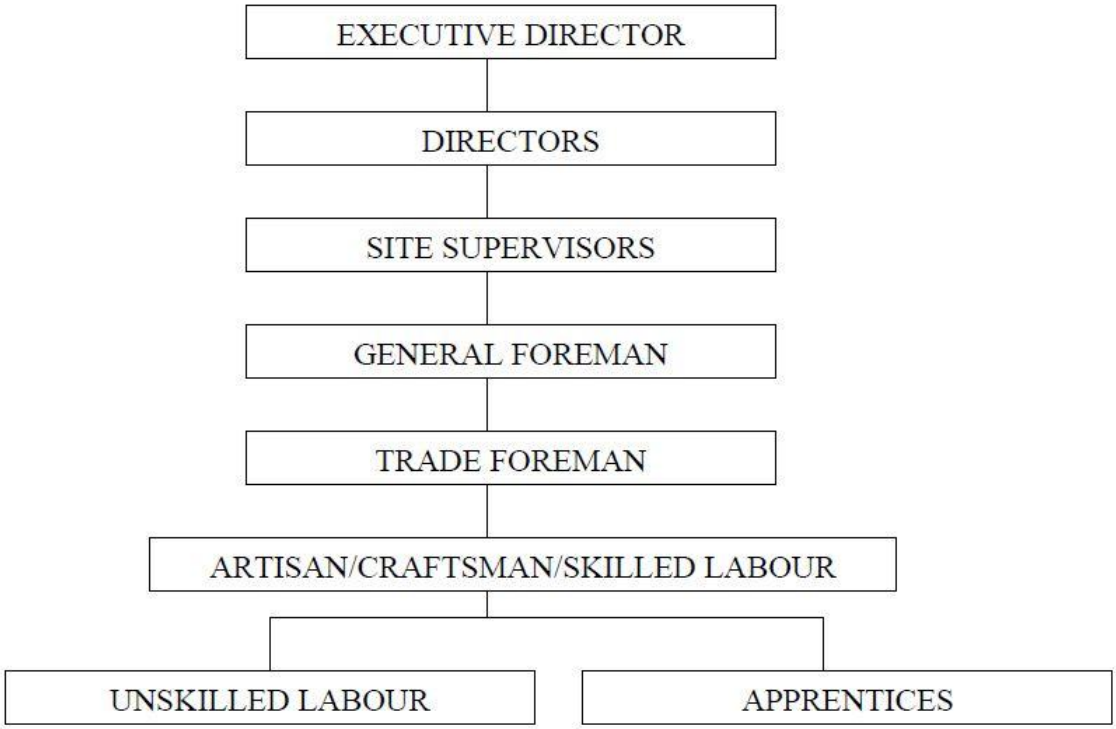
Table 2.3 Classification of skilled workmen

Workmen	Description
General Foreman	This is a craftsman with the relevant experience and is answerable to the site agent. He sees to it that that construction work on site runs smoothly (Fadamiro & Ogunsemi, 1996). He is also responsible for ensuring all the operatives are fully utilized and productive at all times.
Trade Foreman	This is an experienced craftsman in a particular trade and he/ she takes control of his/ her craftsmen engaged in the construction work such as carpentry, welding or bricklaying. The trade foreman is answerable to the general foreman and is responsible for ensuring his/ her craftsmen productive and efficient.
Gang Leader	The gang leader is also defined as the head-gang. She/ he is responsible for directing and controlling all unskilled labour and semi-skilled labour on the construction site.
Wages Clerk & Time Keeper	The wages clerk and time keeper is responsible for putting down the time of arrival and leaving of site employees. They also assist in the preparation of wages and consequently payment of wages.

Source: Author (2021)

A semi skilled construction worker on the other hand is an individual/ employee who posseses slightly the required level of experience, qualification, knowledge and skill in one trade or more trades as required by different authorities in the construction industry. The difference between a skilled and a semi skilled construction worker is usually in the years of experience. An unskilled construction worker refers to class of employee or an employee who is normally engaged for manual work. An unskilled construction worker is most commonly referred to as an unskilled draughtsman or a fundi and they usually posses little knowledge and skill. The structure of workmen in the construction industry is imperative for the realization of the desired objectives. It is thus necessary to thoroughly design the organization structure. Ogunmakin (2005) postulates that the construction industry must be arranged and planned well for effectiveness. Figure 2.1 on the next page shows the organization structure of a typical construction company.

Figure 2.1 Organization structure of a typical construction company



Source: Ogunmakin (2005)

Specification refers to a document which is usually prepared by either an estimator, a builder, a quantity surveyor or an architect in order to supplement drawings (Seeley, 1998). Specification usually adds on to the details provided in the bills of quantities and contract drawings. It delineates the quality and nature of materials as well as particulars of the construction work to be performed.According to Odulami (2002), specifications instruct the contractor how to direct, manage and contruct building construction work. Specification of workmanship in the Kenyan construction industry is usually done in the specifications section of bills of quantities. These specifications are put down in accordance with the British code of practice and British Standards (BS 8000-0:2014). Implementation on construction sites is the responsibility of the contractor under the supervision of the architect and the engineers. Section 32 of the Building Code (1968) also mentions that the manner of preparation, mixing, application or fixing of materials should be proper/ appropriate in a way which allows the material(s) to perform adequately the function(s) which it was intended for.

2.3.2 Nature of Poor Workmanship

The principle cause of building collapses in the Kenyan construction industry according to NCA (2019) is poor workmanship which contributes 35% to building failures. This puts poor workmanship as a major cause of building collapses and consequently construction malpractices. The best practice of ensuring quality workmanship is enforced in construction projects is by the engagement of skilled and accredited construction workers and supervisors. They in turn need to adhere to proper construction practices so as to ensure the construction output is of a superior quality. In addition, through conforming to stipulations of the British Standards (BS 8000-0:2014), workmanship in construction projects will be of proper quality.

Globally, the success of the construction industry is dependent on the quality of output. This puts construction workmanship as a significant factor in determining the performance of the construction industry. According to Ali & Wen (2011), the key methods of improving construction workmanship is the use of quality and adequate materials, proper communication, effective and strict supervision of construction works, knowledge transfer, adequate training and motivation of construction workers. The use of quality and adequate materials can be enforced through stringent quality controls/ quality assurance checks on materials starting from the supplier until when delivered to site. Effective supervision is put forward by Maloney (2002) as a major way of improving construction workmanship in terms of labour performance and output. A supervisor must control and monitor workmen activities so that the desired quality standards are achieved. In addition, the supervisor must know when to reprimand and when to cajole workers with the aim of achieving quality workmanship. He must possess honesty, faithfulness and proper managerial qualities. Through skills/ knowledge transfer, labourers acquire best practices on construction work from experienced experts. Knowledge transfer is a vital resource to a construction company because it adds on to the competitive advantage. Adequate training is the fourth method of improving construction workmanship put forward by Chan et al. (2006) and it entails providing practical training and quality education to construction workmen. Jayeola (2004), argues that motivation is the provision of favourable working conditions, staff care and incentives so as to cultivate morale.

Solutions put forward by Langat (2018) so as to improve workmanship in the construction industry in Kenya are as follows; skills transfer which enables construction workers work with emerging technologies and construction practices as the old technologies and practices become obsolete. For example, traditionally plumbers used lead and galvanized iron pipes but presently the industry is moving to Polypropylene Random Copolymer (PPR) pipes. Changing work methods has been recommended by Langat (2018) as a strategy which improves construction workmanship. It is necessary to change standard operating procedures, processes and work methods because the construction industry is also undergoing mechanization and a general change in the work environment. Additionally artisans employed in the construction industry will need increased knowledge and technical skills so as to respond to the changes in the work environment. Stakeholder engagement is also highlighted by Langat (2018) as a means which will improve construction workmanship in the construction industry. Private providers of skills which improve construction workmanship need to be encouraged and their capacity and efficiency improved. Donors and the government need to increase resource allocation to these institutions so as to boost their capacity to providing learning which will improve construction workmanship. Table 2.4 below shows strategies identified for dealing with poor workmanship.

Table 2.4: Strategies identified for dealing with Poor Workmanship

Item	Description	Sources
1.00	The use of quality and adequate materials in construction projects leads to proper quality of workmanship. Additionally, ensuring stringent quality controls/ quality assurance checks on materials starting from the supplier until when delivered to site will improve the quality of workmanship.	(Ayodeji, 2006)
2.00	Efficient supervision of workmen to ensure they adhere to the proper construction processes/ pratices. Effective supervision is a major way of improving construction workmanship in terms of labour performance and output. A supervisor must control and monitor workmen activities so that the desired quality standards of construction work are achieved. In addition, the supervisor must know when to reprimand and when to cajole workers with	(Maloney, 2002)

	the aim of achieving quality workmanship. He must possess honesty, faithfulness and proper managerial qualities	
3.00	Skills transfer improves workmanship by enabling construction workers to work with emerging technologies and construction practices as the old technologies and practices become obsolete. Through knowledge transfer, labourers acquire best practices on construction work from experienced experts. Knowledge transfer is a vital resource to a construction company because it adds on to the competitive advantage.	(Langat, 2018)
4.00	Adequate training for the use of the right machines and equipments for a particular task helps to improve workmanship in construction projects. Through adequate training, construction workers are able to institute measures to prevent against harsh weather elements which may have an effect/ interference on works done. For example use of gunny bags to help curing concrete columns thereby protecting against moisture loss on sunny days.	(Rao & Vishnukanth, 2006)
5.00	Motivation of workmen ensures they carry out construction work diligently and this raises the quality of workmanship in construction projects. Furthermore, motivation of construction workmen reduces instances of reworks and will consequently improve the quality of workmanship. Motivation can be achieved through positive incentives as follows; financial rewards to best performing/ diligent construction workers, inspiring respect and confidence by provision of an outlet for settling misunderstandings and grievances. Furthermore motivation can be attained by inspiring loyalty by fair discipline administration, fair rewards distribution and fairness in allocation of duties as well as developing sense of participation and harmony through joint consultation and sharing details of progress of activities and intended developments.	(Jayeola, 2004)

6.00	Changing work methods because it is necessary to change standard operating procedures, processes and work methods because the construction industry is also undergoing mechanization and a general change in the work environment	(Langat, 2018)
7.00	Stakeholder engagement	(Langat, 2018)

Source: Author (2021)

2.4 Building and Construction Contractors

2.4.1 An outline of Contractors in the Kenyan Construction industry

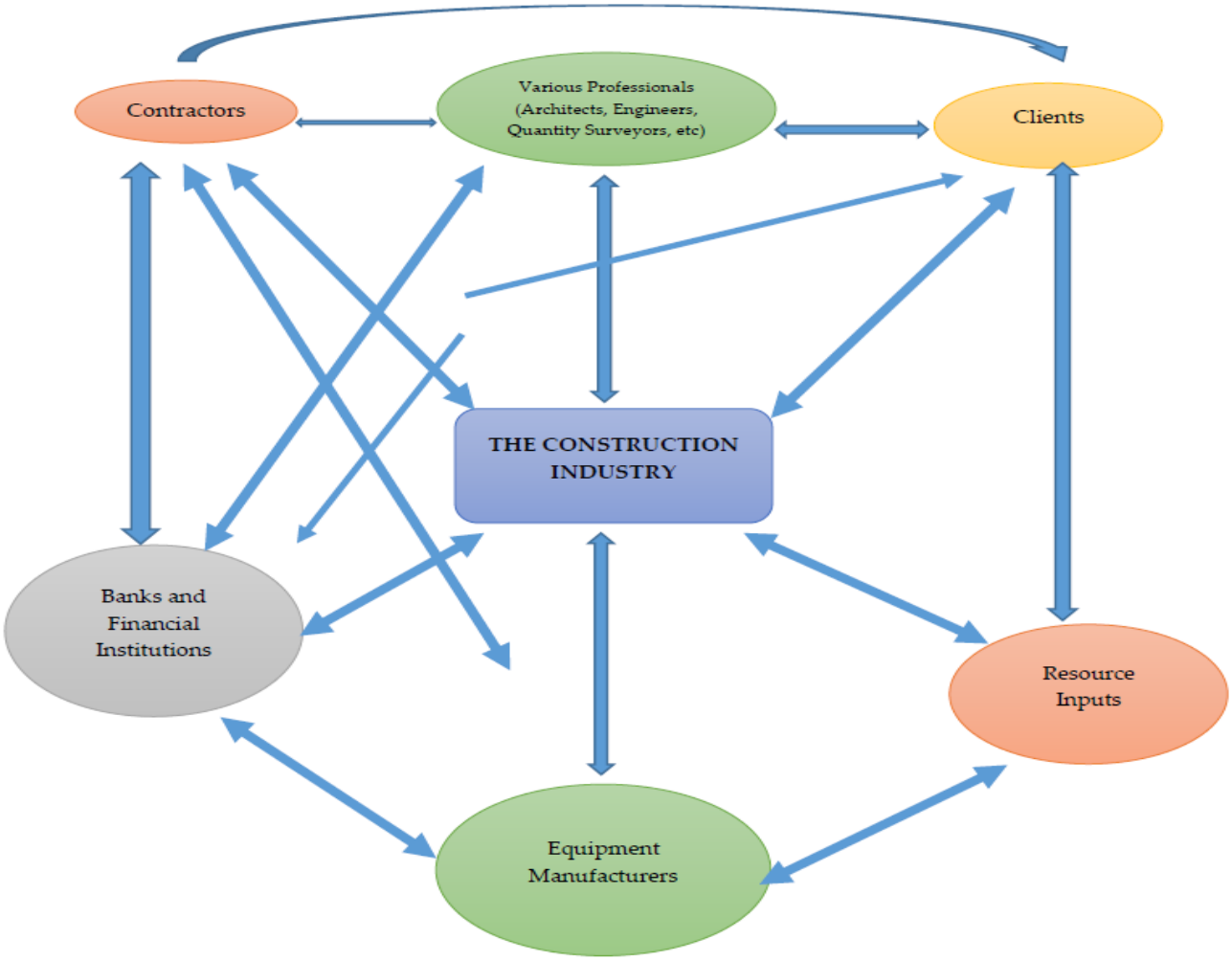
Davies & Jokiniemi (2008) defines a contractor as an organization or a person who carries out construction work(s) according to an agreement or a contract. Davies & Jokiniemi (2008) further lists examples of contractors as follows; subcontractor, specialized contractor, nominated subcontractor, management contractor, main contractor and electrical works contractor. Section 16 of the Act (NCA Act, 2011) outlines that a contractor is an individual who for a valuable consideration or reward carries out the erection, installation or construction of any structure above the ground, on the ground or below ground for another person. Additionally the said person could carry out alteration works for another person. Section 16 of the Act (NCA Act, 2011) further mentions that the said person supplies materials required for the works or controls the use, quality and type of materials supplied by another party. Moreover, the said person also supplies the labour required for the works.

The main reason for engaging a contractor for a construction project is that a client gets a competent person or an organization to carry out his project within the confines of his budget, timeframe and at the desired quality. This is because a contractor is able to leverage on his experience and industry connections to supply quality products, work with the appropriate equipment and obtain skilled labourers to execute the project. Sourcing contractors for a construction project in Kenya is quite easy because contractors are readily available. Contractors are engaged by clients to execute the client's construction project (s). Various professionals (Architects, Engineers and Quantity Surveyors) offer consultancy services to the client which helps in the execution of the client's project(s). An architect comes up with the building design which will be executed by the contractor. The architect further allocates space according to the client's

requirements and includes aesthestics according to environmental aspects, regional and cultural trends.

The client is the contractor's employer and they range from public institutions, private institutions, individuals, county governments or government parastatals (CAK, 2017). Ideally the client will come up with the project and share with the design team a project brief according to his requirements and budget allocation. The design team will then come up with solutions which meet the client's needs. Equipment and materials suppliers are the pipeline which provides contractors with the necessary equipment and material resources from the equipment and materials manufacturers. In most cases established contractors will usually have a business relationship with these equipment and material suppliers which permits them to hire equipments or purchase materials on credit terms (CAK, 2017). Financial institutions form a crucial part amongst the stakeholders in the construction industry. These financial institutions offer financial assistance in tems of loans and grants which are channeled to finance development projects. Financial institutions range from insurance companies, pension funds, financial companies, mortgage companies and banks. Figure 2.2 in the next page shows the inter-relationship of a contractor and other stakeholders in the construction industry.

Figure 2.2: Inter-relationship of a contractor and other stakeholders in the construction industry



Source: CAK (2017)

2.4.2 Categories of Building and Construction Contractors

In the Kenyan construction industry, contractors are categorized by the National Construction Authority (NCA) in different classes according to the contract value limits of works they can undertake. For example, a building contractor in NCA Class 2 can undertake construction works with a contract value of up to Ksh 500,000,000. A specialist contractor in the NCA Class 2 will execute specialist works with a value of up to Ksh 250,000,000 and a roads and other civil works contractor can undertake works with a value not exceeding Ksh 750,000,000. Table 2.5 on next page shows the categories of contractors in the Kenyan construction industry.

Table 2.5: Categories of contractors in the Kenyan construction industry

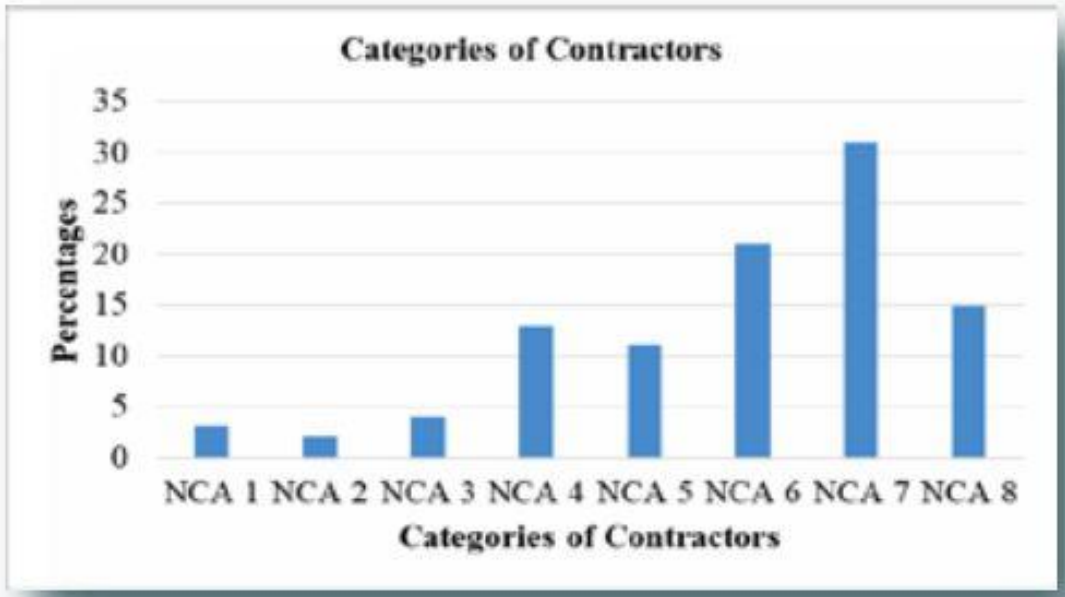
CLASS	CONSTRUCTION WORKS (VALUE LIMIT IN KSH)
NCA 1	Unlimited Contract Value
NCA 2	Contract value up to 500,000,000 (contractors–buildings), up to 250,000,000 contact value (specialist contractors), up to 750,000,000 (roads and other civil works).
NCA 3	Contract value limited to 300,000,000 (contractors –buildings), up to 150,000,000 contact value (specialist contractors) up to 500,000,000 (roads and other civil works)
NCA 4	Contract value limited to 200,000,000 (contractors –buildings), up to 100,000,000 (specialist contractors) up to 300,000,000 (roads and other civil works)
NCA 5	Contract value limited to 100,000,000 (contractors- buildings), up to 50,000,000 (specialist contractors) up to 200,000,000 (roads and other civil works)
NCA 6	Contract value limited to 50,000,000 (contractors – buildings) up to 20,000,000 (specialist –contractors) up to 100,000,000 (roads and other civil works)
NCA 7	Contract value limited to 20,000,000 (contractors – buildings), up to 10,000,000 (specialist –contractors) up to 50,000,000 (roads and other civil works).
NCA 8	Contract value limited to 10,000,000 (contractors – buildings), up to 5,000,000 (specialist –contractors) up to 20,000,000 (roads and other civil works).

Source: NCA (2021)

2.4.3 Statistics of Contractors in the Kenyan Construction Industry

Registration of contractors in the Kenyan construction sector started in 2012. The NCA (2019) highlights that the industry has more than 13,700 registered contractors. The largest proportion of registered contractors is taken up by building works contractors at 43%. Roads and other civil works contractors take up 34%. Contractors who carry out water and electrical works take up 10% and 9% respectively. Mechanical works contractors take up 3% of the proportion. The construction industry is dominated by small and medium enterprise contractors who account for 79% of the industry whereas large contractors take up 21% of the industry (NCA, 2019). Figure 2.3 on the next page shows the categories of contractors registered by the NCA.

Figure 2.3: Categories of Contractors registered by the NCA



Source: NCA, 2019

2.4.4 Quack Contractors in the Kenyan Construction Industry

A quack contractor is an organization or an individual who falsely represents itself or himself to be qualified and proceeds to execute building construction works as per the terms of an agreement or a contract (Davies & Jokiniemi, 2008). Quack contractors in the Kenyan construction industry arise because of clients who look to cut costs and instead of engaging registered contractors they instead take up quack persons to execute their construction projects. Quack contractors in many instances usually use substandard building materials or unskilled workers & supervisors or they will implement poor construction practices. In addition these quack contractors fail to adhere to statutory and safety requirements. The major cause of building collapses in the Kenyan construction industry according to NCA (2019) is poor workmanship which contributes 35% to building failure. Use of substandard materials in construction projects and poor structural design contributes 28% and 25% respectively to building collapses. Failure by contractors to adhere to statutory and safety requirements accounts for 9% of causes of building collapses. From the aforementioned, quack contractors contribute significantly to building collapses. The best practice of dealing with quack contractors is engaging only contractors registered by the NCA for construction works. Additionally, punishing quack contractors with severe fines will go a long

way in eradicating quack contractors. Gacheru (2015) mentions that giving the NCA prosecutorial powers to go after quack contractors will also go a long way in taming rogue/ quack contractors. Increasing the capacity of the NCA in terms of human resource and capital will help increase the frequency of the inspection and survey exercises of construction sites which are necessary to reveal sites with quack contractors (Oded, 2013).

2.4.5 Best Practice on Dealing with Quack Contractors

Globally the best practice of regulating quack contractors is through establishment of a regulatory framework which governs/ regulates the construction industry. By definition, a regulatory framework is the set of regulations and laws which stipulates the legal requirements to be complied with in a particular industry. These regulations and laws are usually complemented guidelines, standard directives and policies (Edinburgh, 2003). For example in Australia, the National Construction Code (NCC) is mandated by the Federal Government of Australia and the Australian building codes board to register contrcators and to ensure contractors adhere to all technical requirements prior to undertaking any building works or plumbing works. The NCC further sets the basic requirements by which all design of buildings, construction projects and performance of buildings should adhere to (Doloi et al., 2017). In the African context, the Construction Industry Development Board (CIDB) regulates construction projects in South Africa. The Construction Industry Development Board Act of 2000 (CIDB Act) stipulates that all the organs of the South African state should award construction projects only to contractors who are duly registered with this board. In addition, all tenders should be posted on the board's website.

In the Nigerian construction industry, it is common for construction contracts to be awarded to businessmen who are a front for the political class (Chendo & Obi, 2015). According to Chendo & Obi (2015), these businessmen then sell the construction contract to contractors who are unqualified and incompetent. They do this without ascertaining whether they are either competent or aware of the appropriate construction processes necessary for the particular construction project. The result of this is that construction projects are executed shoddily which can lead to subsequent collapse of the building (s). This led to the establishment of the Council of Registered Builders of Nigeria (CORBON). The Council of Registered Builders of Nigeria (CORBON) is tasked with regulating construction of buildings. The council is mandated to establish and control/ oversee the

construction industry. It is also mandated to coordinate the development of the construction industry. To achieve development of the construction industry, the Council of Registered Builders of Nigeria (CORBON) co-ordinates training programs for construction site supervisors and skilled construction workers. It also encourages improvement and standardization of construction techniques and practices (Fadason et al., 2017). Table 2.6 below shows the identified strategies of dealing with quack contractors.

Table 2.6: Strategies identified for dealing with Quack Contractors

Item	Description	Sources
1.00	Ensuring only contractors who are registered by the NCA undertake and execute construction works.	(Gacheru, 2015)
2.00	Punishing quack contractors with severe fines will go a long way in eradicating quack contractors.	(Gacheru, 2015)
3.00	Allowing/ giving the NCA prosecutorial powers to go after quack contractors will also go a long way in taming rogue/ quack contractors.	(Gacheru, 2015)
4.00	Increase the capacity of the NCA in terms of human resource and capital so that the authority can enforce its mandate effectively. This will help with the inspection and survey exercises of construction sites which are necessary to reveal sites with quack contractors.	(Oded, 2013)
5.00	Establishment of a regulatory framework which governs/ regulates the construction industry.	(Edinburgh, 2003)

Source: Author (2021)

2.5 Construction Workers

2.5.1 An Outline of Construction Workers

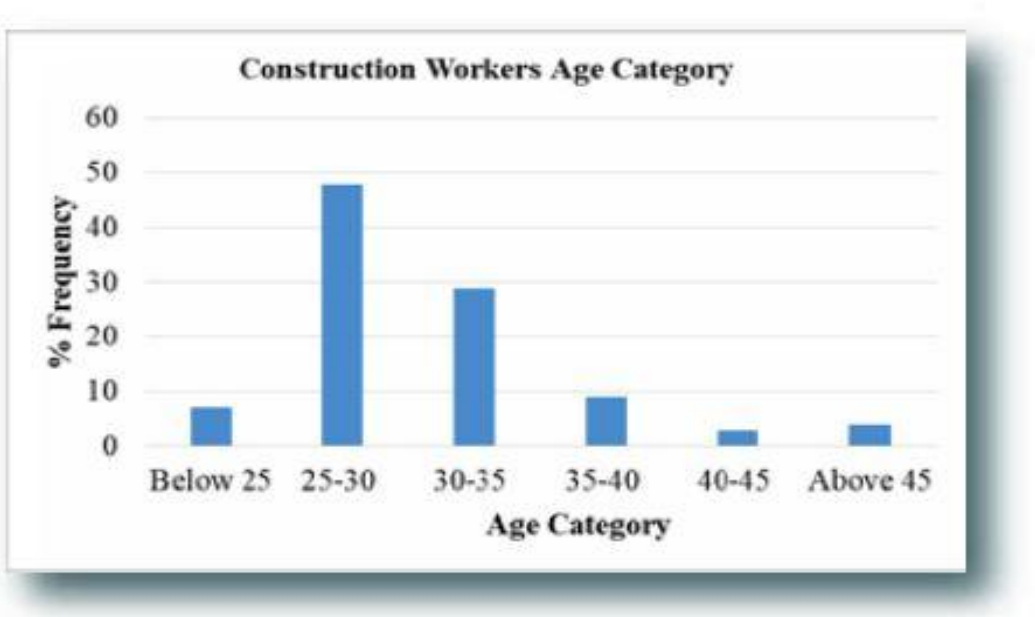
The NCA (2019) posits that a construction worker is either a professional, laborer or artisan who is employed in the construction industry and the associated infrastructure. A construction worker carries out several on-site tasks as follows; assisting in the operation of heavy equipment, loading and offloading building materials, erecting scaffolding and removing debris.

For the purpose of this study, a construction worker will be categorized into three types as follows; skilled construction worker, semi skilled construction worker and unskilled construction worker. A skilled construction worker is an individual who posseses the required level of experience, qualification, knowledge and skill in one trade or more trades as required by different authorities in the construction industry (NCA, 2014). A semi skilled construction worker on the other hand is an individual/ employee who posseses slightly the required level of experience, qualification, knowledge and skill in one trade or more trades as required by different authorities in the construction industry. The difference between a skilled and a semi skilled construction worker is usually in the years of experience. An unskilled construction worker refers to class of employee or an employee who is normally engaged for manual work. An unskilled construction worker is most commonly referred to as an unskilled draughtsman or a fundi and they usually posses little knowledge and skill.

2.5.2 Statistics of Construction Workers in the Kenyan Construction Industry

According to the NCA (2019), the Kenyan construction industry has more than 511,676 construction workers. The industry relies mainly on unskilled construction workers who account for 42% labour force employed in the sector. Skilled construction workers contribute to 25% of the employed labour force whereas semi skilled construction workers account for 33% of the labour force employed in the industry. The main age group of construction workers being 25-30 years. Figure 2.4 on the next page outlines the age category of construction workers.

Figure 2.4: Construction Workers Age Category



Source: NCA (2019)

The number of construction workers engaged averagely per NCA class categories is as follows; 37 skilled construction workers, 96 semi-skilled construction workers and 112 unskilled construction workers for contractors in NCA Class 1 (NCA, 2019). According to the NCA (2019) contractors in NCA Class 2 employ an average of 28 skilled construction workers, 8 semi-skilled construction workers and 13 unskilled construction workers. Contractors in NCA Class 3 and 4 employ less than 15 skilled construction workers and contractors under NCA Class 5 to 8 employ less than 10 skilled workers. The NCA (2019) highlights that amongst the workforce employed in the industry, there exists a gap in the skills set. The breakdown is as follows; site supervisors 1%, aluminium fabricators 1%, interior specialists artisans 2%, plant/ machine operators 2%, painters 10%, carpenters 10%, masons 12%, welders 13%, electricians 23% and plumbers 24%. The best practice of ensuring workforce competency is through regular training of construction workers. Table 2.7 on the next page outlines the classification of skilled and semi-skilled workers in Kenya.

Table 2.7: Classification of Skilled and Semi-Skilled Workers in Kenya

	Kenya		Nairobi	
Trade	**No. Of Workers**	**%**	**No. Of Workers**	**%**
Masons	75,612	55.1%	19,442	51.2%
Carpenters	16,841	12.3%	5,958	15.7%
Steel Fixers	6,939	5.1%	3,087	8.1%
Supervisors	6,115	4.5%	1,869	4.9%
Electricians	5,892	4.3%	1,769	4.7%
Painters	4,889	3.6%	1,737	4.6%
Welders	4,195	3.1%	1,308	3.4%
Plumbers	4,038	2.9%	1,193	3.1%
Machine Operators	2,010	1.5%	501	1.3%
Tile Fixers	1,577	1.1%	394	1.0%
Drivers	442	0.3%	89	0.2%
Surveyors	425	0.3%	80	0.2%
Glaziers	134	0.1%	53	0.1%
Scaffolders	100	0.1%	53	0.1%
Interior Decorators	93	0.1%	37	0.1%
Aluminium Technicians	90	0.1%	34	0.1%
Asphalt Specialists	85	0.1%	24	0.0%
Terrazo Fitters	75	0.1%	8	0.0%
Others	802	0.1%	2	0.3%
Totals	**130,354**	**94.8%**	**37,638**	**99.1%**

Source: NCA (2015)

2.5.3 Best Practices on Improving Construction Workers Competency

In the Kenyan construction industry, solutions put forward by Mitullah & Wachira (2003) to improve competency of construction workers include training of workers, improved motivation of workers, improved communication to workers, engaging skilled workers and fair compensation to workers. Globally, the best practice of improving competency amongst construction workers is knowledge transfer, skills training and sufficient motivation of construction workers (Ali & Wen,

2011). Knowledge transfer refers to the sharing of information regarding best practices/ processes of executing construction works from an experienced expert(s) to lesser skilled workers. It helps to bring awareness to potential users as regards new technology and improved knowledge overally. Skills training on the other hand imparts quality education and knowledge through either practical training from accredited institutions or apprenticeship (skills training under a skilled construction worker). Motivation of workers is a social process which is aimed at cultivating loyalty to supervisors, imporving morale and provision of a proper work environment required for the attainment of the desired objectives (Jayeola, 2004). According to Ifedolapo (2015) instituting a framework which accredits and registers construction workers and also caters to construction workers welfare will also help improve competency . Besides the execution of its other functions, the Construction Industry Development Board (CIDB) in Malaysia also accredits and offers training programs to construction workers and construction site supervisors (NCA, 2019). In India, the Building & Other Construction Workers Act (2016) caters for the welfare, health and safety concerns of construction workers, Additionally, it regulates he conditions of service and employment of construction workers (Doloi et al., 2017). This colossally improves the motivation of construction workers and subsequently improves their competency.

According to Langat (2018), on-site skills training (transfer of skills) and certification is the key way of improving construction workers competency in the Kenyan construction industry. The practice of transfer of skills and artisan training began with apprenticeship training. This is the oldest method of imparting skills to artisans among most of the trades. In the early ages this practice would take a period of five to eight years. An apprentice would work under a master craftsman bound with a contract agreement. With time this practice of apprenticeship training has changed to on-site training. Presently the intensity, duration and method of operation of on-site training is different across the different trades. In 2016, the NCA commenced ‘Be Sure, Jenga Smart’ an on-site training and accreditation drive meant to improve skills of atrisans and site supervisors as well as license their practice. The program was carried out by the NCA officers and was held on construction sites which adhered to NCA’s quality requirements and standards. The training focused on awareness of industrial rights, upholding professionalism, importance of wearing personal protective equipment and the need for accreditation. Several private companies have initiated such drives to impart necessary skills to artisans for example Kenya Master

Federation of Builders, Stanley, Black and Decker, Alibhai Shariff, Sadolin Paints, Housing Finance and Athi River Cement. According to Mugo (2017), the key benefit of training and consequently accrediting artisans is that it empowers artisans with a method of assessment and benchmarking on what is the acceptable, required or specified quality level of workmanship and output required by a construction contract. On-skills training is also referred to as on the job training or job instruction training. Table 2.8 below shows the strategies identified for dealing with construction workers competence.

Table 2.8: Strategies identified for dealing with construction workers competence

Item	Description	Sources
1.00	Knowledge transfer which entails the sharing of information regarding best practices/ processes of executing construction works from an experienced expert(s) to lesser skilled workers. It helps to bring awareness to potential users as regards new technology and improved knowledge overally.	(Langat, 2018)
2.00	Skills training comprises imparting of quality education and knowledge through either practical training from accredited institutions.	(Ayodeji, 2016)
3.00	Motivation of workers which is a social process which is aimed at cultivating loyalty to supervisors, imporving morale and provision of a proper work environment required for the attainment of the desired objectives.	(Jayeola, 2004)
4.00	Instituting a framework which accredits and registers construction workers and also caters to construction workers welfare will also help improve competency of these workers.	(Ifedolapo, 2015)
5.00	On-site skills training (transfer of skills) is the key method of improving construction workers competency.	(Langat, 2018)

Source: Author (2021)

2.6 Conceptual Framework

This section explained graphically the dependent and independent variables that can result to building collapse. The dependent variable in this study was the effectiveness of the NCA whereas the independent variables were substandard building materials, poor workmanship, quack

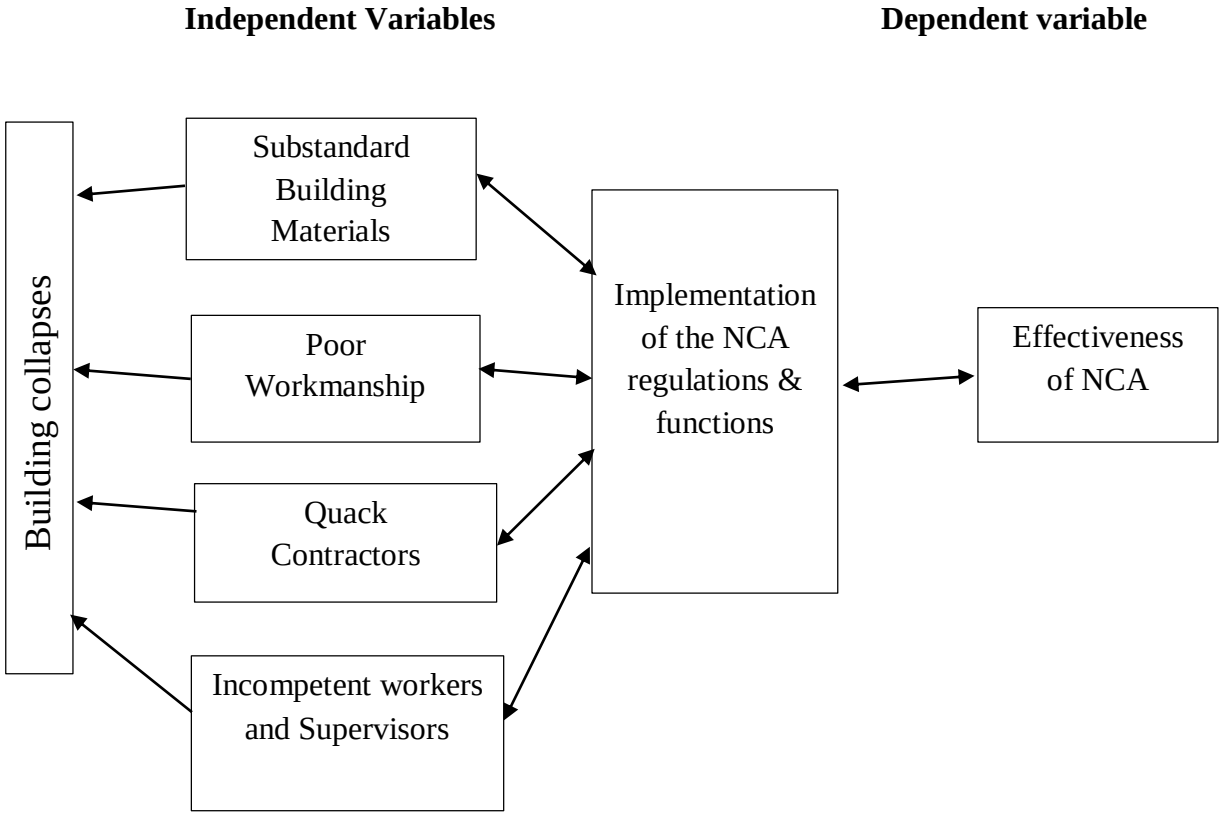
contractors and incompetenct construction workers and supervisors. This study was aimed at determining the effectiveness of the statutory body (the National Construction Authority) in curbing construction malpractices in the Kenyan construction industry through implementation of the regulatory framework - Act No. 41 of 2011 Laws of Kenya. The main presumption was that the National Construction Autority (NCA) operates effectively and has reduced the use of substandard building materials, poor workmanship, use of quack contractors to execute construction projcets and the use of incompetent construction workers. From the put down literature review, it has been well noted that the aforementioned factors contribute significantly to building collapses. According to the NCA (2019) poor workmanship contributes 35% to building failure. Use of substandard materials in construction projects and poor structural design contributes 28% and 25% respectively to building collapses. Failure by contractors to adhere to statutory and safety requirements accounts for 9% of causes of building collapses.

According to Blok and Herwijnen (2001) the functional lifespan of a building structure is the timeline/ duration in which the building project can perform as per the conditions of the purpose it was intended for. The quality & standards of the construction materials used in the construction of a building is thus crucial for the functionality of a building and to also prevent subsequent collapse of the structure. Construction workmanship is the accepted, specified or required standard of work to be achieved on a construction project (Davies & Jokiniemi, 2008). The timely delivery of a construction project within the specified budget and quality is dependent on the workmanship (The Hindu, 2006). Quality workmanship in a construction project usually means that the acceptable, specified or desired standard of work has been achieved. Poor workmanship on the other hand alludes that the desired, specified or acceptable quality of works has not been achieved. The best practice of ensuring quality workmanship is enforced in construction projects is by the engagement of skilled and accredited construction workers and supervisors. They in turn need to adhere to proper construction practices so as to ensure the construction output is of a superior quality. Solutions put forward by Langat (2018) so as to improve workmanship in the construction industry are effective supervision of construction works, knowledge transfer, adequate training and motivation of construction workers.

The research measured and attempted to determine the effect of the independent variables (building collapses, building materials and workmanship, quack contractors, workers and

supervisors) on the dependent variable which is the effectiveness of the NCA. In essence through the stringent enforcement of regulations, the independent variables (poor building materials and workmanship, quack contractors and incompetent workers and supervisors) can be reduced. Through the function of accrediting and certifying skilled workers and construction supervisors, the NCA ensures all labourers working in a construction project have the appropriate expertise required. This ensures delivery of a superior quality product (the building). By accrediting, 'registering contractors and regulating their professional undertakings, the NCA ensures that no quack contractors are involved in the delivery of a construction project. Both of these examples ensure there will be no instances of building collapses since there are neither quack contractors nor incompetent workers or supervisors involved in the construction processes of a project. A reduction of building collapses shows how effective the NCA is operating. On the other hand, lack of effectiveness translates to building collapses. The conceptual framework represents the dependent variable's (effectiveness of the NCA) relationship with the independent variables (poor building materials and workmanship, quack contractors, incompetent workers & supervisors and regulatory framework) which can be controlled by the proper implementation of the NCA mandates. This will subsequently result to less building collapses. Figure 2.5 on the next page shows the conceptual framework.

Figure 2.5: Conceptual Framework



Source: Author (2020)

2.6.1 Conceptual Definitions

Conceptual definitions are outlined on table 2.8 below.

Table 2.8: Conceptual Definitions

Item	Description
Substandard Building Materials	Substandard construction materials are materials which do not conform to the proper/ appropriate quality standards and their use in construction projects results to undesired consequences in the functional lifespan of a building

Poor Workmanship	Poor workmanship is a standard of work carried out on-site which does not meet the accepted or specified threshold which needs to be achieved on a construction project.
Quack Contractors	A quack contractor is an organization or a person who falsely acts like they are qualified for carrying out construction work(s). They do not possess either the requisite qualifications, experience or accreditation necessary for engaging in construction work(s).
Incompetent construction workers and Supervisors	The NCA (2019) defines that an incompetent construction worker is an individual who masquerades as either a professional, a laborer or an artisan in the construction industry. The said person carries out several on-site tasks which she/ he is not qualified for.

Source: Author (2021)

2.7 Conclusion

This chapter discussed construction malpractices which have been highlighted to be the key causes of building collapses in the Kenyan construction industry. It has highlighted construction materials sources, categories and how they are specified in construction projects. The chapter has further outlined the nature of substandard building materials as well as standards of materials quality and best practices on regulating building material standards. In relation to construction workmanship, the chapter has defined the categories of workmanship, how they are specified in construction projects and the nature of poor workmanship. Additionally, it has highlighted the standards of workmanship and the best practice on regulating building construction workmanship.

This chapter has reviewed reasons for engaging contractors/ sub contractors in construction projects and their categories. Consequently it has reviewed how quack contractors arise and the reasons why some clients opt for quack contractors in construction projects. Furthermore it has highlighted the best practice for dealing with quack contractors. Lastly, this chapter has assessed workforce competency in the construction industry, the nature of workforce competency, causes and consequences of incompetent workforce and best practice on dealing with workforce incompetency in the construction industry. The next chapter, chapter three, presents the research design and methodology which was adopted by the study to answer the research questions and hypotheses within the limits of related past literature as covered in this chapter.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the methodology which was undertaken in studying the problem under research. The first part, research design, outlines the general methodology implemented in the execution of the study from the start to the end. This entailed identifying the significant research methods whether quantitative and/ or qualitative respective to the objectives of the study. The second section defines target population from which the researcher will draw inferences in relation to the study. The third part highlights the sample size and sample techniques. Fourthly, the procedures and instruments to collect data are discussed as well as the tools of research which will be used in this study. The next section delineates sources of primary and secondary data. The sixth section introduces discussion on the reliability and the validity of the instruments which are employed in data collection. As regards the validity, this study employs the use of a pilot survey beofore the main questionnaires were issued out.The next section briefly outlines the methods which will be used in data analysis. The eighth section puts forward the parameters and guidelines which regulated the researcher's conduct during the period which the researcher was collecting data for this study. This chapter culminates with a summary which consists of all issues discussed.

3.2 Research Design

A research method/ design is based on a conceptual framework put forward in the literature review. The framework identifies independent and dependent variables. This illustrates the cause – effect relationship of the variables and any intervening institutions. This research implemented both the qualitative and quantitative methods in the analysis of data which was collected. These methods were used to test effect of the independent variables (substandard building materials, poor workmanship, quack contractors and incompetent construction workers and supervisors) on the dependent variable (effectiveness of the NCA). Quantitative methods were used for the closed - ended questions whereas qualitative methods will be used for the open – ended questions. Maxwell (2012) highlights that one key benefit of using a mixed research design approach is the balance of efficient data collection/ analyses processes. This research adopted both so as to derive the aforementioned benefit.

3.3 Target Population

By definition, a 'population is a whole unit/ group of individuals/ events/ objects that have a common trait to be investigated' whereas, the target population is 'the population from which a researcher draws inferences in relation to the study' (Mugenda and Mugenda, 2003). In this study, the target population were the members of professional associations, developers' association and regulatory authorities whom oversee the practice of experts in the built environment in Nairobi. They are as follows: Kenya Property Developers Association (KPDA), National Environmental Management Authority (NEMA), Architectural Association of Kenya (AAK), Nairobi City County (NCC), Institute of Construction Project Managers of Kenya (ICPMK), Board of Registration of Architects and Quantity Surveyors (BORAQS) and Engineers Board of Kenya (EBK). Mugenda & Mugenda (2003) highlights that a sample size which represents the entire population needs to have a minimum of thirty items. This study thus adopted a target population of 98 members which fits this threshold. This resulted to 14 members derived from each regulatory authority.

3.4 Sample Sizing and Sampling

In research, the sampling criteria employed is aimed at selecting a representative sample from the population from which the researcher draws meaningful interpretations about the entire population. Previous studies by Kothari (1990) postulates that the sample size should be optimum to ensure efficiency, reliability, representativeness and flexibility of the research. In sample size determination, the study assumed a 95% confidence with an acceptance error of interval ± 5%. Considering that the target population as 98, the sample size is calculated using the formula proposed by Nachimias (1996):

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq}$$

Where:

N= Population Size

n= Sample Size

p= Sample population estimated to have the characteristics being measured. Assume a 95% confidence level of the target population

q= (1-p)

e= Acceptance error, e=0.05, since the estimate should be 5% of the true value

Z= The standard normal deviate at the required confidence level i.e. 1.96

Therefore,

$$n = \frac{1.96^2 \text{ x } 0.95 \text{ x } (1\text{-}0.95) \text{ x } 98}{0.05^2 \text{ x } (98\text{-}1) + 1.96^2 \text{ x } 0.95 \text{ x } (1\text{-}0.95)}$$

$$n = \frac{17.88264}{0.42497}$$

$$n = 42.07$$

From the target population of 98, the sample size resulted to 42 respondents after factoring Nachimias (1996) formula. Therefore, six respondents from each institution were selected to be the target sample in the study. This is outlined in Table 3.0 below.

Table 3.0: Breakdown of Respondents

Role of Respondents	**Institution**	**Frequency**	**Percentage**
Developers	K.P.D.A.	6	14.2%
Environmental experts in the built environment	N.E.M.A.	6	14.2%
Architects	A.A.K	6	14.2%
NCC building regulations enforcement Officers	N.C.C	6	14.2%
Construction Project Managers	I.C.P.M.K.	6	14.2%
Quantity Surveyors	B.O.R.A.Q.S.	6	14.2%
Engineers	E.B.K	6	14.2%
Total No. of Respondents		**42**	**100%**

Source: Author (2021)

3.5 Data Collection Instruments and Procedures

The research used primary data collected through use of a questionnaire. This is because questionnaires made it easy to pose relevant questions to respondents in an articulated manner. This allowed users to respond to both 'close-ended' questions in the body and 'open-ended' questions in the conclusion. Close-ended questions were preferred for the body as they elicited responses that could be easily quantified and subjected to statistical analyses. Open-ended questions on the other hand were used for the conclusion since they allowed the respondent the choice to answer exploratory without having to select from the provided options. Questionnaires were sent to different institutions that housed the respondents. Once the questionnaires were filled, the respondents were requested to scan and email them to the researcher, even though manual follow-up was done after 3 weeks. The use of questionnaires was the most ideal data collection method for this study given our aim was to collect descriptive data (Gay 1981). Studies by Gay (1981) further postulates that the suitability of using questionnaires is that it offers the following

additional benefits; it is easy to cover a huge population with less time, costs and personnel. Furthermore, the respondents' anonymity may help to improve the honesty in their responses. The anonymity will be assured since respondents will not have to write their names. This helps reduce bias due to characteristic of interview while allowing the respondents ample time to fill in the questionnaire as accurately as possible.

The questionnaires to be used adopted the Likert Scale (strongly agree, agree, neither agree nor disagree, disagree and strongly disagree) method to pose questions for both closed ended questions. According to Garson (2013) argues that, a Likert scale is primarily employed in questionnaires with an aim to ascertain the respondents' preference/ degree of agreement to certain statements. Garson further states that the key strong point of a Likert Scale being the most universal and easily understood data collection method. Open ended questions for the conclusion provided the respondent the choice to answer exploratory without having to select from the provided options. Maxwell (2012) advances that open-ended questions provided opulent qualitative data from which the researcher generated a variety of insights considering the topic under study

3.6 Sources of Research Data

This study focused on these data sources:

- Primary Data - The researcher used questionnaires to gather actual information from respondents who are members of developers' associations, professional associations and regulatory bodies that oversee the practice of professionals in the built environment in Nairobi. They are as follows: Kenya Property Developers Association (KPDA), Nairobi City County (NCC), National Environmental Management Authority (NEMA), Board of Registration of Architects and Quantity Surveyors (BORAQS), Institute of Construction Project Managers of Kenya (ICPMK), Architectural Association of Kenya (AAK), and Engineers Board of Kenya (EBK).
- Secondary Data – The researcher collected and analyzed critically academic studies on both the dependent and independent variables. In addition, secondary data will be sourced from the records and journals within these institutions to help determine the effectiveness of NCA in reducing building collapses, reducing quack contractors, workers and supervisors and promoting the improvement of the construction industry.

3.7 Validity and Reliability of Data Collection Instruments.

Maxwell (2012) postulates that any measurement procedures i.e. questionnaire, test, or observation being reliable should result to the same result even on repeated trials. Mugenda and Mugenda (1999) advance an argument that validity is comprised of meaningfulness and accuracy of the inferences considering the research objectives. To ensure validity, the investigator guaranteed that all forms were fully evaluated to measure the topic of interest, effectiveness of the NCA in carrying out its operations with the intent of reducing building collapses, reducing quack contractors, workers and supervisors and promoting the improvement of the construction industry. This was done by conducting a pilot survey beforehand (before issuing the main questionnaires) on 10 built environment experts who were not part of the sample to check the content legitimacy of the questionnaires. From the pilot study, it was observed that our initial questionnaire 'the amount of years in the construction industry' gap for creating categories to be wider than expected, thus in the research, this was harmonized to ensure its validity. Through the pilot study, it was observed that doing follow-ups on questionnaires was important and sometimes personal deliveries to the target population were essential in actualizing of the project. The areas were modified and identified as being questions which have incorrect or vague instructions. Ideally the pilot survey was to test the correctness of the guidelines and the relevance of the survey.

3.8 Methods of Data Analysis

Once data was collected, Anderson and Poole (2001) argue that the person investigating should be able to correctly interpret the data reliably. The information in the questionnaires was entered into Microsoft Excel. The data was the imported into SPSS, Statistical Package for Social Sciences version 25, then cleaned, edited and coded. The data entered into SPSS was exposed to various statistical and graphical analysis. Descriptive statics were used to define features/ characteristics of the population. Data analysis employed the use of means, cross tabulation, chi-square and Kruskal Wallis (KW) tests. The results from the articulated analyses were presented using tables and figures.

3.9 Ethical Considerations

According to Fouka & Mantzorou (2011), ethics considerations in regards to research refers to the guidelines and parameters which regulates the researcher's conduct. These guidelines and parameters are aimed at guarding the dignity of the respondents and in addition stipulate the

necessary method of reporting the findings. The researcher acquired a letter of introduction authorizing the research from the institution. This letter delineates the need for data collection for this particular study. The data collected from the questionnaires has been utilized solely for academic uses and the targeted respondents provided consent. This information being confidential has been treated as such. The researcher further explained to the respondents that the study was neither backed by any sponsors nor was it biased (Blumberg et al., 2005). Moreover, the researcher outlined to the resondents the uses and the benefits to be derived by the study prior to issuing out the questionnaires as highlighted by Mugenda (2003) and Beauchamp & Childress (2001).

3.10 Conclusion

This study employed the use of questionnaires drafted with both quantitative and qualitative questions as the ideal method of collecting data. The targeted population were fourteen members each from Kenya Property Developers Association (KPDA), National Environmental Management Authority (NEMA), Architectural Association of Kenya (AAK), Nairobi City County (NCC), Institute of Construction Project Managers (ICPMK), Board of Registration of Architects and Quantity Surveyors (BORAQS) and Engineers Board of Kenya (EBK) resulting to 98 respondents. Nachimias (1996) formula was implemented resulting to 42 respondents as the sample size. This study attempted to obtain their view on whether the NCA has reduced the use of substandard building materials, poor workmanship, quack contractors and incompetent construction workers and supervisors. The information from the questionnaires was imported into Statistical Package for Social Sciences version 25, then cleaned, edited and coded. The data entered into SPSS was exposed to various statistical and graphical analysis. Descriptive statistics were used to define features/ characteristics of the population. Data analysis employed the use of means, cross tabulation, chi-square and Kruskal Wallis (KW) tests. The results from the articulated analyses are presented in the succeeding chapter, chapter four.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter will discuss and present the findings obtained/ extracted from the data analyzed after collection from the sample under study. Furthermore, this chapter will outline the interpretation of this study's findings in a clear and concise manner. This will be done within the limits of the pre determined study questions, study objectives and study proposition as set out in sections 1.3, 1.4 and 1.5 respectively in chapter one. Out of the total 42 questionnaires issued to professional associations, developers associations and regulatory organizations who oversee the professionals practice in the built environment in Nairobi City County, 35 questionnaires were returned. The information from the questionnaires was then imported into Statistical Package for Social Sciences version 25, then cleaned, edited and coded. The data entered into SPSS was exposed to various statistical and graphical analysis. Descriptive statics were used to define features/ characteristics of the population. Data analysis employed the use of means, cross tabulation, chi-square and Kruskal Wallis (KW) tests. The results from the articulated analyses were presented using tables and figures.

4.2 Response Rate and Sample Chatacteristics

The sample size of this study was 42 respondents as highlighted in section 3.4 above . The response rate was 83% as shown in table 4.1. This is because out of the 42 questionnaires issued to members of Kenya Property Developers Association (KPDA), National Environmental Management Authority (NEMA), Architectural Association of Kenya (AAK), Nairobi City County (NCC), Institute of Construction Project Managers of Kenya (ICPMK), Board of Registration of Architects and Quantity Surveyors (BORAQS) and Engineers Board of Kenya (EBK), 35 questionnaires were returned. Seven respondents failed to return questionnaires issued out to them for unknown reasons. The response was deemed sufficient as argued by (Mugenda & Mugenda, 1999), that 'a response rate of above 70% is excellent/ representative'. This is shown in Table 4.1 on the next page.

Table 4.1: Respondents Response rate

Type of Response	Number	Percentage
Responded questionnaires	35	83.33 %
Non-responded questionnaires	7	16.67%
Total No. of Respondents	**42**	**100%**

Source: Author (2021)

This study further sought to determine the characteristics of the respondents. This was done particularly by identification of the respondents number of years of practice in the construction industry and the respondents profession. Out of the 35 respondents, 10(29%) respondents had an experience between 1-3 years, 15 (42%) respondents had an experience of between 3-5 years and 10 (29%) respondents had more than 5 years experience in the construction industry. Table 4.2 below shows respondents experience in the construction industry.

Table 4.2: Respondents Experience in the Construction Industry

Experience Category	Frequency	Percentage
1-3 years	10	29%
3-5 years	15	42%
More than 5 years	10	29%
Total No. of Respondents	**35**	**100%**

Source: Author (2021)

In respect to the respondents profession, among the 35 respondents who returned the questionnaires, 6 (17%) were developers, 3 (9%) were NEMA enviromentalists, 6 (17%) were architects, 2 (6%) were Nairobi City County officers, 6 (17%) were construction project managers, 6 (17%) were quantity surveyors and 6 (17%) were engineers. Table 4.3 on the next page shows the profession of the respondents.

Table 4.3: Respondents Role in the Construction Industry

Role of Respondents	Frequency	Percentage
Developers	6	17%
Environmentalists	3	9%
Architects	6	17%
NCC Officers	2	6%
Construction Project Managers	6	17%
Quantity Surveyors	6	17%
Engineers	6	17%
Total No. of Respondents	**35**	**100%**

Source: Author (2021)

4.3 Cause of building collapse

Cross tabulations were done to investigate the opinion of respondents on causes of building collapse depending on their time in the industry and if they have been involved in a construction project. It was found that 6(17%) respondents have been involved in a project that collapsed while 29(83%) were never involved in projects that collapsed. For those that were involved in collapsed projects, they said the main cause was the use of substandard building materials (83.3%) & incompetent supervisors (16.7%). For those whose projects never collapsed, they suggested that the main reasons why a construction project would collapse were; 69% the use of substandard building materials, 17.2% poor workmanship, 6.9% quack contractors, 3.4% use of incompetent workers and 3.4% stated the use of incompetent supervisors. Table 4.4 on the next page outlines the aforementioned.

Table 4.4: A cross tabulation of time in construction industry, project collapse and opinion on causes of building collapse.

Time in the construction industry			In your opinion, what was the cause of collapse ?					Total
			Substandard building materials	Poor workmanship	Quack contractors	Incompetent workers	Incompetent supervisors	
1 - 3 years	Has a project which you have been involved in ever collapsed ?	Yes	1 (100%)					1 (100%)
		No	8 (88.9%)				1 (11.1%)	9 (100%)
3 - 5 years	Has a project which you have been involved in ever collapsed ?	Yes	1 (50%)				1 (50%)	2 (100%)
		No	10 (76.9%)	2 (15.4%)	1 (7.7%)			13 (100%)
More than 5 years	Has a project which you have been involved in ever collapsed ?	Yes	3 (100%)					3 (100%)
		No	2 (28.6%)	3 (42.9%)	1 (14.3%)	1 (14.3%)		7 (100%)
Total	Has a project which you have been involved in ever collapsed ?	Yes	5 (83.3%)				1 (16.7%)	6 (100%)
		No	20 (69%)	5 (17.2%)	2 (6.9%)	1 (3.4%)	1 (3.4%)	29 (100%)

Source: Author (2020)

4.4 NCA competencies

A Likert scale was used to investigate the NCA's competencies. From the findings of the study 40% agreed & 5.7% strongly agreed, that NCA has reduced the use of substandard construction materials while 40% disagreed. 48.6% agreed that NCA has improved the quality of workmanship in construction projects while 37.1% disagreed. 34.3% agreed that NCA has reduced incompetent construction workers while 42.9% disagreed. 51.4% of the respondents agreed that NCA has reduced incompetent construction supervisors and 14.3% disagreed. All the respondents agreed that NCA has reduced quack contractors in the construction industry. Table 4.5 on the next page summarizes the findings of the Likert scale.

Table 4.5: NCA competencies

		Frequency	Percent (%)
The NCA has reduced the use of substandard construction materials.	Strongly agree	2	5.7
	Agree	14	40.0
	Undecided	5	14.3
	Disagree	14	40.0
The NCA has improved the quality of workmanship in construction projects.	Strongly agree	1	2.9
	Agree	17	48.6
	Undecided	4	11.4
	Disagree	13	37.1
The NCA has reduced quack contractors.	Strongly agree	16	45.7
	Agree	19	54.3
The NCA has reduced incompetent construction workers	Agree	12	34.3
	Undecided	5	14.3
	Disagree	15	42.9
	Strongly disagree	3	8.6
The NCA has reduced incompetent construction supervisors	Strongly agree	9	25.7
	Agree	18	51.4
	Undecided	3	8.6
	Disagree	5	14.3

Source: Author (2020)

Investigating the null hypothesis that; The National Construction Authority through its operations has not reduced use of inferior building supplies, poor workmanship and reduction of quack contractors, workers and supervisors. A Kruskal Wallis test was used in testing the 'statistically significant differences between two or more groups of independent variables on a continuous or ordinal dependent variable'.

Given our data was non-parametric, the Kruskal-Wallis H test ("one-way ANOVA on ranks") was used in finding whether there were significant differences between the two/ many categories of the independent variable measured on a continuous dependent variable. Considering the level of satisfaction on how the NCA carries out its mandate on curbing construction malpractices as the ordinal dependent variable. From the Kruskal Wallis test ($p>0.05$), we fail to reject the null hypothesis and conclude that NCA has not reduced the use of substandard building materials, poor workmanship and reduction of quack contractors in the construction industry. Furthermore, the H test suggest that we reject the null hypothesis and infer that the NCA has reduced incompetent

construction workers and incompetent construction supervisors this is because the ($p \leq 0.05$). This is shown on Table 4.6 below.

Table 4.6: Kruskal Wallis Test

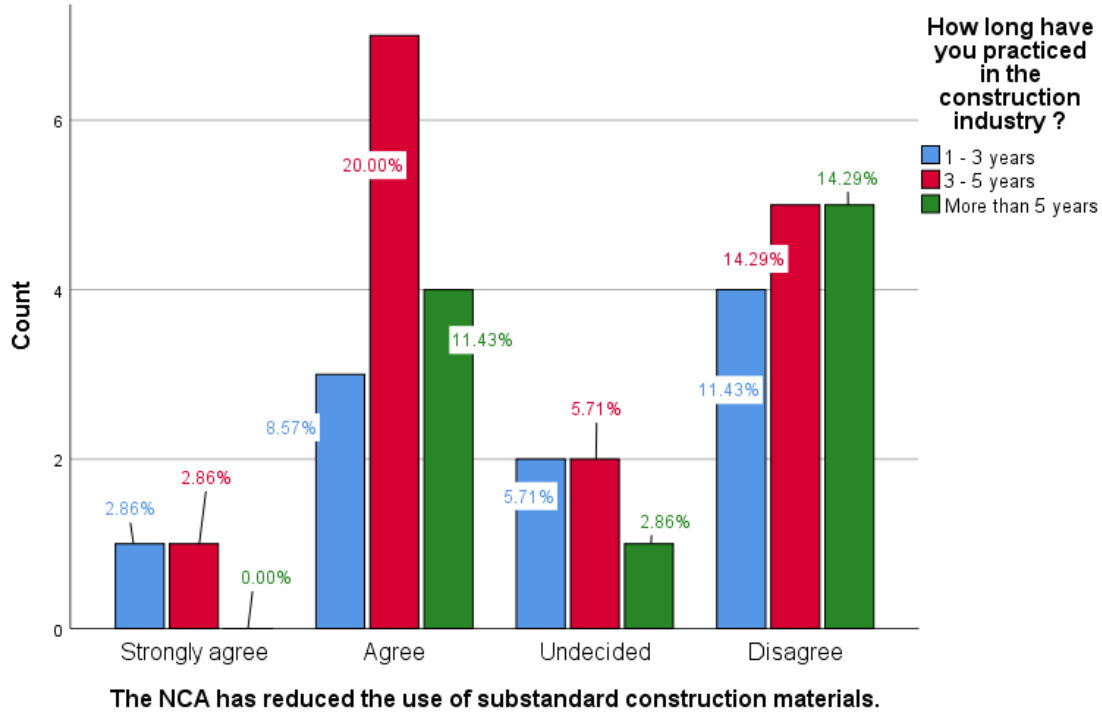
Test Statistics [a, b]					
	The NCA has reduced the use of substandard construction materials.	The NCA has improved the quality of workmanship in construction projects.	The NCA has reduced quack contractors.	The NCA has reduced incompetent construction workers	The NCA has reduced incompetent construction supervisors
Kruskal-Wallis H	0.372	3.407	0.435	7.853	6.618
Degrees of freedom	1	1	1	1	1
Asymp. Sig.	0.542	0.065	0.510	0.005	0.010
a. Kruskal-Wallis Test					
b. Grouping Variable: Are you satisfied with the way the NCA carries out its mandates in regards curbing construction malpractices					

Source: Author (2020)

4.4.1 Use of substandard construction materials

From the study done, 14.29% disagreed that NCA has reduced the use of substandard construction materials for those respondents that have been in the industry for 3 - 5 years and more than 5 years respectively. 20% of the respondents that have been in the construction industry for 3 – 5 years agreed that NCA has reduced the use of substandard construction materials while the same number of respondents disagreed. Those respondents that have been in the industry for 1 – 3 years, 11.43% dis-agreed that NCA has reduced the use of substandard construction materials. This is shown on Figure 4.1 on the next page.

Figure 4.1: A bar graph showing years of practice in the construction industry and opinion on NCA's reduction in use of substandard materials.



Source: Author (2020)

A chi-square test shown in table 4.7 investigated differences in the expected frequencies and the observed frequencies was statistically significant between in the categories of the cross tabulation between time in the construction industry and whether NCA has reduced the use of substandard building materials.

Asymptotically, the sampling designs/ methods approximates the data to be a chi-square distribution given there is an increase in the sample. From the test, we conclude that there were no noteworthy differences amid the expected and observed frequencies of the cross tabulation of time in construction industry and opinion on NCA's reduction in use of substandard materials given time spent in the industry, this is because the ($p>0.05$). This is shown on Table 4.7 on the next page.

Table 4.7: Chi-Square table of time in construction industry and opinion on NCA's reduction in use of substandard materials.

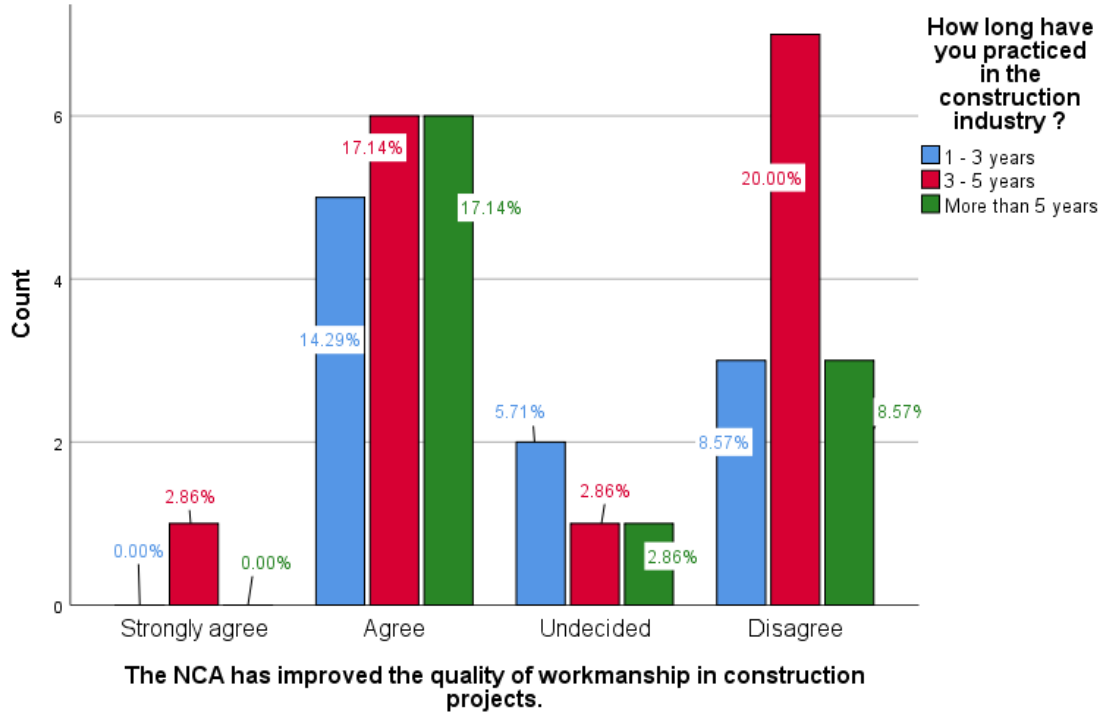
Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi - Square	8.671[a]	9	0.468
Likelihood Ratio	10.714	9	0.296
Linear – by – Linear Association	0.769	1	0.381
Number of Valid Cases	35		
a. 14 cells (87.5%) have expected count less than 5. The minimum expected count is .23.			

Source: Author (2020)

4.4.2 Quality of workmanship

The findings indicate that 17.14% of the respondents who agreed that NCA has improved the quality of workmanship in construction projects had been in the industry for a period of 3 – 5 years, 20% of the respondents that had been in the industry for 3 – 5 years disagreed that NCA has improved the quality of workmanship in construction projects. Those that had been in the industry for a period of 3 –5 years and more than 5 years, 17.14% agreed that NCA has improved the quality of workmanship in construction projects respectively. This is shown in Figure 4.2 on the next page.

Figure 4.2: A bar graph showing years of practice in the construction industry and opinion on NCA on improving the quality of workmanship in construction projects.



Source: Author (2020)

In the determination of 'significant differences between the expected and observed frequencies' among the categories of the cross tabulation between time in the construction industry and whether NCA has improved workmanship, a chi-square test was carried out. From the test, we concluded that there were no significant differences amid the expected and observed frequencies of the cross tabulation of time in construction industry and whether NCA has improved workmanship in the construction industry, this is because the ($p>0.05$). Table 4.8 on the next page shows the aforementioned.

Table 4.8: Chi-Square table of time in construction industry and whether NCA has improved workmanship in the construction industry.

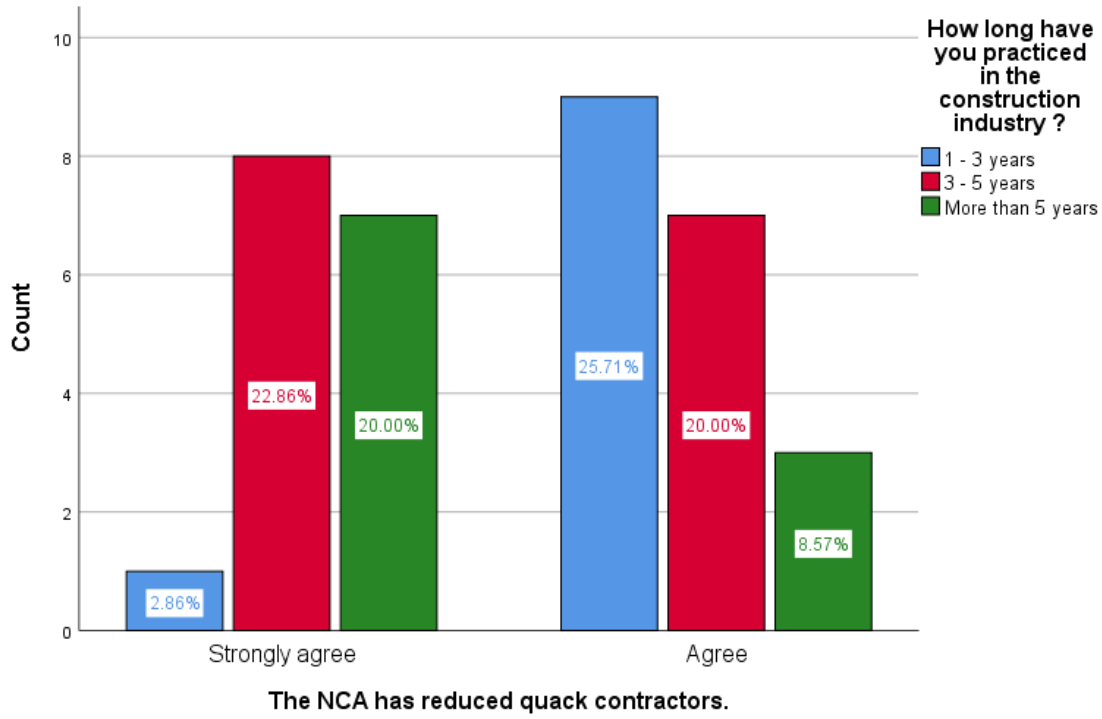
Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi – Square	6.005[a]	9	0.739
Likelihood Ratio	6.400	9	0.699
Linear – by – Linear Association	0.613	1	0.434
Number of Valid Cases	35		
a. 15 cells (93.8%) have expected count less than 5. The minimum expected count is .11.			

Source: Author (2020)

4.4.3 Quack contractors

For those respondents who have been in the industry for 1 to 3 years, 25.71% agreed that NCA has reduced quack contractors in the construction industry. For the respondents who have been in the industry for more than 5 years, 20% strongly agreed that NCA has reduced quack contractors. Those respondents who have been in the industry between 3 – 5 years, 22.86% agreed that NCA has reduced quack contractors (Figure 4.3 on the next page). A chi-square test is aimed at determining 'significant differences between the expected frequencies and the observed frequencies' in the categories of the cross tabulation between time in the construction industry and whether NCA has reduced quack contractors. There were no significant ($p>0.05$) differences between the two variables and thus NCA has reduced the use of quack contractors. This is shown in Table 4.9 on the next page.

Figure 4.3: A bar graph showing years of practice in the construction industry and opinion on whether the NCA has reduced quack contractors.



Source: Author (2020)

Table 4.9: Chi-Square table of time in construction industry and whether NCA has reduced quack contractors in the construction industry.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi - Square	6.311[a]	3	.097
Likelihood Ratio	7.037	3	.071
Linear – by – Linear Association	2.639	1	.104
Number of Valid Cases	35		
a. 6 cells (75.0%) have expected count less than 5. The minimum expected count is 1.83.			

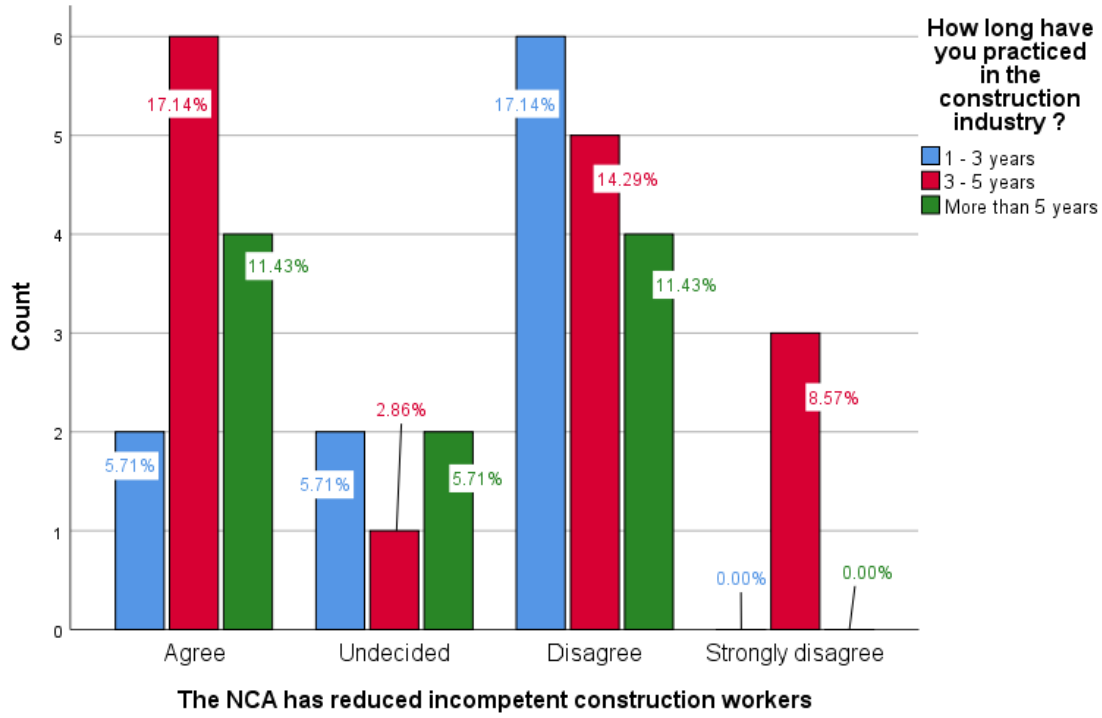
Source: Author (2020)

4.4.4 Use of incompetent construction workers

Those respondents who have been in the industry for 3 to 5 years, 17.14% agreed that the NCA has reduced the use of incompetent construction workers whereas, those that have been in the industry for 1 to 3 years 17.14% disagreed that the NCA has reduced the use of incompetent

construction workers. Those that have been in the construction industry for more than 5 years 11.43% disagreed that the NCA has reduced the use of incompetent construction workers while the same number of respondents agreed that the NCA has reduced the use of incompetent construction workers. Even though there were some that disagreed as shown on Figure 4.4 . A chi-square test was used in determination of 'significant differences between the expected frequencies and the observed frequencies' in the categories of the cross tabulation between time in the construction industry and whether NCA has reduced the use of incompetent construction workers. There were no significant ($p>0.05$) differences between the two variables and thus NCA has made some improvement but has not reduced the use of incompetent construction workers in the industry. This is shown on Table 4.10 on the next page.

Figure 4.4: A bar graph showing years of practice in the construction industry and opinion on whether the NCA has reduced the use of incompetent construction workers.



Source: Author (2020)

Table 4.10: Chi-Square table of time in construction industry and whether NCA has reduced use of incompetent workers in the construction industry.

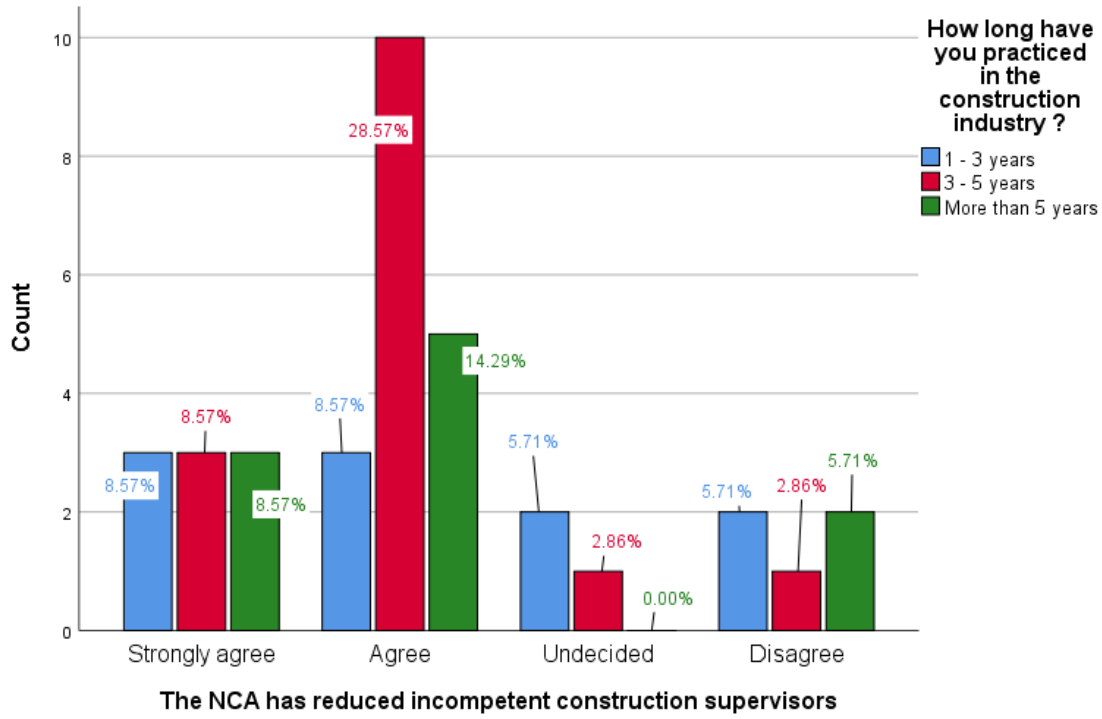
Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi - Square	14.519[a]	9	0.105
Likelihood Ratio	13.665	9	0.135
Linear – by – Linear Association	5.600	1	0.018
Number of Valid Cases	35		
a. 15 cells (93.8%) have expected count less than 5. The minimum expected count is .34.			

Source: Author (2020)

4.4.5 Use of incompetent construction supervisors

Those respondents who have been in the industry for 3 to 5 years 28.57% agreed that the NCA has reduced the use of incompetent construction supervisors. Those that have been in the construction industry for more than 5 years 14.29% agreed that the NCA has reduced the use of incompetent construction supervisors. Those respondents that have been in the construction industry generally agreed that the NCA has reduced the use of incompetent construction supervisors. This is outlined in Figure 4.5 on the next page. A chi-square test was carried out to determine 'significant differences between the expected frequencies and the observed frequencies' in the categories of the cross tabulation between time in the construction industry and whether NCA has reduced the use of incompetent construction supervisors. There were significant ($p \leq 0.05$) differences between the two variables and thus NCA has reduced the use of incompetent construction supervisors. This is shown in table 4.11 on the next page.

Figure 4.5: A bar graph showing years of practice in the construction industry and opinion on whether the NCA has reduced use of incompetent construction supervisors



Source: Author (2020)

Table 4.11: Chi-Square table of time in construction industry and whether NCA has reduced the use of incompetent construction supervisors.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi – Square	17.250[a]	9	0.045
Likelihood Ratio	17.532	9	0.041
Linear – by – Linear Association	2.191	1	0.139
Number of Valid Cases	35		
a. 15 cells (93.8%) have expected count less than 5. The minimum expected count is .34.			

Source: Author (2020)

4.5 Ways to improve the effectiveness of the National Construction Authority (NCA)

Qualitative analysis was used to determine conducts to advance the effectiveness of the National Construction Authority (NCA) to actualize their mandate. Majority (88.4%) of the respondents cited corruption and that the NCA should enact more tough measures on corrupt NCA officials,

contractors and clients. Corruption being a man-made factor results to the use of substandard construction materials, quack contractors, use of incompetent construction workers and use of incompetent construction supervisors. Furthermore, in order to curb corruption some respondents suggested reshuffling the NCA every quarter so as to change officials who may have been corrupt. Some respondents cited that giving prosecutorial power to the NCA to arrest errant contractors & construction supervisors, may improve service delivery in the NCA. Additionally, they proposed that corrupt officials, contractors and clients should be investigated, arrested and removed from office and barred from conducting any construction activities. The respondents that had been in the industry for more than 5 years suggested to improve NCA budget so that the NCA can increase the frequency of inspections on ongoing construction projects. From the study done, the respondents that had been in the industry for a period of 1 to 3 years suggested increase in the proper construction processes seminars/ conferences offered by the NCA so as to increase awareness amongst contractors and construction workers.

4.6 Conclusion

This chapter has presented findings from data analysis and has further discussed these findings. Out of the 42 questionnaires which have been issued out, 35 questionnaires were returned. Seven respondents failed to return questionnaires issued out to them for unknown reason. The information extracted from the questionnaires has been imported into Statistical Package for Social Sciences version 25, then cleaned, edited and coded. The data entered into SPSS has been exposed to various statistical and graphical analysis. Descriptive statics have been used to define features/ characteristics of the population. Data analysis has employed the use of means, cross tabulation, chi-square and Kruskal Wallis (KW) tests. The results from the articulated analyses have been presented using tables and figures. The next chapter, chapter 5, will summarize the findings in respect to the predetermined study questions, study objectives and study proposition as set out in sections 1.3, 1.4 and 1.5 in chapter one. Furthermore, it will present conclusions derived from the findings in Chapter 4.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study is aimed at investigating the effectiveness of the National Construction Authority (NCA) in curbing malpractices in the Kenyan construction industry and in particular Nairobi City County. This has been done by testing the effect of the independent variables; substandard construction materials, poor workmanship, quack contractors and incompetent construction workers and supervisors on the dependent variable; effectiveness of the NCA. The objectives of this study were to establish the extent to which the National Construction Authority (NCA) has been able to reduce substandard building materials, improved workmanship, reduced quack contractors and incompetent construction workers in the construction industry. The study further attempted to test the alternative hypothesis (H_a), that the National Construction Authority (NCA) through its operations has significantly reduced the use of substandard building materials, poor workmanship and quack contractors, workers and supervisors in the construction industry. The information presented in this chapter comprises of discussions generated from the results presented in chapter four, and general conclusions/ recommendations drawn from the discussions. The structure of this chapter is in tandem with the study objectives and proposition as highlighted in sections 1.4 and 1.5 respectively. .

5.2 Discussion and Recommendations as Per Objectives

The findings of the study are highlighted below:

Objective One

To establish the extent to which the National Construction Authority (NCA) has been able to reduce the use of substandard building materials in the construction industry.

The study conducted indicated that NCA has been able to; reduce the practice of using substandard building materials. This is because the *p value is greater than 0.05 ($p > 0.05$)* as shown on table

4.6. The second major cause of building collapses in the Kenyan construction industry according to NCA (2019) is the use of substandard materials in construction projects. Majority of the respondents of this study attributed substandard building materials to be the most causative agent of building collapse. Given the high demand for housing in Nairobi city, unscrupulous business men/ women usually flout NCA regulations. In Kenya there is a common practice among contractors to mix both standard and substandard building material which in turn lead to building collapse. After eight buildings collapsed back in 2015, the NCA did an audit in Nairobi city and found that 58% of the buildings in Nairobi were unfit for habitation (NCA, 2019).

Objective Two

To establish the extent to which the National Construction Authority (NCA) has improved workmanship in the construction industry.

The study carried out indicates that the NCA has been able to improve the workmanship in construction projects in the recent years. This is because the *p value is greater than 0.05 ($p > 0.05$)* as shown in Table 4.3.). The major cause of building collapses in the Kenyan construction industry according to NCA (2019) is poor workmanship which contributes 35% to building failure. Workmanship is a key determinant on the quality aspect in construction projects. In Kenya, there is a challenge in enforcing the NCA's mandate stipulates that, "the authority shall register skilled construction workers under one or more of the classes or works provided in the Third Schedule of the Act", Kenya Gazette Supplement (2014). Studies done by Transparency International (2014), found that contractors and owners of buildings give bribes to the Nairobi City County Government officials to bypass inspection of construction work done (Ndumia, 2015). In the Kenyan industry, use of unskilled labour is a common occurrence given its cheapness. This can have adverse side effects given their lack of knowledge on quality construction practices. Furthermore, the availability of substandard construction materials in the market superimposes the fact that NCA has not reduced their use in construction.

Objective Three

To establish the extent to which the NCA has been able to reduce quack contractors in the construction industry.

The National Construction Authority (NCA) is responsible in regulating registration and renewal of contracts to contractors. This is constituted in the 2011 Kenyan laws under Act No. 41 (G. O. K., 2011), and it 'requires the authority to publish and maintain a public list of registered contractors for licensing check on each contractor'. The study done indicated that the NCA has reduced the number of quack contractors in the industry (*p value > 0.05)* as shown in table 4.6. Studies by (Gacheru, 2015) in Mombasa county found; inadequate transparency from the authority and inadequate sensitization of contractors on the expectations of the NCA to be major cause of non-compliance to NCA's rules and regulation regarding construction. Furthermore, (Gacheru, 2015) noted; high registration fees, high construction levies, corruption, inadequacy among contractors to ensure compliance and poor attitudes were some of the challenges confronted by the contractor in adherence to NCA rules and guidelines.

Objective Four

To establish the extent to which the NCA has been able to reduce incompetent construction workers and supervisors in the construction industry

The study done indicated that the NCA has not reduced incompetent construction workers and supervisors in the construction industry This is because the *p value* is lesser than 0.05 as shown in Table 4.6. The NCA's failure to reduce incompetent construction supervisors and workers can be brought down to inadequacy of a regulatory framework or incompetence by the authority's officials. Studies by (Robert *et al.*, 2007; 2011) indicated that, to ensure effectiveness, deterrence approaches in regards to cooperation, can bring about severe fines to be forced on offenders to ensure compliance. However, studies by Oded (2013) found that, placing heavy fines on regulatory offenders may be threatening insolvency to some firms and thus threatening the livelihoods of people that depend on the construction firm. To ensure adequacy of supervisory resources, entrenching regulatory skills among staff in essential areas is important to ensure effectiveness given prior failures in some sectors (CRA, 2009). Furthermore, to as to encourage compliance, the NCA 'can extend or alter their legal frameworks by requiring additional disclosure, requiring certain governance standards or bringing activities/ products that tighten standards (Njoroge, 2008). Our study found that NCA should increase sensitization among contractors, supervisors and construction workers. The aforementioned findings are outlined on Table 5.1 on the next page.

Table 5.1: Impact of the NCA in the Kenyan Construction industry.

Research Objectives	Hypothesis	Test Results of Hypothesis
Objective 1 To establish the extent to which the National Construction Authority (NCA) has been able to reduce the use of substandard building materials in the construction industry.	The NCA has significantly reduced the use of substandard building materials, poor workmanship and quack contractors, workers and supervisors in the construction industry. (Alternative Hypothesis, H_a)	The null hypothesis, H_o was rejected and the alternative hypothesis, H_a, was accepted.
Objective 2 To establish the extent to which the National Construction Authority (NCA) has improved workmanship in the construction industry.	The NCA has significantly reduced the use of substandard building materials, poor workmanship and quack contractors, workers and supervisors in the construction industry. (Alternative Hypothesis, H_a)	The null hypothesis, H_o was rejected and the alternative hypothesis, H_a, was accepted.
Objective 3 To establish the extent to which the NCA has been able to reduce quack	The NCA has significantly reduced the use of substandard building materials, poor	The null hypothesis, H_o was rejected and the alternative

contractors in the construction industry	workmanship and quack contractors, workers and supervisors in the construction industry. (Alternative Hypothesis, H_a)	hypothesis, H_a, was accepted.
Objective 4 To establish the extent to which the NCA has been able to reduce incompetent construction workers and supervisors in the construction industry	The NCA has significantly reduced the use of substandard building materials, poor workmanship and quack contractors, workers and supervisors in the construction industry. (Alternative Hypothesis, H_a)	The null hypothesis, H_o was accepted and the alternative hypothesis, H_a, was rejected.

Source: Author (2020)

5.3 Summary and Conclusion

This study is aimed at investigating the effectiveness of the National Construction Authority (NCA) in curbing malpractices in the Kenyan construction industry and in particular Nairobi City County. This was done by scrutinizing the null hypothesis that, NCA has not reduced the use of substandard/ inferior construction materials and reduction of quack contractors, workers and supervisors. The study focused on the National Construction Authority (NCA) operations to see how effectively it has carried out its operations/ achieves its mandate. Given the number of unsafe building/ collapsed building in Kenya over the recent years, it was necessary that the construction industry safeguards the society's resources while trying to provide their needs and requirements.

In the Kenyan Construction industry, the key regulator for contractors is the NCA. The NCA according to the NCA ACT, 2011 is mandated to; 'promote and stimulate development/

improvement in the industry, advise and make recommendations to the cabinet secretary on issues affecting the industry, carry-out researches, registration of contractors, providing consultancy services to interested parties, ensure quality and sound construction practices in the country, to maintain the construction information system, certification of skilled workers and site supervisors, develop and publish a code of conduct for the industry'. Thus, this research was aimed at determining the effectiveness of NCA in curbing malpractices in the construction industry in Nairobi.

The study employed the use of questionnaires drafted with both quantitative and qualitative questions as the ideal method of collecting data. These methods were used to test effect of the independent variables (building collapses, building materials and workmanship, quack contractors workers and supervisors and regulatory framework) on the dependent variable (effectiveness of the NCA). Quantitative methods were used for the closed -ended questions whereas qualitative methods will be used for the open – ended questions. Due to resource and time constraints the target population consisted of 6 members derived from each regulatory authority, translating to a total of 42 questionnaires administered. The target population included; The Kenya Property Developers Association (KPDA), National Environmental Management Authority (NEMA), Architectural Association of Kenya (AAK), Nairobi City Council (NCC), Institute of Construction Project Managers of Kenya (ICPMK), Board of Registration of Architects and Quantity Surveyors (BORAQS) and Engineers Board of Kenya (EBK).

Using Descriptive SPSS version 25, statistics were used to define features/ characteristics of the population. Data analysis employed the use of means, cross tabulation, chi-square and Kruskal Wallis (KW) tests. The results from the articulated analyses were presented using tables and figures. The study conducted indicated that NCA has been able to; reduce the habit using of substandard building materials and improved the quality of workmanship in construction projects in the recent years. Even though, majority of the respondents cited substandard building materials as the most causative agent of building collapse. Furthermore, the study indicated that the NCA has reduced the number of quack contractors in the industry, even though it has failed to reduce incompetent construction workers and supervisors. Finally, the study done showed that, the National Construction Authority (NCA) has not been able to reduce building collapse. This can be

attributed to the fact that the authority relies on other government agencies in enforcing regulatory practices i.e. the Kenya Police Service.

5.4 Recommendations

The following recommendations will go a long way to improving the efficiency of the NCA as regards reducing the use of substandard building materials, improving workmanship in the construction industry, reducing quack contractors, reducing incompetent construction workers and supervisors in the construction industry & generally reducing building collapses in the construction industry.

The authority should reduce the accreditation costs for construction workers & supervisors in the construction industry. It should rally and push for accreditation of all construction workers & supervisors such that only accredited workers & supervisors will be engaged on construction projects. The authority needs to increase sensitization to contractors on the necessity of engaging accredited/ competent construction supervisors and competent construction workers/ labourers albeit they are slightly expensive. In addition, the authority needs increased budget allocation so that it can increase the frequency of inspections on ongoing construction projects to ensure all workers & supervisors are accredited amidst checking for enforcement of other items. The NCA needs to be given prosecutorial powers to go after unregistered construction workers & supervisors and contractors who prefer engaging unskilled workers and supervisors.

Similarly to registering and accrediting construction workers, the NCA should initiate a system which accredits and registers construction materials suppliers. The system should also blacklist suppliers with poor quality building materials. This will ensure that all building materials used in construction projects meet the standards of proper quality. The authority needs increased budget allocation so that it can increase the frequency of inspections on ongoing construction projects. As earlier mentioned, the NCA needs to be given prosecutorial powers to go after quack contractors and unregistered construction workers & supervisors. In addition, reshuffling the NCA every quarter so as to change officials who may have been corrupt will also assist in improving the efficiency of the NCA.

5.5 Areas of Further Research

The following mentioned are suggestions which emerged during the period of this study as areas of future research. This study can be replicated on to building construction contractors in Nairobi City County to get their opinion on whether the National Construction Authority (NCA) has been successful in curbing construction malpractices. Additionally, this study can be replicated on the other counties in Kenya so as to assess whether the National Construction Authority has been effective in curbing malpractices in these counties. Lastly, further research is recommended on the effectiveness of construction regulatory bodies in curbing malpractices in other countries. This will assist in the replication of a suitable hybrid model which is intandem with the economic and social vision of the Kenyan government as put forward in the Vision 2030 development plan.

REFERENCES

Adeyemo, A., and Amade, B. (2016) Corruption and Construction Projects in Nigeria: Manifestations and Solutions. Retrieved from https://pmworldlibrary.net/wp-content/uploads/2016/10/pmwj51-Oct2016-Adeyemo-Amade-corruption-and-construction-projects-in-nigeria-featured-paper.pdf

Akinbobola, L. (2016) Seven steps to prevent building collapse. Retrieved May 21, 2021, from https://buildersenquiry.com/7-steps-to-prevent-building-collapse/

Alao, O. O. (2005) Impact of quality control on construction project delivery. An Unpublished B.Tech thesis, submitted to Department of Quantity Surveying, Federal University of Technology, Akure.

Ali, A., and Wen, K. (2011) Possible Solution for Poor Construction Workmanship. Building Defects, 2(1).

Ayodeji, E. (2006) Effect of quality of materials and workmanship on building collapse in Nigeria. Retrieved from https://www.researchgate.net/publication/331980439_Effect_of_quality_of_materials_and_workmanship_on_building_collapse_in_Nigeria/link/5c9896a3299bf111694575a8/download

Baiburin, A. (2017) Errors, Defects and Safety Control at Construction Stage, 807-813. Retrieved from https://www.sciencedirect.com/science/article/pii/S1877705817352402

Beauchamp, T. L., and Childress, J. F. (2001) Principles of biomedical ethics (5th ed.). Oxford : Oxford University Press.

Blok, R., and Herwijnen, F. V. (2001) Service life and life cycle of Building structures. Eindhoven.

Blumberg, B., Cooper, D. R., and Schindler, P. S. (2005) Business research methods. Berkshire: Mc Graw Hill.

Construction Kenya. (2018) Building Materials: Headache for Kenyan builders as counterfeits flood local market. Retrieved from https://www.constructionkenya.com/5005/counterfeit-building-products-kenya/CAK. (2017). The Construction Industry. Analysis of the state of competition.

Chan, P. C., Wong, K. W., and Lam, T. I. (2006) Assessing quality relationships in public housing. International Journal of Quality & Reliability Management, 23(8), 909-927.

Cheit, R. (2011) *Setting Safety Standards: Regulation in the Public and Private Sectors.* Berkeley: University of California Press.

Chendo, I. G., and Obi, N. I. (2015) Building Collapse In Nigeria:. The Causes, Effects, Consequences And Remedies, 3(4), 41-49. Retrieved from www.eajournals.org

Coffee JC (1999) The Future as History: The Prospects for Global Convergence in Corporate Governance and Its Implications, Northwestern University Law Review, 156, pp. 229- 258

CRA, International. (2009) Assessing the Effectiveness of Enforcement and Regulation

Cytonn Report. (2018) Retrieved from https://cytonnreport.com/research/affordable-housing-in-kenya-cytonn-weekly-162018-1

Dahir, A. L. (2019) Building collapse in Nairobi leaves at least four dead, 29 injured (Published 2019). The New York Times - Breaking News, US News, World News and Videos. Retrieved February 27, 2021, from https://nytimes.com/2019/12/06/world/africa/kenya-building-collapse-nairobi.html

Davies, N., and Jokiniemi, E. (2008) Dictionary of Architecture and Building Construction (1st ed.). Elsevier Limited.

Doloi, H., Week, D., and Bora, A. (2017) ROLE OF REGULATORY FRAMEWORK FOR SUPPORTING CONSTRUCTION INDUSTRY IN INDIA, 1, 351-360. Retrieved from https://easychair.org/publications/open/78wr

Edinburgh, G. (2003) Sustainable Construction and the Regulatory Framework Summary Report. University of Dundee, Scotland.

Fadamiro, J. A., and Ogunsemi, D. R. (1996) Fundamentals of building: Designs, construction and materials. Ile-Ife: Fancy publication Ltd.

Fadason, R., Danladi, C., and Sharon, J. (2017) Construction Standard and Regulation in Nigeria. Retrieved from https://www.fig.net/resources/proceedings/fig_proceedings/fig2017/papers/ts

Faremi, O., and Ajayi, O. (2020) Factors Influencing The Use Of Substandard Materials In The Construction Of Residential Buildings. Infrastructure Development

Fasakin, J. O. (2002) Building collapse in Ondo State of Nigeria – Preventive town planning standards and regulations

Fernandez, R. H. (2014) Strategies to Reduce the Risk of Building Collapse in Developing Countries.

Figueroa Fernandez, Raul H., (2014) Strategies to Reduce the Risk of Building Collapse in Developing Countries. Dissertations. Paper 493. http://repository.cmu.edu/dissertations

Folagbade S. O. (2001) Case Studies of Building Collapse in Nigeria. Proceedings of a Workshop on Building Collapse, Causes, Prevention and Remedies. The Nigerian Institute of Building, Ondo State Chapter. 23-24.

Fouka, G., and Mantzorou, M. (2011) "What are the major ethical issues in conducting research? Is there a conflict between the research ethics and the nature of nursing?" . Health Science Journal, 5 (1), 3-14.

Gacheru, E.N and Diang'a, S.O (2015) Regulating Building Contractors in Kenya and Challenges of Enforcing the National Construction Authority Mandate Esther Njoki, Stephen Onyango. International Journal of Soft Computing and Engineering, 5(1), 2231-2307.

G.O.K. (2011) National Construction Authority Act 2011. Nairobi: Government Press.

Hawkins, K. (2002) Compliance strategy, prosecution policy and Aunt Sally. British Journal of Criminology, 444-466.

Ifedolapo, B. (2015) Building Collapse. Causes and Policy Direction in Nigeria, 2. Retrieved from https://www.ijsrit.com/uploaded_all_files/1893700813_j1.pdf

Jagadala, J. (2006) Building Material and Construction (2nd ed.). Government Polytechnic Boudh.

Jayeola, O. O. (2004) Productivity Improvement in Project Organisation. The Quantity Surveyor. Journal of Nigeria Institute of Quantity Surveyors, 46, 18-19.

Kenya Gazette Supplement No. 84 (2014) The National Construction Authority Regulations 2014. Legislative Supplement No. 29. National Council for Law Reporting Library. 6th June, 2014

KNBS. (2021) Quarterly Gross Domestic Product Report. Third Quarter 2020. Retrieved from https://www.knbs.or.ke/?wpdmpro=quarterly-gross-domestic-product-report-third-quarter-2020

Konisky, D. M. (2007) Regulatory Competition and Environmental Enforcement: Is there a Race to the Bottom? American Journal of Political Science, 853-57.

KPDA. (2019) Building Permit Approvals Report - Kenya Property Developers Association – Retrieved November 21, 2021, from https://www.kpda.or.ke/documents/NCCG/KPDA%20NCCG%20Building%20Permitting%20Approvals%20Report,%20January%20-%20June%202019.pdf

Langat, S. (2018) Effects of Skilled Labour on Quality of Workmanship Within the Construction Industry in Nairobi.

Longman., Pearson. (2011) "Effectiveness - Definition from Longman English Dictionary Online." Longman English Dictionary Online. 2011. Web. 04 Oct. 2011. Available: http://www.ldoceonline.com/dictionary/effective

Lopes, J. (1998) The construction industry and macro-economy in Sub-Saharan Africa post-1970. Construction Management and Economics, Vol. 16 pp.637-49.

Machuki, O. (2012) Causes Of Collapse Of Buildings In Mombasa County. A Case Of Mombasa Island-Kenya

Macrory, R. (2014) Regulation, Enforcement and Governance in Environmental Law. (2nd ed.). Oxford: Hart Publishers.

Maloney, W. F. (2002) Construction product/service and customer satisfaction. Journal of Construction Engineering and Management, 128(6), 522-529.

Matheka, B. (2018) '3 dead in Huruma building collapse'. Retrieved March 26, 2019, from https://www.nation.co.ke/news/Huruma-building-collapses/1056-4593070-jj1uld/index.html

Matland, R. E. (2003) Synthesizing the implementation literature: The ambiguity conflict model of policy implementation. Journal of Public Administration Research and Theory, 145–174

Maxwell, J. A. (2012) Qualitative Research Design: An interactive approach (3rd ed.). Carlifornia: Sage.

Ministry of Environmental Conservation. (1999) Environment and Development: Session No.6of 1999.

Mitullah, W.V. and Wachira I. N. (2003) Informal labour in the construction industry in Kenya: A case study of Nairobi. Sectoral Activities Programme, Working Paper 204, Geneva, ILO

Mutanu, B. (2018) 'Building collapses in Kariobangi South'. Retrieved March 26, 2019, from https://www.nation.co.ke/counties/nairobi/Building-collapses-in-Kariobangi/1954174-4335824-n7ekm2z/index.html

Mugenda, O. M. and Mugenda, A. G. (1999) Research Methods: Quantitative and Qualitative Approaches. Nairobi: Acts Press

Mugenda, A. G. (2003) Social science research methods: Theory and practice. Nairobi: ACTS Press.

Nachmias, C. F. (1996) Research Methods in the Social Sciences (5th ed.). Hodder Education.

National Construction Authority (2015) Report on RRI for Registration of Skilled Workers and Site Supervisors. Nairobi: National Construction Authority.

National Construction Authority (NCA) (2019) *The NCA Quarterly*. National Construction Authority. www.nca.go.ke

National Construction Authority Act (2011) S.5. Available at: https://www.nca.go.ke/about-us/our-key-publications

NCA. (2019) Research On Failure and Collapse of Buildings in the Construction Industry in Kenya. Retrieved from https://nca.go.ke/files/32/Research-Publications/38/Research-on-Failure-and-Collapse--of-Buildings-Final-Report-31-10-2019.pdf

Ndumia S. N. (2015) Influence of regulatory framework on performance of building construction projects in Nairobi county, Kenya. Department of Extra Mural Studies, University of Nairobi.

Ndirangu, J. (2009) Understanding the Cause of Collapsed building in Kenya. The Daily Nation Newspaper

Njoroge P. C. (2008) A study of effectiveness of regulatory framework in construction industry in promoting sustainability, A case study of Nairobi County. Department of Real Estate and Construction Management, University of Nairobi Library

OECD. (2014) Oecd Best Practice Principles for Regulatory Policy Regulatory Enforcement and Inspections. Paris: Organisation for Economic Co-Operation Development, Publishing.

Oded, S. (2013) Corporate Compliance: New Approaches to Regulatory Enforcement (New Horizons in Law and Economics series) . Massachusetts: Edward Elgar Publisher.

Ogunmakin, J. A. (2005) Knowledge transfer within the labour profile in Nigeria construction industry. An unpublished B.Tech thesis, submitted to Department of Quantity Surveying, Federal University of Technology, Akure

Olusola, K. O., Ata, O., and Ayangade, J. A. (2002) Quality and Structural Strength of sandcrete Blocks produced in Ile-Ife: A preliminary Investigation. Journal of Environmental Technology, Federal University of Technology, Akure, 1(1&2), 136-142.

Otieno, A. (2018) '5 storey building collapses in Ruaka' : The Standard. Retrieved March 26, 2019, from https://www.standardmedia.co.ke/article/2001282219/five-storey-building-collapses-in-ruaka

Rao, S., and Vishnukanth, M. (2006) Building Materials and Construction. India: State Institute of Vocational Education Andhra Pradesh, Hyderabad.

Robert, B., Martine, C., and Martine, L. (2011) Understanding Regulation: Theory, Strategy and Practice (4th ed.). New York: Oxford University Press.

Shah R. J. and Alotaibi M. (2018) *A Study of Unethical Practices in the Construction Industry and Potential Preventive Measures*. Journal of Advanced College of Engineering and Management. https://www.researchgate.net/publication/322368310

The Hindu (2006) Construction in China and its workmanship. Retrieved March 30, 2006 from http//www.thehindunews.org

Thomas, J. B., and Nitish, S. (2015) Compliance Management: A How-to Guide for Executives, Lawyers, and Other Compliance Professionals. Carlifornia: Praeger.

Thuita, P. (2020) Why buildings collapse in Kenya. Retrieved May 24, 2021, from https://www.constructionkenya.com/2236/buildings-collapse-kenya/

Transparency International (2014) Corruption Perception Index Measures the Perceived Levels of Public sector Corruption. https://www.transparency.org/en/cpi/2014

Vanier, D. J. (1999) Durability of Building Materials and Components. Canada.

Watmore, M. and Bradley, L. (2001) Ethical and socially responsible investing: the next wave? Rothschild Report,.

Waziri, B. S. and Vanduhe, B. A. (2013) Evaluation of Factors Affecting Residential Building Maintenance in Nigeria : Users ' Perspective. Civil and Environmental Research.

Windapo, A. and Rotimi, J. (2012) Contemporary Issues in Building Collapse and Its Implications for Sustainable Development. Retrieved from https://www.researchgate.net/publication/284082610_Contemporary_Issues_in_Building_Collapse_and_Its_Implications_for_Sustainable_Development

Wood, L. (2021) Global construction industry report 2021: $10.5 trillion growth opportunities by 2023 - ResearchAndMarkets.com. Retrieved May 21, 2021, from https://www.businesswire.com/news/home/20210111005587/en/Global-

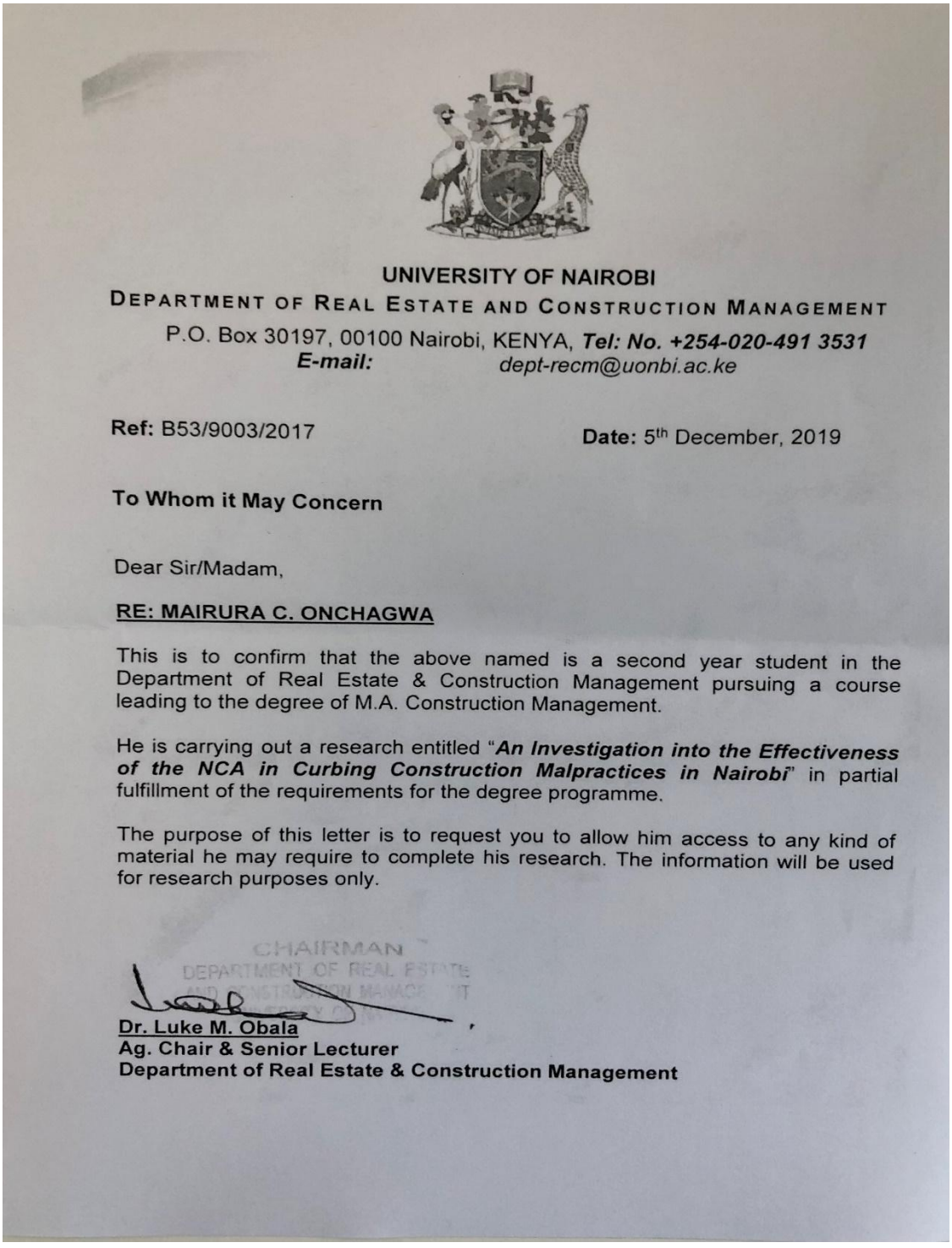
Construction-Industry-Report-2021-10.5-Trillion-Growth-Opportunities-by-2023---ResearchAndMarkets.com

World Bank. (2018) Industry (including construction), value added (% of GDP) - sub-Saharan Africa. Retrieved May 21, 2021, from https://data.worldbank.org/indicator/NV.IND.TOTL.ZS?locations=ZG

Wyk, L. (2009) Green Building Handbook for South Africa. Retrieved November 20, 2021, from http://researchspace.csir.co.za/dspace/bitstream/10204/3263/1/van%20Wyk2_

APPENDICES

Appendix 1: Research Authorization Letter



UNIVERSITY OF NAIROBI
DEPARTMENT OF REAL ESTATE AND CONSTRUCTION MANAGEMENT
P.O. Box 30197, 00100 Nairobi, KENYA, ***Tel: No. +254-020-491 3531***
E-mail: *dept-recm@uonbi.ac.ke*

Ref: B53/9003/2017 **Date:** 5th December, 2019

To Whom it May Concern

Dear Sir/Madam,

RE: MAIRURA C. ONCHAGWA

This is to confirm that the above named is a second year student in the Department of Real Estate & Construction Management pursuing a course leading to the degree of M.A. Construction Management.

He is carrying out a research entitled "***An Investigation into the Effectiveness of the NCA in Curbing Construction Malpractices in Nairobi***" in partial fulfillment of the requirements for the degree programme.

The purpose of this letter is to request you to allow him access to any kind of material he may require to complete his research. The information will be used for research purposes only.

CHAIRMAN
DEPARTMENT OF REAL ESTATE

Dr. Luke M. Obala
Ag. Chair & Senior Lecturer
Department of Real Estate & Construction Management

Appendix 2: Questionnaire to Respondents

AN INVESTIGATION INTO THE EFFECTIVENESS OF THE NATIONAL CONSTRUCTION AUTHORITY (NCA) IN CURBING MALPRACTICES IN THE KENYAN CONSTRUCTION INDUSTRY

Respondents Questionnaire

Part 1: Introduction

I am currently a student at the university of Nairobi where I am pursuing a course leading to Master of Arts in Construction Management. In order to successfully complete this course, I must conduct and submit for examination a research project on "the effectiveness of The National Construction Authority (NCA) in curbing construction malpractices in the Kenyan Construction Industry"

The questionnaire is designed to allow you express your views freely and also propose improvement areas. You are among the selected consultants to participate in this study. You are therefore requested to complete the questionnaire as accurately as possible and scan and email me on chrisonchagwa@students.uonbi.ac.ke . Your responses will be treated confidentially both during and after the study.

Part 2: Respondent Information

a. What is your role in construction projects?

Category of Professional	**Check (✓) your Profession**
Developer	
Environmentalist	
Architect	
NCC Officer	
Construction Project Manager	
Quantity Surveyor	
Engineer	

b. How long have you practiced in the construction industry?

Category of Experience	**Check (✓) your appropriate years of experience**
1-3 Years	
3-5 Years	
More than 5 years	

Part 3: Questionnaire to Developers, Environmentalists, Architects, NCC Officers, Construction Project Managers, Quantity Surveyors and Engineers.

c. Has a project which you were involved in ever collapsed?

Category	**Check (✓) your appropriate answer**
Yes	
No	

d. In your opinion what was the cause of the collapse?

Category	**Check (✓) your appropriate answer**
Use of substandard building materials in the construction project	
Poor workmanship in the course of the project execution	
Implementation of the project by a quack contractor	
Use of incompetent workers in the project execution	
Use of incompetent supervisors in the project implementation	

e. Outlined below are statements of of functions of NCA which are supposed to assist in reducing building collapses. Kindly respond by ticking **(✓)** the appropriate option.

Category	**Strongly Agree**	**Agree**	**Un decided**	**Disagree**	**Strongly Disagree**
The NCA has reduced the use of substandard construction materials.					
The NCA has improved the quality of workmanship in construction projects					
The NCA has reduced quack contractors					
The NCA has reduced incompetent construction workers					
The NCA has reduced incompetent construction supervisors					

f. In your opinion, are you satisfied with the way the NCA carries out its mandates as regards curbing construction malpractices?

Opinion Category	**Check (✓) your appropriate answer**
Yes	
No	

g. In your assessment, what can be done to improve the effectiveness of the National Construction Authority (NCA)

……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……

End of the Questionnaire

Thanks you for your cooperation