AN EFFECTIVE FRAMEWORK FOR RISK MANAGEMENT IN THE NATIONAL GOVERNMENT CONSTITUENCY DEVELOPMENT FUNDED CONSTRUCTION PROJECTS IN NAIROBI COUNTY

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(Construction Project Management)

JOMO KENYATTA UNIVERSITY

OF

AGRICULTURE AND TECHNOLOGY

2023

An Effective Framework for Risk Management in the National Government Constituency Development Funded Construction Projects in Nairobi County

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A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Construction Project Management of the Jomo Kenyatta University of and Technology

2023

DECLARATION

This thesis is my original work and has not been presented for a degree or any other University

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

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DEDICATION

I dedicate this work to the entire Miganda family.

ACKNOWLEDGEMENT

To God be the Glory and Honor in all that we have achieved. Without his mercies and favor all is in vain.

I would like to acknowledge the department of Construction Management, the school of Architecture and Building sciences (SABS) and the whole of Jomo Kenyatta University of Agriculture and Technology (JKUAT) fraternity for giving me this opportunity to study this program and affording us the environment to attend lectures conveniently and comfortably. My sincere gratitude goes to my lecturers for their dedication and hands-on approach in their work, this enabled us to complete our coursework smoothly. My gratitude's go to Dr. Qs Abednego Gwaya the MSc 2016 Course coordinator and my supervisor in his steadfast guidance and encouragement. To Dr. QS. Githae Wanyona; your unrelenting support is greatly appreciated; I am forever indebted.

Special thanks go to Peter Muruthi for his invaluable input during the digitization of my questionnaire and the data collection process. I also want to extend a word of appreciation to my respondents for their positive participation in sparing time for the study. To my Family and the entire MSc. Construction Management (2016) class, thanks for keeping the dream real and for the unwavering support. May the Almighty God bless you all abundantly.

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ABBREVIATIONS AND ACRONYMS

BIM	Building Information Modeling
CDCF	Constituencies Development Catalyst Fund
CDF	Constituency Development Fund
EMV	Expected Monetary Value
NACOSTI	National Commission for Science, Technology and Innovation
NG-CDF	National Government Constituency Development Fund
MPLADS	Members of Parliament Local Area Development Scheme
RMP	Risk Management Process
RSIS	Risk Significance Index Score
SWOT	Strengths, Weaknesses, Opportunities and Threats
PCA	Principal Component Analysis

ABSTRACT

While risk management is described as the most difficult area within construction management its application is promoted in all projects to avoid negative consequences. Despite the efforts by the national government, many construction projects funded through NG-CDF run a high risk of poor performance and have a reputation for time and cost overruns. Failure to manage construction risks in a more systematic way has made many CDF projects to stretch over the scheduled timelines, spending more than the baseline budget and missing the intended scope, settling for a poor performance than the initial target. The purpose of this study was to investigate effectiveness of risk management in the NG-CDF construction projects in Nairobi County, with a view of making recommendations that are geared towards upgrading the risk management process of the NG-CDF construction projects. A survey research design was considered in this study; the study was conducted in Nairobi County where it targeted two on-going CDF projects in each ward of the seventeen constituencies (each constituency has 5 wards) translating to a total of 170 projects. The accessible population to the research were Construction project managers charged with the responsibility of managing projects within their jurisdiction. The sample size was 118 Ward Managers, questionaires were used to collect primary data which was then analysed using descriptive statistics tools and presented in tables and figures. Further a regression model was developed to quantify the variables relationship. The study revealed that resource risk management had a positive significant influence on NG-CDF construction projects in Nairobi County. In line with the second objective the study revealed that risk management procedures play a positive instrumental role on performance of NG-CDF construction projects in Nairobi County. All the independent variables had negative correlation to the dependent variable. The model had an average adjusted coefficient of determination (R^2) of 0.402 and which implied 40.2% of the variations on risk impact on NG-CDF construction projects performance in Nairobi County is explained by the independent variables. The regression model was as follows; $\mathbf{Y= 1.242 -0.535x_1-0.583x_2-0.379x_3 -0.551x_4.}$ The study concluded that strong risk management policies have a positive impact of on performance of NG-CDF construction projects in Nairobi County. To enhance the process, CDF risk management committee should benchmark its operations with other established organizations and that the risk management team should use an approved project management software for accountability and efficiency enhancement. The constituencies should have a well laid policy guiding the risk management process.The policy frame work should provide clear and strong basis for informed decision making at all levels of the organization.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Risk management is a concept which is used in all industries, from IT related business, automobile or pharmaceutical industry to the construction sector. Each industry has developed their own risk management standards, but the general ideas of the concept usually remain the same regardless of the sector. According to the Project Management Institute (2014) project risk management is one of the nine most critical parts of project commissioning. This indicates a strong relationship between managing risks and a project success.

While risk management is described as the most difficult area within construction management its application is promoted in all projects in order to avoid negative consequences (Potts, 2017). The construction industry operates in a very uncertain environment where conditions can change due to the complexity of each project (Sanvido, 2015). The aim of each organization is to be successful and risk management can facilitate it. However, it should be underlined that risk management is not a tool which ensures success but rather a tool which helps to increase the probability of achieving success. Risk management is therefore a proactive rather than a reactive concept.

Construction projects are highly prone to risk which makes people working in these projects bear with failures like delays in completion, cost overruns and not bidding to quality which has resulted in poor performance of these projects. Construction projects which are associated with housing, offices, hospitals, factories, water projects, churches among others are unique and built only once. Consequently, the construction industry plays a key role in the economy of any nation, more so in a developing country like Kenya.

Globally, the construction industry faces numerous risks. In the United Kingdom (UK), the construction industry is vulnerable to weather extremes that impact

adversely on the projects implementation and financial performance. In Singapore, turbulent economy coupled with continuous change in the corporate environment has exposed players in the construction industry to increased risk. This has motivated a need among construction project managers to develop an integrated approach to construction project management, necessitating a strategic planning approach that covers the entire scope of construction projects, from inception to occupancy (Hlaing, 2015).

In Sweden, construction projects risks have led to significant deviations in construction projects. According to a report by Sweden Construction Commission, the cost for poor quality can amount to 20% of the total cost. Moreover, about 70% of all problems can be identified at the early stages and, therefore, poor quality cost can be decreased by more than 60%. In Palestine the construction industry has a reputation for time and cost overruns (Mousa & Enshassi, 2015).

In the developing country context, especially in Africa, risk management in the construction sector is an amorphous affair faced with higher levels of risk as compared to the developed countries. The level of adoption of formal risk management strategies is not widely studied either. In Ghana for instance, there is limited level of adoption of formal risk management among construction-oriented firms, with low levels of procedural documentation. One reason that is forwarded for this situation is the low level of awareness regarding appropriate tools and techniques to effectively manage construction risk. Consequently, the construction sector in Ghana faces many problems related to frequent cost and time overruns (Fugar & Agyakwah-Baah, 2014).

In Rwanda many construction projects have suffered overrun in cost, delayed schedule, failure and even abandonment. Further, over 50% of construction projects in Rwanda have been failing by not meeting the cost projections, time schedules, quality demands or safety targets. Risk management among construction firms in Kenya has gained increased prominence owing to what Ngundo (2014) observes as an increase in infrastructure development in the country. The rise of many construction projects, most notable in real estate at the mass market level, has been

faced with a lot of uncertainty, resulting in outcomes that fail to meet minimum standards benchmarked against best practice in the sector.

Ngundo (2014) attributed the low levels of project success to failure to develop proper procedures, lack of sufficient training and capacity building programs, incompetence among project staff, low levels of formal quality management support and low levels of management commitment. As a result, project risk management planning is characterised by poor risk identification, assessment, prioritization, mitigation and control. The overall outcomes are weak and inappropriate risk management measures that increase the vulnerability of the construction firms to risk.

1.1.1 NG-CDF Construction Projects

Constituency Development Fund is a devolved fund. CDF was established by the Kenyan government to eliminate poverty, share national resources, and encourage citizen participation. CDF started in 2003 through the CDF Act. In January 2013, CDF Act 2013 replaced CDF Act 2003(that was amended in 2007). On 20th February 2015, CDF Act 2013 was declared unconstitutional hence invalid. Due to the ruling CDF Act 2013 was replaced by National Government Constituencies Development Fund (NG-CDF) Act 2015 with effect from 19th February 2016(NG-CDF Board, 2016).

There are over 85,000 NG-CDF construction projects to date this according to NG-CDF Board. The total amount allocated to NG-CDF projects in 290 constituencies as from year 2003 to 2017 is Ksh 193,896,852,648. A cursory look at the status of NG-CDF construction projects shows many in several constituencies have either stalled, are not operational, are abandoned, not started despite funds allocation one to three years ago, or complete but in a poor state. As argued by various authors, NG-CDF has mainly been used for political patronage as opposed to local community development as was envisioned in the NG-CDF Act, (Mungai, 2010).

1.1.2 Projects Risk Management

Uher (2013) noted that risk management has been described as a management tool that helps in identifying root causes of uncertainty, evaluating their impact and formulating appropriate risk management strategies. Perera (2014) observed that risk management is composed of several processes including risk identification, classification, analysis, attitude and risk response. Ahmed (2015) further added that successful project risk management entailed the use of metric tools and techniques to quantify the risk involved. Risk management strategies were processes aimed at managing the attendant risks and focused on the quantified construction project risks.

Risk management included eliminating the risk by avoiding it usually by treating the root causes, accepting the risk but having a contingency plan in place, shifting risk to a third party by transferring it, for example, through insurance, and reducing the likelihood of its occurrence by mitigation. Uher (2013) noted the difficulty in instituting cost-effective risk management systems, owing to the fluid nature of the risk dynamics that underlies effective risk management in the construction sector. In order to circumvent uncertainty, Uher (2013) proposed the use of matured risk management systems, coupled with delegation to the agent best equipped to deal with the risk.

Panigrahi (2014) observed that resource risks related to uncertainties that revolved around financial risks, material risks, capital equipment risks and land resources, among others. Resource risk management strategies aspired to maintain a continual and timely availability of resources and ensure their proper working order. Meredith and Mantel (2016) defined project control risk management strategies as feedback loops that informed management on variations between actual and desired performance. Project control risk management strategies were key to ensuring timely revision of project activities, to avoid deviations that may impact adversely on firm performance.

1.2 Statement of the Problem

Performance of any project is measured by the extent of meeting the standards laid down at the start of the project. Risk management has been conceptualized as having a great bearing on the outcome of projects. The Government of Kenya earmarks substantial resources through NG-CDF for provision of services. In recent times, there has been much controversy about the management of the funds regarding accountability; allocation, targeting and priority setting; and overall effectiveness.

Despite the efforts by the national government, many construction projects funded through NG-CDF run a high-risk of poor performance and has a reputation for time and cost overruns. Failure to manage construction risks in a more systematic way has made many CDF projects to stretch over the scheduled timelines, spending more than the baseline budget and missing the intended scope, settling for a poor performance than the initial target. The likelihood of improved project performance can be increased by carrying out a comprehensive risk identification to identify risks affecting the project, risk assessment and analysis, carrying out risk prioritization and ranking and applying risk response strategies and monitoring the effect of these strategies in responding to the risks identified.

Mutunga (2014) reports that public funds go to waste since CDF projects stall and yet the government keeps pumping more funds into the kitty. He further reports that in some areas within the country, most of the projects have either stalled or failed to kick off; in others, shoddy performance by merchants had been noted. A report by Mars Group (2015) reveals that CDF project that were initiated between 2009 and 2013 amounting to over 12 billion most of them are yet to be completed. NG-CDF funded projects are extremely complex and fraught with uncertainty. Risk and uncertainty can potentially have damaging consequences for the construction projects. Poor performance of these projects therefore has a huge detrimental effect to the society since they are meant to bring services closer to people in order to alleviate poverty, create employment, and eventually raise people's standard of living through better schools, healthcare facilities and the like. Although a number of scholars have explored risk management in construction projects, as yet there does

not appear to be any study in the country that has considered the effectiveness of risk management in the NG-CDF construction projects in Nairobi County, Kenya. This study sought to fill the gap.

1.3 Purpose of the Study

The purpose of this study was to investigate effectiveness of risk management in the NG-CDF construction projects in Nairobi County, with a view of making recommendations that are geared towards upgrading the risk management process of the NG-CDF construction projects.

1.4 Objectives of the Study

The main objective of this study was to investigate effectiveness of risk management in the NG-CDF construction projects in Nairobi County. The specific objectives of this study include.

i. To describe the level of risk impacts on the NG-CDF projects and the variables that might influence it namely resource risk management, risk management procedures and risk management policies.
ii. To determine the relationship between level of Risk impact and its determinants.
iii. To Develop regression model for application of risk impact in NG-CDF Construction project.
iv. To formulate a framework for enhancing the risk management process of the NG-CDF projects in Nairobi County.

1.5 Research Hypothesis

Risk impact in an NG-CDF project is influenced by: the overall risk management of work done in the project, resource risk management, risk management procedures and risk management policies in the constituency.

H_0: $\beta_i=0$ for all regression coefficient, implying that the explanatory variable(s) has a zero influence on risk impact on the overall NG-CDF project performance.

H_1: $\beta_i \neq$ for at least one regression coefficient, implying that the explanatory variable(s) has an influence on risk impact on the overall NG-CDF project performance.

1.6 Study Justification

Most project managers and other stakeholders in the construction industry assume that their projects would succeed and therefore they usually end up underrating and ignoring project risk management (Omeno & Sang, 2018). This has contributed to the massive failure of projects by not meeting the cost projections, time schedules, quality demands or safety targets. Omeno and Sang (2018) confirms this statement by indicating that, many NG-CDF construction projects have stalled while others are of low-quality despite of them costing huge sums of money.

1.7 Significance of the Study

The findings from the study will be valuable to the Kenyan Government since the information will be used to formulate effective policies that will enhance effective risk management in construction projects funded by NG-CDF. Government The findings could be used by project managers in various counties to appreciate the role of project risk management on performance of projects and in policy making. The findings may result to funds being set aside for risk management in devolved funds projects and the assignment of risk officers to such projects.

Contractors, project managers and other stakeholders in the construction industry would benefit from this study because the findings can be injected into future projects hence offering ways to promote and propagate the use of BIM in risk management. The results may encourage other organizations to gauge the effects risks may have had on their performance with a view to completing projects on time, to cost and to the required quality. The findings will provide CDF management with information they require to improve on project risk management resulting to better performing projects.

From an academic perspective, the scholars and researchers will benefit from the study as it contributes to the pool of knowledge available in this area of risk management in National Government Constituency Development Funded construction projects thus, acting as a point of reference to other related studies. The study will contribute to knowledge in the area of project management in general and risk management in particular in Kenya and elsewhere especially. Researchers will use the findings to review literature.

1.8 Scope and Limitations of the Study

1.8.1 Scope

This study was conducted in Nairobi County. The County was preferred among other Counties in the Country since it houses the capital city of Kenya and has the largest share of construction of NG-CDF projects. Further the county was chosen for practical reasons which includes time and costs constraints. The research specifically looked into risk management in CDF projects within the County. A survey to investigate project risk management was delimited to 170 on-going construction projects. The study employed a probabilistic sampling technique of simple random sampling in data collection and construction project managers of the on-going projects were considered as the appropriate respondents for the questionnaires. The field work was conducted within eight weeks after which the data collected was analyzed and a report compiled.

1.8.2 Limitations

The scope of the study for data collection was limited to Nairobi County. The researcher would have covered a wider scope, but limited resources constrained the study. A cost and time schedule had been prepared by the researcher to enable the study to be completed on time and within the estimated budget. Due to the busy schedule of construction project managers, the researcher realized challenges in accessing some of the respondents. To counter this, questionnaires were digitized and a link to access the questionnaires online was forwarded to the construction project managers.

1.9 Definition of Terms.

Constituency Development Fund (CDF) schemes: This are decentralization initiatives which send funds from the National government to each constituency for expenditure on development projects intended to address particular local needs (Tshangana, 2010).

Project Performance: It is a measure of the level of project success in terms of cost; time; quality; environmental performance; and health and safety (Njogu, 2015).

Project risk management: This is the application of appropriate tools and procedures to contain risk within acceptable limits by identifying, addressing and eliminating potential problems before they damage a project (Liu, 2009).

Project risk: The PMI (2014) recognizes project risk as an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality.

Project: Njogu (2015) defines a project as a temporary undertaking to create unique product, service and result.

1.10 Research Project Organization

This section presented the overall report structure.

Chapter I includes the background to the problem, statement of the problem, purpose of the study, objectives of the study, research hypothesis and justification of the study, significance and scope of the study, limitations of the study, definition of terms and finally the study outline.

Chapter II presents a review of literature related to the NG-CDF and risk management in construction projects. It gives the literature gap, theoretical framework and conceptual framework for the study.

Chapter III contains the research design, target population, sample and the sampling procedures. Data collection approaches are also discussed in this chapter as well as the instruments of data analysis and data presentation.

Chapter IV clearly indicates how the data collected was analyzed and results obtained. The chapter encompasses the research objectives as stated in chapter I. Data was presented in this chapter in form of charts, tables, graphs and mathematical equations.

Chapter V summarizes the findings as discussed and analyzed in chapter four of this research. The chapter also highlights the conclusions, recommendations and areas of further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The Chapter presents reviews of the work done by other scholars on risk management of construction projects. The chapter is organized into several broad areas including; the Constituency Development Funds (CDF), project risk management, risks in construction projects, risk management practices, risk management tools and techniques, measurement of project performance, theoretical and conceptual framework and finally the research gaps.

2.2 Constituency Development Fund

Constituency Development Fund (CDF) schemes are decentralization initiatives which send funds from the National government to each constituency for expenditure on development projects intended to address local needs (Tshangana, 2010). The CDF scheme in India is known as the Members of Parliament Local Area Development Scheme (MPLADS). According to Udefuna (2013), an equal amount of funds is allocated annually to each single-member parliamentary constituency to be used for works of developmental nature with emphasis on the creation of durable community assets based on the locally felt needs.

Gathoni and Ngugi (2016) highlights that, the main goal of CDF projects in Malawi is to respond to immediate, short-term community development need and ensure that rural development spreads evenly throughout the county. In Tanzania the Constituency Development Fund is commonly referred to as the Constituencies Development Catalyst Fund (CDCF) as it is envisioned as a catalyst for accelerating self-help development efforts at grassroots level (Tsubura, 2013).

The constituency development Fund Bill was established through NG-CDF Act in the Kenya Gazette Supplement No. 107(Act No.11) of 9th January 2004 which had been enacted by parliament in 2003 (Amended in 2007). It is an annual budgetary allocation by the Central Government to each of the country's 290 parliamentary

jurisdictions – the constituencies. While there are several rules that govern the utilization of the fund to ensure transparency and accountability, decisions over utilization of the funds are supposed to be mainly by the constituents. The cardinal aim of the CDF is to devolve national resources at the community level with the aim of spurring economic development at the grassroots level, which would then translate to overall national economic growth and poverty reduction (Kibebe, 2014).

Unlike other development funds that filter from the central government through larger and more layers of administrative organs and bureaucracies, the funds under this program go directly to local levels. In essence, the NG-CDF is intended to provide at the grassroots the opportunity to make expenditure choices that maximize their welfare in line with their needs and preferences. To the extent that the local population is better informed about their priorities, the choices made can be expected to be more aligned to their problems and circumstances. The NG-CDF can therefore be considered a decentralization scheme that provides communities with opportunity to make spending decisions that maximizes social welfare (Baskin, 2010).

2.3 Construction Projects Performance

According to Kerzner (2016), a construction project is a complex set of activities and tasks with a definite start date and a definite completion date and consumes resources such as money, human resources, outputs and equipment in order to achieve specific objectives. Further Project Management Institute (PMI, 2014) emphasizes that a project is temporary because it has a defined beginning and a defined end in time as well as defined scope and resources. It is also unique because it is not a routine operation. Construction has generally been said to be a process in which material, equipment and machinery are assembled into a permanent facility. It is generally defined to encompass the creation of physical infrastructure, other civil-engineering work, all building work, as well as the maintenance and repair of existing structures. Construction projects have been classified in several ways to distinguish amongst them.

A review of existing literature reveals that various criteria have been considered in evaluating construction project performance. Time, cost and quality have been conceptualized as the basic criteria to project performance. Khosravi & Afshari (2011) provides a model for project performance and it entails, time performance, cost performance, quality performance, health, safety and environment and lastly client satisfaction. Five objectives, namely, cost; time; quality; environmental performance; and health and safety have been found to be more significant in determining construction project performance (Njogu, 2015).

Reichelt and Lyneis (2014) remarked three important structures underlying the dynamic of a project performance which are: the work accomplishment structure, feedback effects on productivity and work quality and effects from upstream phases to downstream phases. Thomas (2012) identified the main performance criteria of construction projects as financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting. Chan and Kumaraswamy (2012) stated that construction time is increasingly important because it often serves as a crucial benchmarking for assessing the performance of a project and the efficiency of the project organization.

Cheung (2014) identified project performance categories such as people, cost, time, quality, safety and health, environment, client satisfaction, and communication. It is obtained by Navon (2015) that a control system is an important element to identify factors affecting construction project effort. For each of the project goals, one or more Project Performance Indicators (PPI) is needed. Pheng and Chuan (2016) obtained that human factor played an important role in determining the performance of a project.

Ugwu and Haupt (2017) remarked that both early contractor involvement (ECI) and early supplier involvement (ESI) would minimize constructability-related performance problems including costs associated with delays, claims, wastages, and rework. Ling et al (2017) obtained that the most important of practices relating to

scope management are controlling the quality of the contract document, quality of response to perceived variations and extent of changes to the contract. It was recommended for foreign firms to adopt some of the project management practices highlighted to help them to achieve better project performance in Singapore.

Owoko (2013) challenged that, project performance should be evaluated from the following elements: contractors' experience, contractor's cash flow site management, employer's ability to honor contractor's certificates on time and adequacy of funding from external sources. Functionally, profitability to contractors, absence of claims and court proceedings and "fitness for purpose" for occupiers can be used as measures of project performance (Musyoka, 2012).

Al-Momani (2010) stated that the success of any project is related to two important features, which are service quality in construction delivered by contractors and the project owner's expectations. Managing the construction so that all the participants perceive equity of benefits can be crucial to project success. It is obtained that the complete lack of attention devoted to owner's satisfaction contributes to poor performance. Declining market shares, low efficiency and productivity, and the rapid construction cost escalation also lead to poor performance. Nitithamyong (2014) remarked that the success of construction projects depends up on technology, process, people, procurement, legal issues, and knowledge management which must be considered equally. Pheng and Chuan (2016) defined project success as the completion of a project within acceptable time, cost and quality and achieving client's satisfaction. Project success can be achieved through the good performance of indicators of the project. So, success refers to project success and performance refers to performance of indicators such as project managers. Wang and Huang (2016) stated that Project success has been widely discussed in the project management (PM) literature. The focus of most studies of project success is on dimensions of project success (how to measure it) and factors influencing project success. Wang and Huang (2016) studied that how the engineers evaluate project success and to what extent key project stakeholders' performance correlates with project success. It is obtained that project owners play the most important role in determining project success, and project management organizations' performance as

the single point of project responsibility has significant correlations with project success criteria. Lam et al (2017) stated that the allocation of risk among the contracting parties in a construction contract is an important decision leading to the project success.

2.4 Project Risk Management

Flyvbjerg, Holm and Buhl (2003) argue that the importance of instituting risk management in construction projects is to increase value-added along the construction value chain, ensuring compliance with best practice construction approaches, thus minimizing waste and inefficiencies. Risk management of construction projects thus optimizes shareholder value on all activities along the value chain and maximizes overall profitability. This is mainly through minimizing or eliminating the potential adverse impact of uncertain events that may affect achievement of the project objectives. Flyvbjerg et al. (2003), further observe that effective risk management increases value through adherence to budget, adherence to schedule, and conformance to quality expectations, among other measures.

Njogu (2015) defines a project as a temporary undertaking to create unique product, service and result. The PMI (2013) recognizes project risk as an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality. According to Musyoka (2012), project risk management includes the process concerned with conducting risk management through planning, identification, analysis, responses and monitoring and control on a project. The construction industry generally has a bad reputation for time and cost overruns. One of the reasons for the bad reputation as cited by Mousa and Enshassi (2005) who carried out research in Palestine is that the construction industry is one of riskiest of all business types. The need for improved project performance led to Serpella (2014) conducting research on risk management in construction projects in Chile. The scholars address the problems of risk management in construction projects using a knowledge-based approach and proposes a methodology based on a three-fold arrangement that includes; the

modeling of the risk management function, its evaluation and the availability of a best practices model.

In Ghana, Osei-Fosu (2014) discusses the strategies for improving risk factors affecting cost estimation in the building construction industry. Another study done by Alhassan (2016) in Ghana sought to assess the risk management practices of Ghanaian contractors towards typical construction project risk factors. The results of the study revealed that, contractors do not utilize risk analysis techniques but resort to the use of comparison of projects for the purposes of analysis. A study by Gitau (2015) conducted in Rwanda has given insight on the extent of the risk management practices at planning phase and the effect of these practices on project cost and schedule performance. The study discovered that, the process of risk management was not adequate and no measures were put in place to mitigate the risks.

Kenya is not an exception to research pertaining project risk management. Wachuru (2013) has addressed the role of risk management practices in the success performance of CDF projects. The author acknowledged that, the level of application of risk management practices in CDF projects was very minimal. Oketch (2014) investigated the political, economic and environmental risks factors that affect the successful implementation of Public Private Partnerships (PPP) projects in the Kenyan road sub-sector. The results of the study showed that, the economic risks were identified as most severe followed closely by political and lastly environmental risks. It was recommended that, where applicable projects should insure against risk.

Mandere (2016) examined the use of quality management practices in large building construction firms in Kenya. Mandere (2016) also sought to determine challenges faced by these firms in their quality management efforts. The survey collected primary data through the use of self-administered questionnaires and used descriptive statistics for data analysis and reporting. The findings revealed the use of various quality management practices, with the traditional low-innovation practices being the most common. However, there were no significant differences in terms of preferences for the various quality management practices.

2.4.1 Risk in Construction Projects

A number of studies have categorized risks differently as shown in the following table.

Table 2.1: Categorization of Construction Risks

Previous Study	Category of Risks
Caltrans Office of Statewide Project Management Improvement (2007).	➢ Design risks. ➢ External risk. ➢ Environmental risks. ➢ Organization risks. ➢ Project Management risks. ➢ Right of way risks. ➢ Construction risks. ➢ Engineering services risks.
Baloi (2012)	✓ Technical ✓ Construction ✓ Legal ✓ Natural ✓ Logistic ✓ Social ✓ Economic ✓ Financial ✓ Commercial ✓ Political
PMI (2014)	❖ Technical, quality performance risks ❖ Project management risks. ❖ Organization risks. ❖ External risks
Njogu (2015)	➢ Design/Technical ➢ Time ➢ Financial/ Economic ➢ Quality risks ➢ Construction/ project execution ➢ Political and environmental ➢ Natural disasters

Source: Researcher, 2019

A study by Mousa and Enshassi (2005) revealed that, financial failure by contractors; dangerous working condition; closure; defective design; delayed payment on contract; segmentation of Gaza Strip; unstable security circumstances; poor

communication between involved parties; unmanaged cash flow and award of design to unqualified designers were the most significant risk factor as rated by contractors.

The important risks in terms of impact on construction objectives as identified by Chilesh and Yirenkyi-Fianko (2012) in Ghana includes; delay in payment; inflation; financial failure; price fluctuation and quality performance control. In Kenya, a study by Njogu (2015) identified 23 key risks affecting project delivery. The risks are as illustrated in the following table;

Table 2.2: Key Risks among Contractors in Kenya

Rank	Risk Factors	Rank	Risk Factors
1	Information unavailability-details, drawings, sketches	13	Lack of compliance with safety and health requirements on site
2	Adverse weather conditions	14	Wastage of materials on site by workers
3	Inadequate/ defective specification	15	Inadequate supervision and supervision team
4	High performance or quality standards to meet	16	Excessive approval procedures in administrative government departments
5	Inadequate or insufficient site information (site investigation report)	17	Lack of coordination between project participants
6	Delayed payment by the employer	18	Tight project schedule
7	Design variations required by clients	19	Actual quantities different from contract quantities
8	Defective work	20	Lack of compliance with environmental requirements
9	Lack of consistency between the BQs, drawings and specifications	21	Financial failure of the contractor
10	Technical complexity and design innovations requiring new construction methods and materials	22	Financial failure of the sub-contractor
11	Unhealthy working condition for workers	23	Delays in supply of utilities i.e. electricity and water
12	Cost under estimation		

Source: Njogu (2015)

2.4.2 Risk Management Practices

Managing risk in construction projects has been recognized as a very important management process to achieve the project objectives in terms of time, cost, quality, safety and environmental sustainability (Osei-Fosu, 2014). There are many variations of risk management process (RMP) available in literature, but most described frameworks are as listed in the following table.

Table 2.3: Risks Management Sub-processes

Previous Study	Risk Management Sub-process
Chapman and Ward (1997)	➢ Define the project ➢ Focus the process ➢ Identify the issues ➢ Structure the issues ➢ Clarify ownership ➢ Estimate variability ➢ Evaluate implications ➢ Harness the plans ➢ Manage implementations
Musyoka (2012)	✓ Risk identification ✓ Risk assessment and analysis ✓ Risk prioritization or ranking ✓ Risk management response ✓ Risk monitoring and continuous improvement
PMI (2014)	❖ Risk planning ❖ Risk identification ❖ Qualitative risk analysis ❖ Quantitative risk analysis ❖ Risk response ❖ Risk monitoring and control
Alhassan (2016)	➢ Risk identification ➢ Risk analysis ➢ Risk response ➢ Risk control and monitoring

Source: Reserchер, 2019

This study focuses on the different sub-processes of risk management process as listed by Musyoka (2012) – Reason being it consolidates the sub-processes.

a) Risk Identification

This is the first stage in risk management, and it entails capturing all the potential risks that could arise within the project (Mousa & Enshassi, 2005). Controllable and uncontrollable risks are revealed on this stage. Controllable are voluntarily undertaken and its outcome is part of the direct control of a project while those risks which do not influence a project are termed as uncontrollable (Alhassan, 2016). According to Musyoka (2012), risk identification is associated with the use of the following techniques: expert judgment, brainstorming, diagrammatic techniques, Delphi technique, checklists, interviews and Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis.

b) Risk Assessment and Analysis

Risk analysis involves assessing the identified risks (Mousa & Enshassi, 2005). The process indicates what could happen in the event that the project does not travel along the planned route (Alhassan, 2016). Qualitative and quantitative methods are employed in the analysis of risks. The qualitative methods are most applicable when risks can be placed somewhere on a descriptive scale from high to low level (Aimable, 2015). Banatienne and Banaitis (2012) affirms that, the quantitative methods are used to determine the probability and impacts of risk identified and are based on numeric estimation.

Table 2.4: Various Risk Analysis Techniques

Risk Analysis	
Qualitative	**Quantitative**
✓ Direct judgment	✓ Probability analysis
✓ Ranking options	✓ Sensitivity analysis
✓ Comparing options	✓ Scenario analysis
✓ Descriptive analysis	✓ Simulation analysis

Source: Alhassan (2016)

c) Risk Prioritization or Ranking

This involves itemizing all identified project risks in a particular hierarchy of project risk significance for a particular project (Musyoka, 2012). Risks are measured in terms of the impact they cause to the project objectives. For instance, while considering cost or schedule of a project, the following interpretation can be made using a five-point scale in regard to risk impact.

Table 2.5: Impact of Risk on Construction Project Objectives

Scale	Itemized Risks	Impact Interpretation
1	Negligible risk	Would have no substantive effect on cost or schedule.
2	Minor risk	Would cause only small cost/schedule increases.
3	Moderate risk	Would cause moderate cost/schedule increases; important requirements would still be met.
4	Serious risk	Would cause major cost or schedule increases and secondary requirements may not be achieved.
5	Critical risk	Would cause project failure.

Source: Researcher, 2019

c) Risk Management Response Strategies

This stage focuses on the action to be taken towards the identified risks and threats. An article by the Government of South Australia (2012) points out that**,** the selected measures for a risk contribute to either mitigating the risk or strengthening current controls. Musyoka (2012) acknowledge that, risk response includes; eliminating the risk by avoiding it usually by treating the root causes; accepting the risk but have a contingency plan in place; shifting the risk to a third party by transferring it, for instance, through insurance and reducing the likelihood of its occurrence by mitigation.

The Project Management Institute (2013) as lists the following strategies for managing risks in the construction projects; **avoid** (extending schedule, reducing scope, shutting down the project); **transfer** (Financial risk exposure, insurance, warranties, guarantees); **mitigate** (taking early actions, adopting less complex

processes, conduction of more tests, choosing more stable supplies, prototyping, redundancy); or **accept** (***passive acceptance:*** no action except to document the strategy and leave it to the project team to deal with it; ***active acceptance:*** establishing contingency reserve for money, time and resources).

d) Risk Monitoring

Checking on identifiable risks and new risks as well as monitoring of residual risks are expected as the project progresses (Alhassan, 2016). By regularly reviewing the effectiveness and efficiency of controls and the appropriateness of treatment / action options selected, it becomes easier to determine whether resources are being put to the best use possible.

An article on risk management framework published by the Government of South Australia (2012) clearly indicates that, effective communication and consultation are essential to ensure that those responsible for managing risk and those with a vested interest, understand the basis on which decisions are made and why particular treatment / action options are selected or the reasons to accept risks have changed.

2.4.3 Risk Management Tools

The Project Management Institute (2013) identifies tools and techniques for the risk management process as conceptualized in the following table.

Table 2.6: Tools and Techniques for the Risk Management Process

Risk Management Sub-process	Tools & Techniques	Outputs
Risk planning	➢ Analytical techniques (stakeholder risk profile analysis & use of strategic risk scoring sheets) ➢ Expert judgment ➢ Meetings	✓ Risk management plan
Risk identification	✓ Documentation reviews ✓ Information gathering techniques (brainstorming, Delphi technique, interviewing & root-cause analysis) ✓ Checklist analysis ✓ Assumptions analysis ✓ Diagramming techniques (Cause and effect diagrams, system or process flow charts & influence diagrams) ✓ SWOT analysis ✓ Expert judgment	➢ Risk register
Qualitative risk analysis	➢ Risk probability and impact assessment ➢ Probability and impact matrix ➢ Risk data quality assessment ➢ Risk categorization ➢ Risk urgency assessment ➢ Expert judgment	✓ Project documents updates
Quantitative risk analysis	✓ Data gathering and representation techniques (Interviewing & probability distributions) ✓ Quantitative risk analysis and modeling techniques (Sensitivity analysis, expected monetary value (EMV) analysis, Modeling and	➢ Project documents updates

Risk Management Sub-process	Tools & Techniques	Outputs
	simulation) ✓ Expert judgment	
Risk response	➢ Strategies for negative risks or threats (avoid, transfer, mitigate & accept) ➢ Strategies for positive risks or opportunities (exploit, share, enhance and accept) ➢ Contingent response strategies ➢ Expert judgment	✓ Project management plan updates ✓ Project documents updates
Risk monitoring and control	✓ Risk reassessment ✓ Risk audits ✓ Variance and trend analysis (Earned value analysis) ✓ Technical performance measurement (weight, transaction times, number of delivered defects, storage capacity, etc.) ✓ Reserve analysis ✓ Meetings	➢ Work performance information ➢ Change requests ➢ Project management plan updates ➢ Project documents updates ➢ Organizational process assets updates

Source: PMI (2013)

2.5 BIM Application to Risk Management

In recent years, Building Information Modelling (BIM) has been seen as one of the main interest areas in the construction industry and it is expected to play a significant role in facilitating risk management (Zou et al, 2015). Several computer applications have been developed to support the use of BIM in practice and a new trend to use BIM-related digital tools for risk management has been emerging. BIM has been proven as an effective way to assist early identification and assessment of risks for design and construction through 3D visualization, 4D scheduling and 5D cost estimating (Grilo, A. & Jardim-Goncalves, R, 2010); (Zhang, 2011) and (Mitchell, 2012).

In Finland, Sulankivi et al (2010) note that several BIM-based software packages for design and construction professionals are widely used in Finland and other Scandinavian countries. The scholar lists ArchiCAD, Revit and Tekla Structures for designers and Tekla Construction Management software and NavisWorks software for project management purposes as the most widely used softwares. Both Tekla software and Autodesk NavisWorks software includes sophisticated 4D-tools that can be deployed to aid in mitigation of Risk management within the Pre-Construction period.

Wang et al (2014) developed a 5D BIM model in Hong Kong where a 3D model (Revit-based software) was linked with the construction project schedule (MS Project files) using Autodesk NavisWorks to allow real-time and whole-project simulation. A study by Dhlamini et al (2009) in Namibia presents a commercial web-based application known as Risk Radar Enterprise (RRE) using MS Access database. The Risk Radar Enterprise application enables management and communication of project costs, schedule, technical and performance risk within a common enterprise framework. The scholar further claims that, RRE gives the project team the visibility they need to proactively identify, analyze, track, control, mitigate and report risk.

ORACLE provides a cloud-based service know as Oracle Prime Projects which empowers the project team to have real-time visibility into project cost, schedule, risk and performance information (ORACLE, 2017). The Oracle Prime Projects risk management capabilities provides a risk register and the necessary tools that develops risk-response plans to address project risks and establish post-response scenarios to be compared with pre-response results (Nyabioge et al, 2018). The cloud service also can run a Monte Carlo analysis on a project, incorporating schedule and risk data to produce histogram curves showing expected time and cost outcomes and the probability of achieving each one (ORACLE, 2017).

2.6 Theories Related to Risk Impact on Performance

This study was guided by three theories. These included Theory of Constraints, Fuzzy Set Theory, and financial economics theory.

2.6.1 Theory of Constraints

The primary theoretical anchorage of this study is the Theory of Constraints (TOC), a management paradigm that postulates that any manageable system faces several constraints that limit the achievement of its organizational goals (Goldratt, 2014). The TOC was the main theory for this study, as it interrogated the entire construction value chain, from start to finish. The TOC largely takes a process-based view of firm performance and identifies the rate determining steps, that is, those that are most critical in affecting project performance, and by extension, firm performance. When these are resolved, they have a net effect of enhancing the flow of work and effective allocation and distribution of firm resources. At the minimum, TOC holds that there is at least one constraint and proposes the use of a focusing process to identify the constraint and organize the rest of the processes around it.

In identifying the constraint or constraints, TOC proposes measurement and control using three key parameters, namely, the throughput, operational expense and inventory. Inventory represents the financial costs of all items necessary in production; operational expense, on the other hand, is the cost of production; while throughput refers to the rate at which the system generates sales revenues. According to TOC, if there were no constraints inhibiting an organization from achieving its throughput, its sales revenues would be infinite. This is however, impossible in a real life system, and only by optimizing flow through the constraints, can overall throughput be maximized. Constraints can be internal, where the system fails to generate sufficient supply to match demand, conversely, external, where supply exceeds demand. In order to focus processes through the constraints, TOC proposes five key steps, namely, identification of the systems constraints, formulating strategies on exploiting the identified constraints, prioritizing these strategies, increasing the constraints throughout capacity and monitoring and elevating with the necessary feedback loops. The five focusing steps are known as the Process of Ongoing Improvement (POOGI) and the centroid of their implementation is the identified system constraints (Goldratt, 2014).

In applying TOC to risk management of construction projects, there is recognition of the fact that existing and future constraints are liable to become project risks. In practice, in the initial definition of construction project risks, project management focuses on the identification of the most critical risks involved (Steyn, 2012). Risk events are thus prioritized according to their potential impact at any given stage in a project. This implies that, along the project life cycle, different risks tend to assume different levels of criticality as the project progresses. Using the feedback loop implied in the last focusing step of TOC approach ensures that risk events are effectively managed by continually reducing the most critical current risk, thereby ensuring that the overall risk is reduced gradually, continually and systematically. This ensures that scarce resources are directed at managing the risks that may impact adversely on the project at any given point, and that emergent risks obtain the required attention, in terms of resource allocation, at the right stage. Ultimately, this speed up project performance and has a multiplier effect on firm performance.

2.6.2 Fuzzy Set Theory

In his seminal work, Zadeh (1965) proposed the fuzzy set theory as a tool to model the uncertainty that envelops the human cognitive processes. This theory points out the fact that fuzziness or uncertainty, affects all situations where it is necessary to apply human thinking, judgement and formulate decisions consciously and deliberately. This theory has been extended to cover the uncertainty and fuzziness that surrounds the risk management process in construction projects and eventually, affects the performance of these firms. The fuzzy logic provides a useful managerial tool for critically analyzing potential areas of risk in construction projects.

Chen and Huang (2017) notes that in its application by project management, fuzzy logic presents a decision rule, in that activity durations with a lower degree of criticality should be minimized before activities with higher degree of criticality. In other words, activities that are important and urgent should be prioritized over those activities that are of lesser importance and urgency. Where activities are equally ranked for purposes of achieving the projects outcomes, then the priority should be based on an assessment of the resources available in terms of skills, materials and

capital. That activity that best fit the resources available should be implemented. In this study, the fuzzy set theory was used in explaining how risk management strategies are prioritized, to favor activities with higher critical mass in managing construction risk, over those with less.

Since risk management strategies can be many and diversified, fuzzy logic provides a framework for discriminating the most important strategies that explain the highest variance in firm performance. Given the fact that firms worked in environments characterized by scarcity of resources, construction firm managers may then focus on optimizing those strategies that deliver maximum value. Carr and Tah (2011) have the efficacy of fuzzy set theory, through fuzzy approximation and composition, in defining risk descriptions and their consequences. Fuzzy logic was used to illustrate the relationships between risk factors, risks and their consequences, and quantify their potential impact on project performance measures. In so doing, fuzzy logic enabled the development of a construction project risk management system that produced consistent results in relation to quantifying construction risk indicators and their performance implications.

2.6.3 Financial Economics Theory

The financial economics theory builds upon the classic Modigliani-Miller (M-M) paradigm (Miller & Modigliani, 1963), as adapted to the field of risk management. This approach holds that hedging leads to lower cash flow volatilities and thus, lower volatility of firm value as measured by its stock price volatility. The ultimate value of hedging is expected to be a higher value for the firm, or a hedging premium reflected in a higher market value of equity. Implications for construction firm risk management deduced from the irrelevance conditions include higher debt capacity (Miller & Modigliani, 1963), progressive tax rates, lower expected costs of bankruptcy (Smith & Stulz, 1985), and securing internal financing (Froot, Scharfstein& Stein, 1993).

Higher debt capacity is motivated by the need for firms to raise their gearing ratios, using the tax shield to minimize tax liability as far as possible. Hedging facilitates this by lowering risk of default and allowing higher debt capacity. Hedging is also

postulated to lead to a positive relation with growth options, represented by high market-to-book value ratio. This is postulated to increase the firm's ability to secure internal financing for important strategic projects and lower the costs of financial distress important especially for large construction firms with high development expenditure. Jin and Jorion (2016) have demonstrated that risk management does lead to a hedging premium, Faff and Nguyen (2012) have verified positively, the link between hedging and higher debt capacity, and Geczy, Minton and Schrand (2017) demonstrated a positive relationship with the internal financing hypothesis, while Nance, Smith and Smithson (1993) verified positively the tax hypothesis. Since this study also investigated the role of insurance in enhancing construction firm performance, where insurance was treated as a form of hedging, the study used the financial economics theory to offer explanations as to how insurance resulted in increased firm value, essentially through increased profitability.

2.7 Literature Review Gap

The literature reviewed has highlighted a number of studies that have been done on project risk management both in Kenya and globally. It has emerged that most of the models and theories on project risk management are based on other countries and very little has been done for Kenyan consumption. This gives an insight to the reason why there has been sluggish adoption of risk management practices in the country. Musyoka (2012) and Wachuru (2013) carried out research on risk management practices, but the scholars did not come out clearly on the appropriate framework that can improve performance of construction projects. This study also notes the scantiness of theory aligning BIM with risk management to support the development process of a project. These glaring gaps created the need to develop a framework that integrates BIM solutions to streamline the risk management process of NG-CDF construction projects.

2.8 Conceptual Framework

From the theoretical framework of the study, the conceptual framework of the study was formulated as shown in Figure 2.1. The conceptual framework is a summary of collection of variables in the study and comprises of three major part. The dependent

variable of the study is NG-CDF construction projects performance. The independent variables are risk management work done, resource risk management, risk management procedures, risk management policies.

Independent Variables **Dependent Variable**

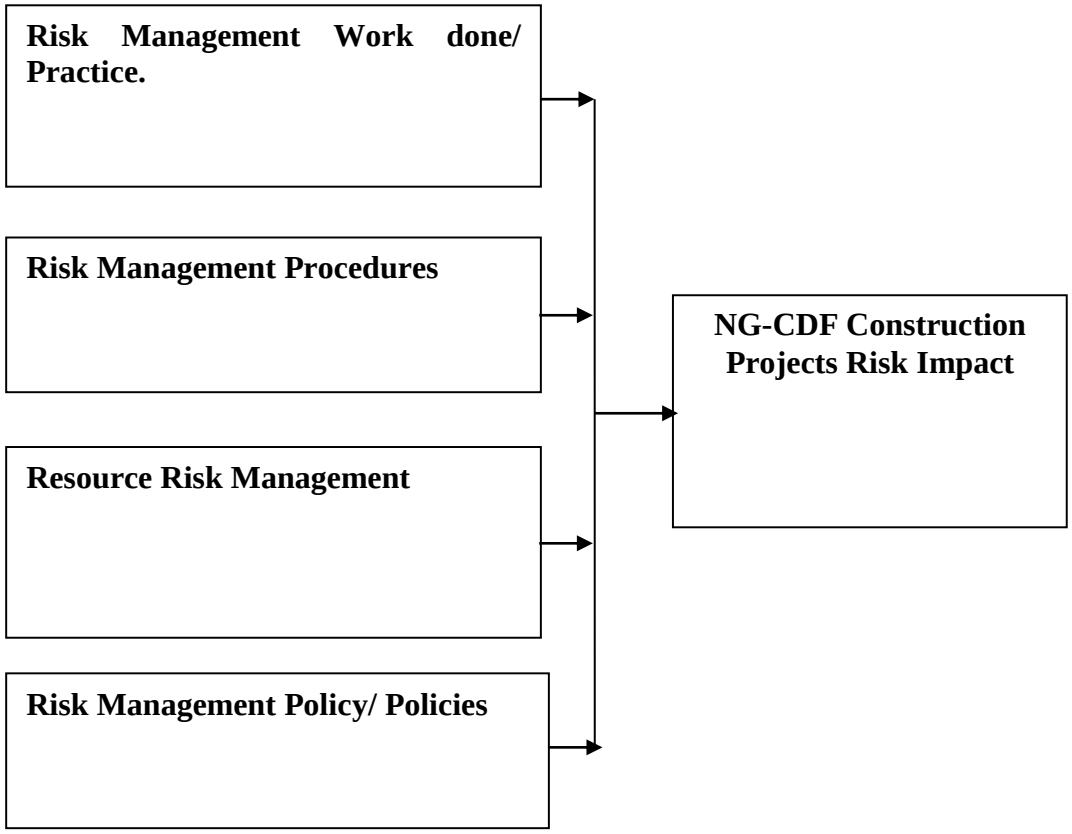

Figure 1.1: Conceptual Framework

Source: Researcher, (2019)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section covers the research procedures and methods adopted in the study. The main areas discussed include research design, area of study/target population, the sampling technique, approaches and procedures for data collection, measurement of the variables and ethical considerations.

3.2 Research Design

A survey research design was considered the best approach for this study. Quantitative research strategies were deployed. The choice of the design was influenced by several factors including research objectives, the nature of the study variables and the quality of knowledge that already exist in the given area.

3.3 Area of Study/Target Population

The study was conducted in Nairobi County where it targeted two on-going CDF projects in each ward of the seventeen constituencies (each constituency has 5 wards) translating to a total of 170 projects. Nairobi County was preferred among other Counties in the Country since it houses the capital city of Kenya and has the highest Gross Domestic Product (GDP) at 27.5% (Mutuku, 2019)

3.4 Sampling

The study employed a probabilistic sampling technique of simple random sampling in data collection and construction project managers of the on-going NG-CDF projects were considered as the appropriate respondents for the questionnaires of the 170 targeted projects.

3.4.1 Sample size determination

The rule of thumb was to obtain a large sample as big as possible. However, the sample size was dependent on many factors which included the following.

i. Administrative concerns. For instance, the research deadlines.
ii. Cost consideration (desire to minimize cost)
iii. Sampling method.

A sample size was determined using a formula provided by Godden (2004) as follows.

$$SS = \frac{Z^2 \times P(1- P)}{M^2}$$

Where:

SS- Sample size for infinite population (not known population)

Z- Standard normal deviate at the required confidence level. For instance, 1.96 for 95% confidence level.

P- Population proportion (assumed to be 0.5 since this provides the maximum sample size)

M- Margin of error at 5% (0.05)

Therefore, the sample size was;

$$SS = \frac{1.96^2 \times 0.5(1- 0.5)}{0.05^2} = 384$$

Sample size formula for finite population (known)

The following formula was applied to arrive at the appropriate sample size;

$$Ss = \frac{SS}{\left[1 + \frac{(SS - 1)}{Pop}\right]}$$

Where;

SS; Sample size for infinite population

Ss; Sample size for finite population

Pop; Finite population (known target population)

Therefore.

$$Ss = \frac{384}{\left[1 + \frac{(384 - 1)}{170}\right]}$$ **= 118 is the desired sample size.**

A sample of 118 on going NG-CDF Construction projects were picked randomly from the target population and questionnaires administered to 118 construction managers.

3.5 Method of Data Collection

Primary data was collected using self-administered structured questionnaires developed based on the research objectives. By self-administering the selected research instruments which consisted of both structured and close ended questions, it allowed respondents to feel as though they could be completely truthful in their answers, rather than feeling under pressure from an interviewer or other participants. The questionnaires were both online (Google forms) and hand delivered to the construction project managers.

3.6 Pilot Study

The research used a convenience sample of five CDF projects in Kasarani Constituency - Nairobi County. To conduct a pilot survey for purpose of pre-testing the questionnaires, the respondents to the questionnaires comprised of 5 construction project managers. Based on the pilot study, the questionnaires were refined by removing any question that provided unreliable or irrelevant information.

3.6.1 Validity of the Questionnaires

The questionnaires were designed and carefully constructed to avoid ambiguity. Additionally, the researcher ensured that, the questions in the data collection tools facilitated answers to all the research objectives.

3.6.2 Reliability Test

To establish the reliability of the instrument, an internal consistency a method known as Cronbach's alpha was used and the analysis was executed using R software version 3.4.3.

Table 3.1: Cronbach's α Values Interpretation within a Scale of 0 - 1.

Cronbach's Coefficient Alpha	Internal Consistency Remarks
$\alpha < 0.5$	Poor
$0.5 \leq \alpha < 0.7$	Sufficient
$\alpha \geq 0.7$	Good

Source: Inuwa (2014)

The questionnaires were basically constructed to capture the demographic profiles of the respondents and the study objectives as illustrated by the following table.

Table 3.2: Questionnaire Factor Categories Cronbach's α Scores

S/N	Factor category	No. of Items	Cronbach's α	Reliability Status
1	Demographic data	4	0.708	**Reliable**
2	Risk likelihood and impact	45	0.932	**Reliable**
3	Risk Management Practices	16	0.882	**Reliable**

Source: Researcher, 2019

As show in the table above, the study areas and variables had a α Scores which were above 0.7 and therefore deemed reliable for this study. Cronbach alpha ranges between 0-1. Scores between 0-0.6 indicate that the instrument has a low reliability while scores of 0.7 and above indicate that the instrument has a high level of internal consistency and reliability (Cooper & Schindler, 2013)

3.7 Method of Data Analysis and Presentation

A statistical program Statistical Package for the Social Sciences (SPSS) version 25 was used for the statistical analyses of the data obtained from the questionnaire survey. Descriptive statistics method was applied in analyzing quantitative data where data was scored by calculating the percentages, frequencies, averages, mean and standard deviation. Additionally, inferential statistics were applied through correlation analysis and multiple regression analysis. The results were presented in form of charts, tables, graphs and mathematical equations.

The multiple linear regression model used in this study was as follows.

$$Y=\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where, Y was the risk impact on NG-CDF construction projects.

β_0 was the constant. β_1, β_2, β_3 and β_4 were the independent variables coefficients and determine the response of Y to a unit change in variable x.

X_1= Risk management work done/ practice.

X_2= Risk management procedures

X_3= Resource risk management

X_4= Risk management policies

F-test was used to test the joint significance of all coefficients and t-test for the test significance of individual coefficients. The significance of the regression model was determined at 95% confidence interval and 5% level of significance.

3.8 Operationalization / Measurement of Variables

Table 3.3: Operationalization of the Research Variables

Category	Variables	Indicators	Measurement
Dependent Variable	Risk impact on NG-CDF construction projects	-Impact on Project Cost -Impact on project time -Impact on quality -Impact on environment -Impact on health and safety	Aggregated index of 1-5 point scale
Independent Variable	Risk management work done	-Risk identification -Risk analysis -Risk prioritization and ranking -Risk response and monitoring -Risk management tools and techniques	Aggregated index of 1-5 point scale
Independent Variable	Risk management procedures	-Software's availability -Adequate financial resources -Log table -Risk register -Risk committee	Aggregated index of 1-5 point scale
Independent Variable	Resource risk management	-Risk management manpower -Risk management financing	Aggregated index of 1-5 point scale
Independent Variable	Risk management policies	-Policy Guide availability -Guidelines on risk management	Aggregated index of 1-5 point scale

Source: Researcher, 2019

3.9 Ethical Consideration

The engaged respondents were made to understand the reasons for conducting the research through a consent form attached on the questionnaires and no one was coerced or unduly engaged in the data collection process. A research permit had been obtained from the National Commission for Science, Technology and Innovation (NACOSTI) to ease the data collection exercise. Finally, all the information obtained from the respondents was handled with confidentiality and the names of the respondents were not disclosed.

3.10 Chapter Summary

In this chapter, details regarding the research design, target population, sampling, data collection, analysis and presentation were discussed. The subsequent sections presented the results of data analysis executed using a statistical program SPSS version 25, discussions, conclusions, recommendations and areas of further research.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses the interpretation and presentation of the findings obtained from the field. The chapter presents the background information of the respondents and findings of the analysis based on the objectives of the study. Descriptive statistics and inferential statistics were used to do the data analysis of the study.

4.2 Response Rate and Background Information

This section presents the study response rate and the respondents' demographic information. The demographic information sought included respondent's working experience of the project manager field of specialization, highest educational qualifications, field of specialization and level of knowledge of risk management.

4.2.1 Response Rate

The study targeted a sample size of 118 respondents in collecting data out of which 95 filled in and returned the questionnaires making a response rate proportion of 80.51% as shown in Table 4.1. According to Mugenda and Mugenda (2003) a response rate of 50% is adequate for analysis and reporting. Further, a rate of 60% is good and a response rate of 70% and over is excellent. Based on the assertion, the response rate was considered as excellent.

Table 4.1: Response Rate

Response	Frequency	Percentage
Responded	95	80.5
Not responded	23	19.5
Total	**118**	100

Source: Research data, (2019)

4.2.2 Working Experience of the Project Manager

Participants were required to indicate their working experience of the project manager. Results are presented in Table 4.2

Table 4.2: Working Experience of the Project Manager

Working Experience	Frequency	Percentage
Less than 5 Years	18	18.9
5-10 Years	24	25.3
10-15 Years	31	32.6
Over 15 Years	22	23.2
Total	**95**	**100.0**

Source: Research data, (2019)

Results show that most of the respondents (32.6%) had served as project managers for a period of 10-15 years, 25.3% of the respondents had served for a period of 5-10 years, 23.2% of the respondents had served for over 15 years while 18.9% of the respondents had served for not more than 5 years. This implies that respondents could give reliable information based on their vast experience.

4.2.3 Highest Level of Education

Individual's level of education is perceived to ability to understand and interpret subjects, in view of analysing respondent's ability to respond to the study topic, respondents were required to indicate their highest level of educational qualifications. The findings are presented in Table 4.3

Table 4.3: Level of Educational Qualification

Academic Qualifications	Frequency	Percentage
Diploma	17	17.9
Bachelor's Degree	46	48.4
Master's Degree	32	33.7
Total	**95**	**100.0**

Source: Research data, (2019)

The findings of this revealed that most of the respondents as shown by 48.4% of the respondents held bachelor's degrees, 33.7% of the respondents were holders of master's degree, while 17.9% the respondents were holder's college diploma certificate. This implies that, respondents were well educated which means that they were in a position to respond to research questions with ease.

4.2.4 Field of Specialization

Respondents were required to indicate their filed of specialisation, results are presented in the Table 4.4

Table 4.4: Field of Specialization

Specialisation	Frequency	Percentage
Engineering	16	16.8
Architecture	33	34.7
Accounting	46	48.4
Total	**95**	**100.0**

Source: Research data, (2019)

Results show that 48% of the respondents worked as project accountants, 34.7% of the respondents worked as Architects while 16.8% of the respondents worked as project engineers. This shows that nearly all the key project personnel were well involved in this study.

4.2.5 Level of Knowledge of Risk Management

Respondents were required to indicate their level of knowledge of risk management; results are presented in the Table 4.5

Table 4.5: Level of Knowledge of Risk Management

Level of Knowledge	Frequency	Percentage
Average Level	33	34.7
High Level	62	65.3
Total	**95**	**100.0**

Source: Research data, (2019)

Results presented in the table above show that most of the respondents (65.3%) considered themselves to have high level of knowledge on risk management process while 34.7% indicate to have fair understanding on risk management process.

4.3 Description of Risk Impact and Explanatory Variables

This section analyses risk factors likelihood of occurrence and impacts. Further, it analyses the study explanatory variables using measures of central tendencies.

4.3.1 Risk Impact

In this section risk factors in NG-CDF projects have been analysed. The analysis of the impact is categorized in term of likelihood of occurrence, impact on project cost, impact on project time, impact on quality impact on environment and impact on health and safety. Mean based on the responses has been used as the impact measure. The findings are presented in Table 4.6

Table 4.6: Risk factors Likelihood of Occurrence and Impacts

Risk Factors	Likelihood of occurrence	Impact on Project Cost	Impact on project time	Impact on quality	Impact on environment	Impact on health and safety
Design/ Technical						
Design variations required by clients	3.78	3.81	3.90	3.32	2.90	2.50
Defective designs(shoddy and/or erroneous)	3.52	4.02	3.94	3.78	3.54	3.49
Incomplete design	2.89	3.68	3.71	3.53	3.43	3.21
Inadequate or insufficient site information (site investigation report)	3.62	3.77	3.81	3.84	3.92	3.81
Inadequate/ defective specification	3.52	3.65	3.50	4.15	2.95	3.12
Information unavailability-details, drawings, sketches	3.88	3.98	3.65	3.87	3.42	3.21
Unclear scope of work	3.71					
Lack of consistency between the BQs, drawings and	3.92	3.80	3.63	3.95	3.61	3.77

Risk Factors	Likelihood of occurrence	Impact on Project Cost	Impact on project time	Impact on quality	Impact on environment	Impact on health and safety
specifications						
Time						
Delay in handing over the site	4.03	4.23	4.12	2.96	2.88	2.11
Inadequate project programme	3.88	3.86	3.86	3.57	3.25	2.97
Tight project schedule	3.92	3.88	3.78	3.85	3.07	3.87
Difficult to access the site	3.65	4.02	3.84	3.73	3.05	3.65
Delays in supply of Materials	3.75	4.01	3.60	3.65	2.87	2.87
Delays in supply of utilities i.e. electricity and water	4.08	3.85	3.74	3.61	3.46	2.94
Financial/ Economic						
Delayed payment by the employer	3.87	4.08	3.79	2.90	2.56	2.34
Exchange rate fluctuations and inflation	2.98	3.89	2.98	2.80	2.31	2.34
Cost under estimation	3.79	3.94	3.65	3.87	3.42	2.90
Quality risks						
Inadequate sub-contractor efficiency and competency	3.80	3.60	3.50	4.11	3.92	3.78
Defective work	3.67	3.98	3.65	3.87	3.42	3.11
Technical complexity and design innovations requiring new construction methods and materials	3.40	3.90	3.84	3.71	2.65	2.13
Construction/ project execution						
Legal disputes during construction among the parties to contract	4.11	3.98	4.21	3.71	2.73	2.64
Industrial disputes during construction	4.07	3.74	3.99	3.56	2.86	2.54
Loss or damage of third parties property due to construction activities	3.59	3.76	3.54	2.86	3.46	3.64
Serious accidents on site	3.84	3.81	3.90	3.32	2.90	2.50
Wastage of materials on site by workers	3.55	4.02	3.81	3.94	3.87	3.43
Actual quantities different from	3.40	3.54	3.71	3.71	3.29	2.47

Risk Factors	Likelihood of occurrence	Impact on Project Cost	Impact on project time	Impact on quality	Impact on environment	Impact on health and safety
contract quantities						
Inadequate labour and equipment productivity	3.03	3.69	3.78	3.91	3.83	3.21
Equipment failure	3.43	3.92	3.89	4.08	3.02	2.87
Difficult site conditions	3.72	4.03	3.96	3.79	3.23	3.52
Inadequate supervision and supervision team	3.40	4.17	4.03	3.98	3.74	3.32
Poor communication between contract parties	3.42	3.86	3.32	3.21	2.76	2.64
Lack of coordination between project participants	3.80	3.88	3.78	3.85	3.07	2.86
Political and Environmental						
Prolonged approval procedures in administrative government departments	4.03	4.07	3.74	3.65	2.87	2.87
Compliance with new government Acts and Legislations	3.92	4.08	3.79	2.90	2.56	2.34
Lack of support for the project by the local communities	4.15	3.89	2.98	2.80	2.31	2.34
Adverse weather conditions	3.83	3.94	3.65	3.87	3.42	2.90
Impact of construction project on surrounding environment	3.54	3.50	3.34	3.54	3.88	3.65
Unhealthy working condition for workers	3.74	3.60	3.50	4.11	3.92	3.78
Compliance with environmental requirements	3.84	3.98	3.65	3.87	3.42	3.11
Compliance with safety and health requirements on site	3.85	3.81	3.90	3.32	3.65	3.76
Unstable security circumstances	3.64	4.02	3.94	3.78	2.54	3.49
Natural Disasters						
Damage caused by wind, hurricanes, fire, landslides	3.58	3.68	3.71	3.53	3.65	3.56

Source: Research data, (2019)

Weighted means were used to analyse risk factors likelihood of occurrence in relation to various impacts as shown in Table 4.6. On design and technical, lack of consistency between the BQs, drawings and specifications with a mean of 3.92 and information unavailability-details, drawings and sketches with a mean of 3.88 had the highest mean on the likelihood of occurrence. It was further established that inadequate/ defective specification resulted to poor project quality outcome as represented by a mean of 4.15. These findings are in line with those of Navon (2015) who found out that managerial and design factor is the major and most significant problem in a high-rise construction project in terms of frequency and risk impacts. Fang (2004) also found out that the most significant risk events are found to be financial risks, including capital return difficulty, owners' delaying payment and owner's unreasonable upfront capital demand. Additionally, Zou, Zhang and Wang (2007) also identified personnel risk, such as client risk, designer risk, contractor risk, subcontractor risk or supplier risk, as major risks in the Chinese construction market.

The findings are also in line with those of Ahmed, Azhar, Castillo and Kappagantula, (2002) who identified ten most critical causes as building permits approval, change order, changes in drawings, incomplete documents, inspections, changes in specifications, decision during development stage and shop drawings and approval. Sambasivan and Soon (2007) also identify ten most important causes of risks in the construction industry to be contractor’s improper planning, contractor’s poor site management, inadequate contractor experience, inadequate client’s finance and payments for completed work, problems with subcontractors, shortage in material, labor supply, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage.

The study also established that delays in supply of utilities like electricity and water (4.08) and delay in handing over the site (4.02) were highly likely to occur. Delay in handing over the site brought about high projects cost (4.23) and affected the projects timelines as shown by a mean of (4.12). Inadequate sub-contractor efficiency and

competency highly affected the projects Quality as shown by a mean of 4.11. Legal disputes during construction among the parties to contract registered high Likelihood of occurrence. As represented by a mean of 4.11. It was also worth noting that excessive approval procedures in administrative government departments were also likely to occur in most of the construction projects as shown by a mean of 4.03. The findings concur with those of Mousa and Enshassi (2005) who revealed that, financial failure by contractors; dangerous working condition; closure; defective design; delayed payment on contract; segmentation of Gaza Strip; unstable security circumstances; poor communication between involved parties; unmanaged cash flow and award of design to unqualified designers were the most significant risk factor as rated by contractors.

4.3.2 Risk Management Work Done

Statement on risk management work done were analyzed and the findings are presented as follows in Table 4.7.

Table 4.7: Risk Management Work done.

Risk Management Work Done	N	Min	Max	Mean	Std Dev
Risk Identification					
Risk identification process was carried out at the inception of the project to identify both internal and external factors affecting the project	95	3	5	3.65	0.77
Tools and techniques used to identify these risks, included; review of documentation, brainstorming, interviews, expert judgment etc.	95	3	5	3.51	0.12
Risk Analysis					
For all the risks identified the likelihood and impact of the risk was assessed.	95	3	5	3.46	0.65
Risk Prioritization and Ranking					
The risks identified were ranked depending on their significance to the project.	95	3	5	3.68	0.61
The risks were ranked from low/negligible risks to major/critical risks.	95	3	5	3.52	0.43
Risk Responses and Monitoring					
We had open and effective communication channels in the project team, the contractors, suppliers, client and other project stakeholders.	95	3	5	3.71	0.32

Risk Management Work Done	N	Min	Max	Mean	Std Dev
The risk management plan developed from analysis of risks affecting the project was communicated to all stakeholders.	95	3	5	3.54	0.23
Strategies were developed to manage the risks identified. For instance; taking insurance covers, performance guarantees, and retention sum and defect liability period.	95	3	5	3.63	0.85
Risk management was always part of the agenda in the project's progress meetings.	95	3	5	3.68	0.43
A risk matrix was developed for the project.	95	3	5	3.88	0.86
The risk matrix was reviewed and updated throughout the life cycle of the project.	95	3	5	3.49	0.39
We undertook continuous performance improvement through learning and innovation.	95	3	5	3.75	0.61
Risk Management Tools and Techniques					
A risk register/matrix was developed incorporating the risks identified, controls, responses, and residual risks.	95	3	5	3.78	0.31
The risk register/matrix was continuously reviewed by the project team/project manager.	95	3	5	3.56	0.43
A project risk auditor was appointed to advice and/or manage the risks in the project.	95	2	4	3.32	0.32
There was adequately trained human resources to manage the project and the risks identified (adequate human capital)	95	2	4	3.40	0.13

Source: Research data, (2019)

Table 4.7 above analyzed the various risk management practices and presented the findings in terms of mean and standard deviations. On risk identification, the study established that the risk identification process was carried out at the inception of the project to identify both internal and external factors affecting the project as shown by a mean of 3.65. Tools and techniques used to identify these risks, included review of documentation, brainstorming, interviews, expert judgment as shown by a mean of 3.51. The findings go in line with those of Westland (2006) who identified project steps where more attention should be directed toward risk management. In the initial project phase, the feasibility study is undertaken, which is a thorough analysis of a

project proposal. At this stage, a number of solutions are identified and assessed, and the study is conducted to identify potential risks associated with proposed solutions.

Further in the planning phase, a risk plan is drawn up where potential risks related to project planning are identified. All the stakeholders should contribute in drawing up this plan to make sure that every potential risk has been identified. In addition to identifying risk, the risk plan assigns the type of action which should be taken to respond to a particular problem. Performing this stage in the planning phase aims at mitigating risk before the execution phase, during which any occurring risk is very costly if no action is taken in advance (Westland, 2006).

On risk analysis, it was established that after risks identification and likelihood, the impact of the risk was assessed as shown by a mean of 3.46. The risks identified were ranked depending on their significance to the project (3.68) and were further ranked from low/negligible risks to major/critical risks as shown by a mean of 3.52. Risk Management tools and techniques such as the risk register/matrix were developed incorporating the risks identified, controls, responses and residual risks as shown by a mean of (3.78). Finally, the risk register/matrix was continuously reviewed by the project team/project manager as shown by a mean of 3.56. The findings are in line with those of Musyoka (2012) who acknowledged that, risk response includes eliminating the risk by avoiding it usually by treating the root causes; accepting the risk but have a contingency plan in place; shifting the risk to a third party by transferring it, for instance, through insurance and reducing the likelihood of its occurrence by mitigation. According to Kamau (2015), risk identification is associated with the use of the following techniques: expert judgment, brainstorming, diagrammatic techniques, Delphi technique, checklists, interviews and Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. The findings however disagreed with those of Alhassan (2016) in Ghana who revealed that, contractors do not utilize risk analysis techniques but resort to the use of comparison of projects for the purposes of analysis.

4.3.3 Resource Risk Management

Participants were required to indicate their level of agreement with the following statements relating to influence of resource risk management on NG-CDF construction projects in Nairobi County.

Table 4.8: Influence of resource risk management on NG-CDF construction projects

Statements	N	Max	Min	Mean	Std Dev
The current and future material risk exposures of the project are identified, assessed, quantified, appropriately mitigated and managed	95	3.00	5.00	4.24	0.61
There is proper utilization of the resources allocated for risk management process	95	3.00	5.00	3.96	0.76
The CDF risk management committee have skilled and experienced personnel	95	3.00	5.00	4.21	0.71
Management committee uses ICT to Track resource availability	95	3.00	5.00	4.05	0.78
Proper measures are put in place to Manage workload allocation to track hour-by-hour availability	95	3.00	5.00	4.26	0.59
It is possible to View project schedules to monitor task progress	95	3.00	5.00	4.07	0.72
The CDF risk management committee can Monitor resource productivity on the project dashboards.	95	3.00	5.00	4.38	0.72
The CDF risk management committee through assess the duration and timing to special skill requirements prior before the beginning the projects.	95	3.00	5.00	4.08	0.77
Delayed financial disbursement have negatively affected the quality process NG-CDF construction projects in Nairobi County	95	3.00	5.00	4.01	0.72
Strategies are in place to ensure delayed deliveries are made on time	95	3.00	5.00	4.06	0.63
Construction cost overruns negatively affected the quality process NG-CDF construction	95	3.00	5.00	4.11	0.72
Project team conflicts negatively affected the quality process on implementation of NG-CDF construction	95	3.00	5.00	4.01	0.71

Source: Research data, (2019)

From the study findings majority of the respondents agreed that CDF risk management committee can monitor resource productivity on the project dashboards (M= 4.38 SD=0.72), Proper measures are put in place to manage workload allocation to track hour-by-hour availability (M=4.26 SD=0.59), the current and future material risk exposures of the project are identified, assessed, quantified, appropriately mitigated and managed (M= 4.24 SD=0.61) and that the CDF risk management committee have skilled and experienced personnel (M=4.21 SD=0.71). These findings go hand in hand with the study findings by Flyvbjerg et al. (2003), observe that effective risk management increases value through adherence to budget, adherence to schedule, and conformance to quality expectations, among other measures.

The study also revealed that construction cost overruns negatively affected the quality process NG-CDF construction (M=4.11 SD=0.72), strategies are in place to ensure delayed deliveries are made on time (M= 4.06 SD=0.63), The CDF risk management committee through assess the duration and timing to special skill requirements prior before the beginning the projects(M=4.08 SD=0.77), It is possible to view project schedules to monitor task progress (M=4.07 SD=0.72), management committee uses ICT to track resource availability (M= 4.05 SD=0.78), Delayed financial disbursement have negatively affected the quality process NG-CDF construction projects in Nairobi County, project team conflicts negatively affected the quality process on implementation of NG-CDF construction (M= 4.01 SD=0.71) and that there is proper utilization of the resources allocated for risk management process (M= 3.96 SD=0.76). These findings are in support of the study findings by Kerzner (2016), instituting resource risk management in construction projects is to increase value-added along the construction value chain, ensuring compliance with best practice construction approaches, thus minimizing waste and inefficiencies.

4.3.4 Risk Management Procedures

Participants were required to indicate their level of agreement with the following statements relating to risk management procedures on NG-CDF construction projects in Nairobi County.

Table 4.9: Influence of risk management procedures on NG-CDF construction projects

Statements	N	Max	Min	Mean	Std Dev
The risk management team have adequate project management software	95	3.00	5.00	4.29	0.52
There is adequate financial resource allocation to the risk management committee	95	3.00	5.00	4.16	0.66
There are log tables maintained and inspected from time to time in project office	95	3.00	5.00	4.29	0.58
Risk register has been developed incorporating the risks identified, controls, responses and residual risks	95	3.00	5.00	4.15	0.64
The CDF management have positive attitude towards risk management process	95	3.00	5.00	4.13	0.73
The CDF risk management committee have a champion for the process	95	3.00	5.00	4.16	0.79
The CDF risk management team uses approved project management software	95	3.00	5.00	4.00	0.74
The CDF risk management committee benchmarks its operations with other established organizations	95	3.00	5.00	3.88	0.74

Source: Research data, (2019)

From the study findings majority of the respondents agreed that risk management team have adequate project management software (M= 4.29 SD=0.52) there are log tables maintained and inspected from time to time in project office (M=4.29 SD=0.58), the CDF risk management committee have a champion for the process, There is adequate financial resource allocation to the risk management committee (M= 4.16 SD=0.66) and that Risk register has been developed incorporating the risks identified, controls, responses and residual risks ((M= 4.15 SD=0.64). These findings go hand in hand with the study findings by Wachuru (2013) development of risk management procedures should be part of the planning process to figure out risk that might happen in the project and how to control that risk if it in fact occurs.

Results also show that the CDF management have positive attitude towards risk management process (M= 4.13 SD=0.73) CDF risk management team uses approved project management software (M= 4.00 SD=0.74) and that the CDF risk management

committee benchmarks its operations with other established organizations (M= 3.88 SD=0.74). These findings are in support of the study findings by Mandere (2016) who found out that having a risk management plan can aid to capture the negative and positive impacts to the project and what actions that ca be used to deal with them.

4.3.5 Risk Management Policies

Respondents were required to indicate their level of agreement with the following statements relating to influence of risk management policies on NG-CDF construction projects in Nairobi County

Table 4.10: Influence of risk management policies on NG-CDF construction projects

Statements	N	Max	Min	Mean	Std Dev
The constituency has well laid policy guiding the risk management process	95	3.00	5.00	4.23	0.63
The policy guarantee compliance with appropriate regulations, wherever applicable, through the adoption of best practices	95	3.00	5.00	4.08	0.72
The constituency has well laid guidelines on the intervals of carrying out Risk management	95	3.00	5.00	3.88	0.81
Risk management process is clear, definite and easily understood by all the participants	95	3.00	5.00	3.98	0.80
NG-CDF construction projects are founded on risk Management Framework for identifying, assessing, mitigating, monitoring, evaluating and reporting all risks	95	3.00	5.00	4.37	0.65
Policy frame work provide clear and strong basis for informed decision making at all levels of the organization and to continually strive towards strengthening the Risk Management System through continuous learning and improvement	95	3.00	5.00	3.88	0.81
Risk Management Policy provide for the enhancement and protection of business value from uncertainties and consequent losses	95	3.00	5.00	4.07	0.78
Risk Management Policy provide clear and strong basis for informed decision making at all levels of the organization	95	3.00	5.00	4.04	0.78

Source: Research data, (2019)

From the study findings majority of the respondents agreed that NG-CDF construction projects are founded on risk management framework for identifying, assessing, mitigating, monitoring, evaluating and reporting all risks (M= 4.37 SD=0.65), The constituency has well laid policy guiding the risk management process (M=4.23 SD=0.63), The policy guarantee compliance with appropriate regulations, wherever applicable, through the adoption of best practices (M=4.08 SD=0.72) Risk Management Policy provide for the enhancement and protection of business value from uncertainties and consequent losses ((M= 4.07 SD=0.78) and that risk management policy provide clear and strong basis for informed decision making at all levels of the organization (M=4.04 SD=0.78). These findings go hand in hand with the study findings by Musyoka (2012) Strong risk management policies offers the chance to gain a clear understanding of the goals, duties and contents of the service and the feasibility of the project.

The study also revealed that risk management process is clear, definite and easily understood by all the participants(M= 3.98 SD=0.80), Policy frame work provide clear and strong basis for informed decision making at all levels of the organization and to continually strive towards strengthening the risk management system through continuous learning and improvement and that the constituency has well laid guidelines on the intervals of carrying out risk management (M= 3.88 SD=0.81) These findings are in support of the study findings by Banatienne and Banaitis (2012) a comprehensive preventative risk management program leverages a team of experts to identify and provide a deeper understanding of all types of risks.

4.3.6 NG-CDF Construction Projects in Nairobi County

Respondents were required to indicate their level of agreement with the following statements relating to quality of risk management process by NG-CDF construction projects in Nairobi County.

Table 4.11: Quality of risk management process by NG-CDF construction projects

Statements	N	Max	Min	Mean	Std Dev
RISK management has enabled tracks on actual performance against target, identifies trends that are correlated with forecasted performance	95	3.00	5.00	4.19	0.67
Process of risk quantification for the company has to be qualitative, supported by quantitative impact analysis.	95	3.00	5.00	4.14	0.74
operational uncertainties like unpredictable changes are timely predicted and changes made on time	95	3.00	5.00	4.11	0.69
Risk facing NG-CDF construction is timely to external parties, such as customers, vendors, regulators and shareholders.	95	3.00	5.00	4.11	0.71
NG-CDF construction cans early warning signals concerning potential risk-related events.	95	3.00	5.00	4.19	0.70
Risk management process gives management of NG-CDF construction with a real time view of risks inherent in a process, function or unit.	95	3.00	5.00	3.88	0.60

Source: Research data, (2019)

From the study findings majority of the respondents agreed that risk management has enabled tracks on actual performance against target, identifies trends that are correlated with forecasted performance (M= 4.19 SD=4.19) and that process of risk quantification for the company has to be qualitative, supported by quantitative impact analysis (M= 4.14 SD=0.74), operational uncertainties like unpredictable changes are timely predicted and changes made on time, risk facing NG-CDF construction is timely to external parties, such as customers, vendors, regulators and shareholders (M= 4.11) and that risk management process gives management of NG-CDF construction with a real time view of risks inherent in a process, function or unit (M=3.88 SD=0.60). These findings are in support of the study findings by Alhassan (2016) risk management system helps in achieving the project's goals mainly depend on the planning, preparation, results and evaluation process

4.4 Correlation analysis

In order to determine the relationship between the variables under study, the study used Karl Pearson's product moment correlation analysis. The findings were as shown in the Table 4.12.

Table 4.12: Correlation Results

		Risk Impact On NG-CDF Construction Projects	Risk Management Work Done(X_1)	Risk Management Procedures X_2	Resource Risk Management (X_1)	Risk Management Policies (X_4)
Risk impact on NG-CDF construction projects	Pearson Correlation	1	-.419**	-.432**	-.396**	-.382**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	95	95	95	95	95
Risk management work done(X_1)	Pearson Correlation	.419**	1	.149	.307**	.159
	Sig. (2-tailed)	.000		.151	.002	.125
	N	95	95	95	95	95
Risk management procedures (X_2)	Pearson Correlation	-.432**	.149	1	.158	.136
	Sig. (2-tailed)	.000	.151		.127	.189
	N	95	95	95	95	95
Resource risk management (X_3)	Pearson Correlation	-.396**	.307**	.158	1	.239*
	Sig. (2-tailed)	.000	.002	.127		.020
	N	95	95	95	95	95
Risk management policies (X_4)	Pearson Correlation	-.382**	.159	.136	.239*	1
	Sig. (2-tailed)	.000	.125	.189	.020	
	N	95	95	95	95	95

Source: Research data, (2019)

From the finding in the table above, the study found that there was negative correlation between risk impact on NG-CDF construction projects and risk management work done as shown by correlation factor of -0.419, this strong

relationship was found to be statistically significant as the significant value was 0.000 which is less than 0.005. The study also found negative correlation between risk impact on NG-CDF construction projects and Risk management procedures as shown by correlation coefficient of 0.432, this too found to be significant at 0.00 level of confidence. The study also found negative correlation between risk impact on NG-CDF construction projects and resource risk management as shown by correlation coefficient of -0.396, this too found to be significant at 0.00 level of confidence. The study further found strong positive correlation between risk management policies and risk impact on NG-CDF construction projects as shown by correlation coefficient of -0.382 at 0.000 levels of confidence.

4.5 Regression Analysis

In this study, a multiple regression analysis was conducted to test the influence among predictor variables. The research used statistical package for social sciences (SPSS V 21.0) to code, enter and compute the measurements of the multiple regressions. The model summary is presented in the Table 4.13 below

Table 4.13: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.654[a]	.428	.402	.58256

Source: Research data, 2019

The study used coefficient of determination to evaluate the model fit. The adjusted $R^{2,}$ also called the coefficient of multiple determinations, is the percent of the variance in the dependent explained uniquely or jointly by the independent variables. The model had an average adjusted coefficient of determination (R^2) of 0.402 and which implied 40.2% of the variations on risk impact on NG-CDF construction projects performance in Nairobi County is explained by the independent variables understudy (risk management work done, risk management procedures, resource risk management and risk management policies).

The study further tested the significance of the model by use of ANOVA technique. The findings are tabulated in Table 4.14 below.

Table 4.14: Summary of One-Way ANOVA results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.830	4	5.708	16.818	.000[b]
	Residual	30.544	90	.339		
	Total	53.374	94			

Critical value =2.47

Source: Research data, (2019)

From the ANOVA statics, the study established the regression model had a significance level of 0.000% which is an indication that the data was ideal for making a conclusion on the population parameters as the value of significance (p-value) was less than 5%. The calculated value was greater than the critical value (16.818 > 2.47) an indication that risk management work done, risk management procedures, resource risk management and risk management policies all have a significant effect on risk impact linked with NG-CDF construction projects performance in Nairobi County. The significance value was less than 0.05 indicating that the model was significant.

In addition, the study used the coefficient table to determine the study model. The findings are presented in the Table 4.15 below.

Table 4.15: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.242	.550		2.259	.026
	Risk Management Work Done	-.535	.168	-.269	-3.179	.002
	Risk Management Procedures	-.583	.146	-.326	-3.999	.000
	Resource Risk Management	-.379	.161	-.203	-2.360	.020
	Risk Management Policies	-.551	.185	-.246	-2.975	.004

Source: Research data, (2019)

As per the SPSS generated output as presented in table above, the equation ($\mathbf{Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon}$) becomes:

$Y= 1.242 -0.535x_1-0.583x_2-0.379x_3 -0.551x_4$

From the regression model obtained above, a unit change in risk management work done while holding other factors constant would reduce risk impact on NG-CDF construction projects performance in Nairobi County by a factor of -0.535. A unit increase in risk management procedures while holding the other factors constant would reduce risk impact on NG-CDF construction projects performance in Nairobi County by a factor of -0.581. A unit increase in resource risk management while holding the other factors constant would reduce risk impact on NG-CDF construction projects performance in Nairobi County by a factor of -0.379 and that unit increase in risk management policies while holding the other factors constant would reduce risk impact on NG-CDF construction projects performance in Nairobi County by a factor of -0.551.

The analysis was undertaken at 5% significance level the criteria for comparing whether the predictor variables were significant in the model was through comparing the obtained probability value and α=0.05. If the probability value was less than α, then the predictor variable was significant otherwise it wasn't. All the predictor

variables were significant in the model as their probability values were less than α=0.05.

4.6 Discussion of the Findings

The study found a positive correlation between NG-CDF construction projects performance and Resource risk management (correlation factor = 0.659, significant value = 0.000) test correlation results also show that a unit change in resource risk management while holding other factors constant would positively change NG-CDF construction projects performance in Nairobi County by a factor of 0.968. These findings are in support of the study findings by Kerzner (2016), instituting resource risk management in construction projects is to increase value-added along the construction value chain, ensuring compliance with best practice construction approaches, thus minimizing waste and inefficiencies.

Descriptive results reveled that agreed that CDF risk management committee can monitor resource productivity on the project dashboards (M= 4.38 SD=0.72), proper measures are put in place to manage workload allocation to track hour-by-hour availability (M=4.26 SD=0.59), the current and future material risk exposures of the project are identified, assessed, quantified, appropriately mitigated and managed (M= 4.24 SD=0.61) and that the CDF risk management committee have skilled and experienced personnel (M=4.21 SD=0.71). These findings go hand in hand with the study findings by Flyvbjerg et al. (2003), observe that effective risk management increases value through adherence to budget, adherence to schedule, and conformance to quality expectations, among other measures.

Further the study revealed that construction cost overruns negatively affected the quality process NG-CDF construction (M=4.11 SD=0.72), strategies are in place to ensure delayed deliveries are made on time (M= 4.06 SD=0.63), The CDF risk management committee through assess the duration and timing to special skill requirements prior before the beginning the projects (M = 4.08 SD=0.77), It is possible to view project schedules to monitor task progress (M=4.07 SD=0.72), management committee uses ICT to track resource availability (M= 4.05 SD=0.78), delayed financial disbursement have negatively affected the quality process NG-CDF

construction projects in Nairobi County, project team conflicts negatively affected the quality process on implementation of NG-CDF construction (M= 4.01 SD=0.71) and that there is proper utilization of the resources allocated for risk management process (M= 3.96 SD=0.76). These findings are in support of the study findings by PMI (2013) recognizes resource risk management as an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost and quality.

The study found a positive correlation between NG-CDF construction projects performance and risk management procedures (correlation factor = 0.659 significant value = 0.000) test correlation results also show that a unit change in risk management procedures while holding other factors constant would positively change NG-CDF construction projects performance in Nairobi County by a factor of 0.541. These findings are in support of the study findings by Mandere (2016) who found out having a risk management plan can aid to capture the negative and positive impacts to the project and what actions that ca be used to deal with them.

Results show that risk management team have adequate project management software (M= 4.29 SD=0.52) there are log tables maintained and inspected from time to time in project office (M=4.29 SD=0.58), the CDF risk management committee have a champion for the process, There is adequate financial resource allocation to the risk management committee (M= 4.16 SD=0.66) and that risk register has been developed incorporating the risks identified, controls, responses and residual risks ((M= 4.15 SD=0.64).These findings go hand in hand with the study findings by Wachuru (2013) development of risk management procedures should be part of the planning process to figure out risk that might happen in the project and how to control that risk if it in fact occurs.

Results also show that the CDF management have positive attitude towards risk management process (M= 4.13 SD=0.73) CDF risk management team uses approved project management software (M= 4.00 SD=0.74) and that the CDF risk management committee benchmarks its operations with other established organizations (M= 3.88 SD=0.74). These findings are in support of the study findings by Oketch (2014) that

Project risk management help in identifying, analyzing and then responding to any risk that arises over the life cycle of a project thus aiding the project remain on track and meet its goal.

The study found a positive correlation between NG-CDF construction projects performance and risk management policies (correlation factor = 0.364 significant value = 0.000) test correlation results also show that a unit change in risk management policies while holding other factors constant would positively change NG-CDF construction projects performance in Nairobi County by a factor of 0.326; These findings are in support of the study findings by Musyoka (2012) Strong risk management policies offers the chance to gain a clear understanding of the goals, duties and contents of the service and the feasibility of the project.

The study established that NG-CDF construction projects are founded on risk management framework for identifying, assessing, mitigating, monitoring, evaluating and reporting all risks (M= 4.37 SD=0.65), the constituency has well laid policy guiding the risk management process (M=4.23 SD=0.63), the policy guarantee compliance with appropriate regulations, wherever applicable, through the adoption of best practices (M=4.08 SD=0.72) risk management policy provide for the enhancement and protection of business value from uncertainties and consequent losses (M= 4.07 SD=0.78) and that risk management policy provide clear and strong basis for informed decision making at all levels of the organization (M=4.04 SD=0.78). These findings go hand in hand with the study findings by Banatienne and Banaitis (2012) a comprehensive preventative risk management program leverages a team of experts to identify and provide a deeper understanding of all types of risks.

The study also revealed that risk management process is clear, definite and easily understood by all the participants (M= 3.98 SD=0.80), policy frame work provides clear and strong basis for informed decision making at all levels of the organization and to continually strive towards strengthening the risk management system through continuous learning and improvement and that the constituency has well laid guidelines on the intervals of carrying out risk management (M= 3.88 SD=0.81). These findings are in support of the study findings by Alhassan (2016) risk

management system helps in achieving the project's goals mainly depend on the planning, preparation, results and evaluation process.

Assessment on quality of risk management process by NG-CDF construction projects in Nairobi County showed that risk management has enabled tracks on actual performance against target, identifies trends that are correlated with forecasted performance (M= 4.19 SD=4.19) and that process of risk quantification for the company has to be qualitative, supported by quantitative impact analysis (M= 4.14 SD=0.74), operational uncertainties like unpredictable changes are timely predicted and changes made on time, risk facing NG-CDF construction is timely to external parties, such as customers, vendors, regulators and shareholders (M= 4.11) and that risk management process gives management of NG-CDF construction with a real time view of risks inherent in a process, function or unit (M=3.88 SD=0.60). These findings are in support of the study findings by Mousa and Enshassi (2005) observed that quality of risk management process ensures that projects are completed within the set time, using the correct budget, and follow the quality guidelines.

4.7 Formulation of Risk Management Framework

One objective of this study was to formulate a framework for enhancing the risk management process of the NG-CDF projects in Nairobi County. This study therefore proposes the following risk framework for the NG-CDF while undertaking their projects. a diagrammatic representation of the framework is also shown in Figure 4.2

	Risk factor	Risk Management Prescription
1	Supply of defective materials	Ensure only trusted suppliers are engaged in the supply of materials. Periodic review of suppliers to enable the NG-CDF board select good suppliers
2	Working under harsh conditions	Proper planning of projects taking into consideration weather conditions to ensure the most appropriate conditions are provided for work. This requires regular assessment of the conditions under which site teams work to

	Risk factor	Risk Management Prescription
		ensure maximum performance is achieved at all times.
3	Improper construction methods	To avoid the problem of improper construction methods, site managers and foremen should be given regular training to enable them have current knowledge of practices in the industry and grant them the ability to identify wrong methods used by site teams
4	Lack of protective equipment	NG-CDF board should ensure adequate PPE is made available to workers at all times and also workers are given the required training on site safety and the need to use protective equipment
5	Ineffective time allocation of project	To ensure the problem of ineffective time allocation is managed, project planning at the initial stage of projects should be done with emphasis on allowing reasonable time on the execution of projects. This will require good method statements which will take into consideration risk factors likely to affect time on the projects
6	Poor communication between involved parties	Good collaborations between involved parties (from clients, consultants and contractors) should be encouraged on all projects to ensure a common good is pursued for the project
7	Unsuitable leadership style	People put in charge of managing projects or sites should be given the required leadership training to ensure building construction projects precede based on good leadership. This has to take into account local specific factors likely to affect project performance
8	Low productivity	The issue of productivity at the construction site can be improved through motivation of site teams and also instituting a very effective management team and style on projects.
9	Delayed payment in contracts	The influence of delayed payments can be managed by ensuring issues of payment are well documented at the start

	Risk factor	Risk Management Prescription
		of projects. NG-CDF board should be encouraged to ensure payments arrangements made are executed according to plan. Contractors may also want to put in place a backup plan to ensure the cash flow of projects are not negatively affected by delayed payments.
10	Poor site management and supervision	The issue of poor site management and supervision can be managed by ensuring management team on site are given the required training and also have the required technical knowhow on the construction methods and technologies used on projects.
11	Fluctuation of materials prices	As the problem of price fluctuation is outside the control of the project teams, procurement of materials for projects should be made well in advance of their use periods to prevent increased costs from material price increases.
12	Health and Safety issues	Health and safety issues should be given the needed consideration on projects as it has a high influence on project performance. Management teams on site should have appropriate training in health and safety which will help them pass on health and safety guides on site to workers. There should be periodic tool box talks on health and safety at the project sites to ensure site teams are well equipped on health and safety issues
13	Bribery and Corruption	Often the risks to construction organizations stems from corrupt practices of which it has no knowledge, undertaken by its suppliers and customers. Due diligence and careful negotiations should be required to insulate construction organizations from the wrongdoing of others. NG-CDF board should consider deploying enhanced scrutiny when entering into contracts with other parties.
14	Material wastage	The issue of material wastage on projects can be managed by ensuring proper planning of material usage and also

Risk factor	Risk Management Prescription
	using the most appropriate methods of construction which will lead to low waste generation. This can also be checked by having good supervision of the activities of site workers.

Source: Research data, (2019)

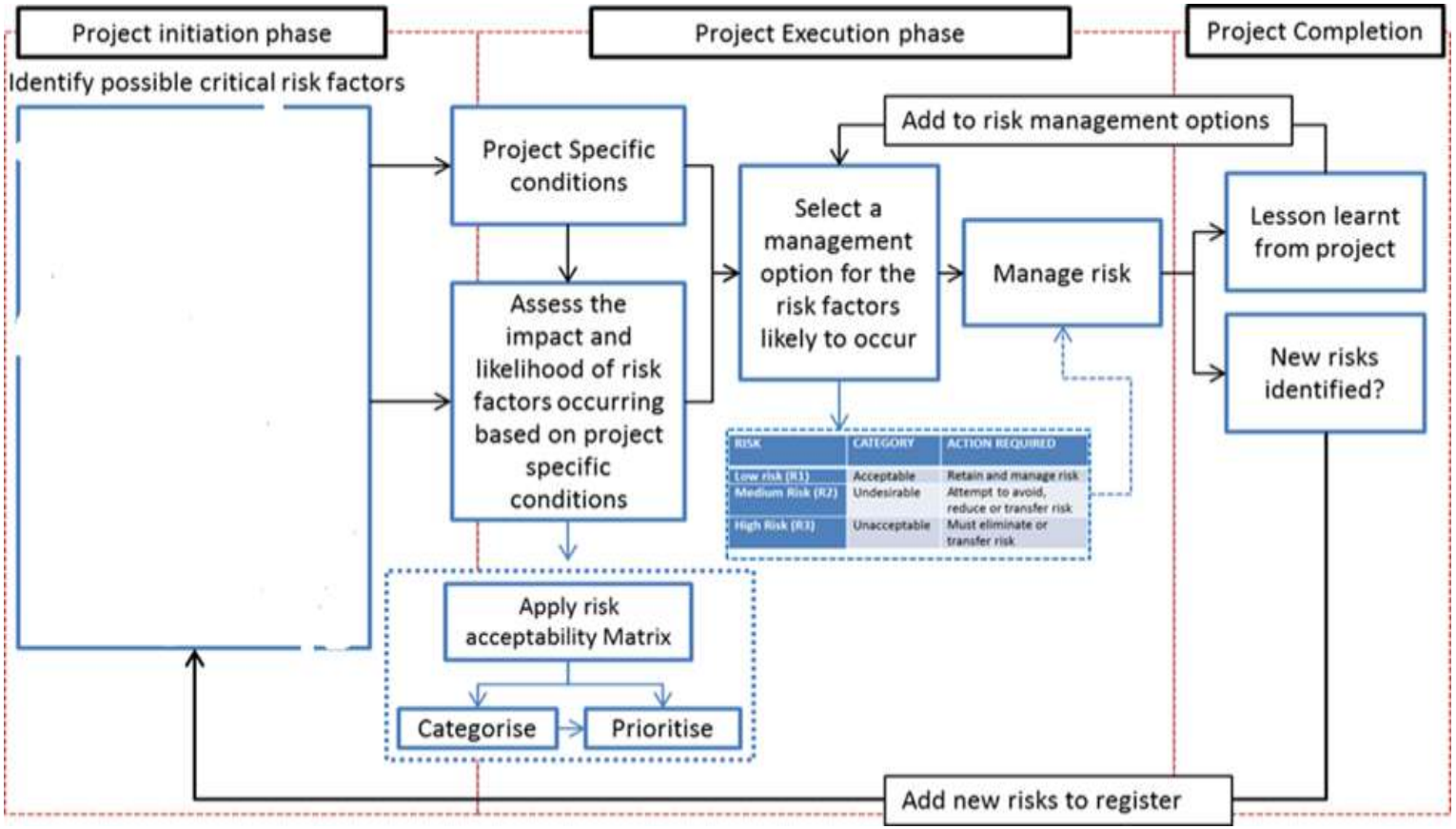

Figure 4.1 Framework

Source: Research data, (2019)

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents the summary of the research findings, discussion of the findings, conclusion and recommendations. The chapter is guide by the study objectives which were to describe the level of risk impacts on the NG-CDF projects and the variables that might influence it namely resource risk management, risk management procedures and risk management policies. The second objective was to determine the coefficients of correlation between risk impacts and other four explanatory variables, the third variable was to regress risk impact on the four explanatory variables and finally to formulate a framework for enhancing the risk management process of the NG-CDF projects in Nairobi County.

5.2 Conclusions

The study concludes that resource risk management had a positive significant influence on NG-CDF construction projects in Nairobi County, to promoted resource risk management the management committee ensured that ensured proper utilization of the resources allocated all processes, measures had be put in place to ensure that current and future material risk exposures of the project are identified, assessed, quantified, appropriately mitigated and managed and that deliveries were made on time, the CDF risk committee salon assessed the duration and timing to special skill requirements prior before the beginning the projects.

In line with the second objective the study revealed that risk management procedures play a positive instrumental role on performance of NG-CDF construction projects in Nairobi County. To enhance the process, CDF management have positive attitude towards risk management process, CDF risk management committee benchmarks its operations with other established organizations and that the risk management team used

an approved project management software for accountability and efficiency enhancement.

The study concludes that strong risk management policies have a positive impact of on performance of NG-CDF construction projects in Nairobi County, the constituency has well laid policy guiding the risk management process, Policy framework provide clear and strong basis for informed decision making at all levels of the organization and that the available policy guarantee compliance with appropriate regulations, wherever applicable, through the adoption of best practices

5.4 Recommendations

Construction risk management is extremely critical for every company. Not knowing where there might be risks on a project leave company vulnerable and ill-prepared. NG-CDF board and the Constituency risk management committee should deploy the model and framework developed to enhance the chances of success in the NG-CDF run projects. This will reinforce the risk management policy that is consistent with the risk management strategy.

It is also important to establish effective education and training environments through continued professional development to gain sufficient attentions and attitude from the industry on all key issues about Project Risk Management (PRM)

5.5 Area for Further Research

Further investigation should be carried out in contractual risk management (CRM) in conjunction with the project procurement route (PPR). This could include further case studies of construction projects and investigation into special contract.

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APPENDICES

Appendix I: Questionnaire Cover Letter

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

SCHOOL OF ARCHITECTURE AND BUILDING SCIENCES (SABS)

DEPARTMENT OF CONSTRUCTION MANAGEMENT

August, 2018.

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

I am a Master of Science student in the above addressed institution conducting a research on **"Risk Management and its Influence on Performance of NG-CDF Construction Projects in Nairobi County".** The research is for meeting the requirement for a master degree in construction project management at the Jomo Kenyatta University of Agriculture and Technology. The research aims to develop a framework that will improve the risk management process of the NG-CDF construction projects.

This questionnaire is purely for academic purposes and the information shall be kept confidential. Kindly fill the questionnaire as per the instructions within two weeks. If you would like to contact the developer of this questionnaire, do not hesitate to use the contacts provided herein.

Thanking you in anticipation of your cooperation.

Sincerely yours,

Mr. Njom Jared O. Miganda

(Reg. No. AB343-0696/2016)

MSc (Construction Project Management) Candidate

(Email: njommiganda@gmail.com) (Tel No: +254721704715)

Appendix II: Questionnaire for the Construction Project Manager

SECTION 1: DEMOGRAPHIC DATA

Kindly put a tick **(√)** in the box next to the selected response.

1) Kindly indicate highest level of educational qualification attained

☐ Certificate ☐ Diploma ☐ Bachelor's degree ☐ Masters

☐ Others (specify) _____

2) Kindly indicate your educational specialization

☐ Construction Management ☐ Architecture ☐ Civil Engineering

☐ Quantity surveying ☐ other (specify) _____

3) Please indicate how long you have worked in the construction industry?

☐ Less than 5years ☐ 5-10years ☐ 10-15years ☐ over 15years

SECTION 2

A: CONSTRUCTION RISKS LIKELIHOOD (PROBABILITY) OF OCCURRENCE AND IMPACT ON PROJECT PERFORMANCE.

Please assign (tick as appropriate) the likelihood of occurrence of each risk factor and its impact on each of the project objectives.

Risks Likelihood (Probability) of Occurrence		**Impact of risk on Construction Project Objectives**	
Symbol	**Meaning**	**Symbol**	**Meaning**
1	Rare (remote)	1	Very low
2	Unlikely	2	Low
3	Likely (possible)	3	Moderate
4	Highly likely	4	High
5	Almost certain	5	Very high

	RISK FACTORS	**Likelihood of occurrence**					**Impact on Project Cost**					**Impact on Project Time**					**Impact on Quality**					**Impact on Environment**					**Impact on Health and Safety**				
		5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
	Design/ Technical																														
1	Design variations required by clients																														
2	Defective designs(shoddy and/or erroneous)																														
3	Incomplete design																														
4	Inadequate or insufficient site information (site investigation report)																														
5	Inadequate/ defective specification																														
6	Information unavailability-details, drawings, sketches																														
7	Unclear scope of work																														

8	Lack of consistency between the BQs, drawings and specifications																																
	Time																																
9	Delay in handing over the site																																
10	Inadequate project programme																																
11	Tight project schedule																																
12	Difficult to access the site																																
13	Delays in supply of Materials																																
14	Delays in supply of utilities i.e. electricity and water																																
	Financial/ Economic																																
15	Delayed payment by the employer																																
16	Financial failure of the contractor																																
17	Financial failure of the sub-contractor																																
18	Exchange rate fluctuations and inflation																																
19	Cost under estimation																																
	Quality risks																																
20	Inadequate sub-contractor efficiency and competency																																
21	Defective work																																
22	Technical complexity and design innovations requiring new construction methods and materials																																
23	High performance or quality standard to meet																																
	Construction/ project execution																																
24	Legal disputes during construction among the parties to contract																																
25	Industrial disputes during construction																																
26	Loss or damage of third parties property due to construction activities																																
27	Serious accidents on site																																
28	Wastage of materials on site by workers																																
29	Actual quantities different from contract																																

	quantities																															
30	Inadequate labour and equipment productivity																															
31	Equipment failure																															
32	Difficult site conditions																															
33	Inadequate supervision and supervision team																															
34	Poor communication between contract parties																															
35	Lack of coordination between project participants																															
	Political and Environmental																															
36	Excessive approval procedures in administrative government departments																															
37	Compliance with new government Acts and Legislations																															
38	Lack of support for the project by the local communities																															
39	Adverse weather conditions																															
40	Impact of construction project on surrounding environment																															
41	Unhealthy working condition for workers																															
42	Compliance with environmental requirements																															
43	Compliance with safety and health requirements on site																															
44	Unstable security circumstances																															
	Act of God																															
45	Damage caused by wind, hurricanes, fire, landslides																															

B: RISK MANAGEMENT WORK DONE

Kindly indicate the extent to which the following project risk management work done were applicable in your project(s) on a 5-point scale where; 1= Not Applied and 5= Very Great Extent.

S/N	RISK MANAGEMENT PRACTICES	5	4	3	2	1
	Risk Identification					
1	Risk identification process was carried out at the inception of the project to identify both internal and external factors affecting the project					
2	Tools and techniques used to identify these risks, included; review of documentation, brainstorming, interviews, expert judgment etc.					
	Risk Analysis					
3	For all the risks identified the likelihood and impact of the risk was assessed.					
	Risk Prioritization and Ranking					
4	The risks identified were ranked depending on their significance to the project.					
5	The risks were ranked from low/negligible risks to major/critical risks.					
	Risk Responses and Monitoring					
6	We had open and effective communication channels in the project team, the contractors, suppliers, client and other project stakeholders.					
7	The risk management plan developed from analysis of risks affecting the project was communicated to all stakeholders.					
8	Strategies were developed to manage the risks identified. For instance; taking insurance covers, performance guarantees, and retention sum and defect liability period.					
S/N	**RISK MANAGEMENT PRACTICES**	**5**	**4**	**3**	**2**	**1**
9	Risk management was always part of the agenda in the project's progress meetings.					
10	A risk matrix was developed for the project.					
11	The risk matrix was reviewed and updated throughout the life cycle of the project.					
12	We undertook continuous performance improvement through learning and innovation.					
	Risk Management Tools and Techniques					
13	A risk register/matrix was developed incorporating the risks identified, controls, responses and residual risks.					
14	The risk register/matrix was continuously reviewed by the project team/project manager.					

15	A project risk auditor was appointed to advice and/or manage the risks in the project.					
16	There was adequately trained human resources to manage the project and the risks identified(adequate human capital)					

C: Resource Risk Management

Kindly indicate the extent to which the following project risk management practices were applicable in your project(s) on a 5-point scale where; 1= strongly disagree and 5= strongly agree.

Statements	**1**	**2**	**3**	**4**	**5**
The current and future material risk exposures of the project are identified, assessed, quantified, appropriately mitigated and managed					
There is proper utilization of the resources allocated for risk management process					
The CDF risk management committee have skilled and experienced personnel					
management committee uses ICT to Track resource availability					
Proper measures are put in place to Manage workload allocation to track hour-by-hour availability					
It is possible to View project schedules to monitor task progress					
The CDF risk management committee can Monitor resource productivity on the project dashboards.					
The CDF risk management committee through assess the duration and timing to special skill requirements prior before the beginning the projects.					
Delayed financial disbursement have negatively affected the quality process NG-CDF construction projects in Nairobi County					
Strategies are in place to ensure Delayed deliveries are made on time					
Construction cost overruns negatively affected the quality process NG-CDF construction					
Project team conflicts negatively affected the quality process on implementation of NG-CDF construction					

D: Risk Management Procedures

Kindly indicate the extent to which the following project risk management practices were applicable in your project(s) on a 5-point scale where; 1= strongly disagree and 5= strongly agree.

Statements	**1**	**2**	**3**	**4**	**5**
The risk management team have adequate project management software					
There is adequate financial resource allocation to the risk management committee					
There are log tables maintained and inspected from time to time in project office					
Risk register has been developed incorporating the risks identified, controls, responses and residual risks					
The CDF management have positive attitude towards risk management process					
The CDF risk management committee have a champion for the process					
The CDF risk management team uses approved project management software					
The CDF risk management committee benchmarks its operations with other established organizations					

E: Risk Management Policies

Kindly indicate the extent to which the following project risk management practices were applicable in your project(s) on a 5-point scale where; 1= strongly disagree and 5= strongly agree.

Statements	**1**	**2**	**3**	**4**	**5**
The constituency has well laid policy guiding the risk management process					
The policy guarantee compliance with appropriate regulations, wherever applicable, through the adoption of best practices					
The constituency has well laid guidelines on the intervals of carrying out Risk management					
Risk management process is clear, definite and easily understood by all the participants					
NG-CDF construction projects are founded on risk Management Framework for identifying, assessing, mitigating, monitoring,					

evaluating and reporting all risks					
Policy frame work provide clear and strong basis for informed decision making at all levels of the organization and to continually strive towards strengthening the Risk Management System through continuous learning and improvement					
Risk Management Policy provide for the enhancement and protection of business value from uncertainties and consequent losses					
Risk Management Policy provide clear and strong basis for informed decision making at all levels of the organization					

F: NG-CDF Construction Projects in Nairobi County

Kindly indicate the extent to which the following on construction projects(s) on a 5-point scale where; 1= strongly disagree and 5= strongly agree.

Statements	**1**	**2**	**3**	**4**	**5**
RISK management has enabled tracks on actual performance against target, identifies trends that are correlated with forecasted performance					
Process of risk quantification for the company has to be qualitative, supported by quantitative impact analysis.					
operational uncertainties like unpredictable changes are timely predicted and changes made on time					
Risk facing NG-CDF construction is timely to external parties, such as customers, vendors, regulators and shareholders.					
NG-CDF construction cans early warning signals concerning potential risk-related events.					
Risk management process gives management of NG-CDF construction with a real time view of risks inherent in a process, function or unit.					

SECTION 3: VIEWS ON THE CURRENT RISK MANAGEMENT PRACTICES

1) In your opinion, what measures would you consider important for improving project risk management practices in NG-CDF construction projects in Nairobi County.

SECTION 4: FRAMEWORK DEVELOPMENT

2. Based on your experience in the construction industry, kindly indicate the possible risk factors that NG-CDF might encounter and what should be done mitigate these risks in construction projects risks?

Risk factor	**Proposed risk Management recommended**

'THANK YOU FOR COMPLETING THIS QUESTIONNAIRE'

THIS IS TO CERTIFY THAT:
MR. NJOM JARED MIGANDA
of JOMO KENYATTA UNIVERSITY OF SCIENCE AND TECHNOLOGY, 72866-200 Nairobi,has been permitted to conduct research in *Nairobi County*

on the topic: *RISK MANAGEMENT AND ITS INFLUENCE ON PERFORMANCE ON NATIONAL GOVERNMENT CONSTITUENCY DEVELOPMENT FUNDED CONSTRUCTION PROJECTS IN NAIROBI COUNTY*

for the period ending:
23rd August,2019

.....
Applicant's Signature

Permit No : NACOSTI/P/18/38008/24815
Date Of Issue : 24th August,2018
Fee Recieved :Ksh 1000

.....
Director General
National Commission for Science, Technology & Innovation

CONDITIONS

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2. Both the Licence and any rights thereunder are non-transferable.
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REPUBLIC OF KENYA

NACOSTI

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No.A 28340

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Appendix III: List of Projects

LIST OF NG-CDF CONSTRUCTION PROJECTS IN NAIROBI COUNTY,

FINANCIAL YEAR *2017/2018*

1) WESTLANDS CONSTITUENCY			
SINO	**PROJECT NAME**	**PROJECT ACTIVITY**	**AMOUNT (Ksbs)**
1	New Kihumbuini primary school	Rehabilitation of 8 classrooms	4,500,000
2	Kihumbuini primary school	Construction of 2 classrooms to completion	4,500,000
3	Bohra primary school	Rehabilitation of 4 classrooms and top up in the construction of two classrooms.	3,500,000
4	Lower Kabete primary school	Top up in the construction of two lassrooms.	1,500,000
5	Highridge primary school	Laying of cabro blocks at the front parking area and renovations.	3,279,007
6	Loresho primary school	Top up in the construction of two classrooms.	1,500,000
7	North Highridge secondary	Construction of 2 classrooms to completion	4,500,000
8	Vet. Lab secondary	Rehabilitation of 2 classrooms	3,000,000
9	NG-CDF office	Construction ofNG-CDF office	8,500,000
2) **DAGORETTI NORTH CONSTITUENCY**			
10	ST Gorges primary school	Construction of dormitory	2,000,000
11	Lavington primary school	Renovation of multi-purpose hall	500,000
12	Gatina Kabiro muslim primary school	Playing field levelling and landscaping	2,878,400
13	Kawangware day nursery and primary school	Completion of renovations	610,320
14	Kileleshwa primary	Completion of kitchen (landscaping and	2,377,934
15	Gatina primary	Construction of perimeter wall	10,000,000

16	Muslim primary school	Leveling of parade field	500,000
17	Kawangware primary school	Construction of boys and girls toilets	2,000,000
18	Dagoretti mixed secondary	Completion of perimeter wall	5,344,248
-19	State House girls high school	Construction of2 classrooms	2,331,975
20	Lavington secondary	Completion of administration block	2,000,000
21	Kilimani police station	Completion of police station fencing and pit latrine	1,380,000
3) **DAGORETTI SOUTH CONSTITUENCY**			
22	CDF offices	Extension ofCDF offices to include registry arid an extra office	2,000,000
23	Kagira primary school	Renovation of 4 classrooms	2,000,000
24	Mukarara primary school	Renovation of 4 classrooms and staff offices	*3,000,000*
25	Kirigu primary school	Renovation of 4 classrooms, staff offices and construction of septic tank	3,500,000
26	Kabiria primary school	Construction of two new classrooms and a septic tank	3,800,000
27	Riruta Satellite	Renovation of 4 classrooms and staff	3,000,000

	primary school	offices	
28	Nembu girls high school	Part funding for the construction of perimeter wall	2,000,000
29	Dagoretti high school	Part funding for the on-going of perimeter wall	2,000,000
30	K wa Hassan road	Grading, gravelling and drainage (Est. lkm)	2,500,000
32	Mumira Gatura road	Grading, gravelling and drainage (Est. 1.2km)	3,500,000
33	D.C - Ndumaini road	Grading, gravelling and drainage (Est. 800m)	2,500,000
34	PC - Kinyanjui Technical road	Grading, gravelling and drainage (Est. 1.2km)	3,500,000
35	Wambiri road	Grading, gravelling and drainage (Est. lkm)	4,000,000
36	Nangumi road	Grading, gravelling and drainage (Est. 800m)	2,000,000
37	Dagoretti high - Muhuri link road	Grading, gravelling and drainage (Est. 1.5km)	4,000,000
38	Wagachanja drainage	Improvement of the drainage (Est. 300m)	3,600,000
39	Muthama - Ndwaru road	Grading, gravelling and drainage (Est. 600m)	1,500,000
40	Kagondo road	Grading, gravelling and drainage (Est. 1km)	3,000,000
41	Waithaka-Mukarara - Kikuyu	Grading, gravelling and drainage (Est. 1km)	3,000,000

	link road		
42	Kavuthi road	Grading, gravelling and drainage (Est. 1.2km)	1,000,000
43	County Commissioner office - Dagoretti	Renovation of the office and expansion the boardroom	2,000,000

	district		
44	AP housing at Assistant County Commissioner grounds - Waithaka division	Construction of AP houses	3,000,000
45	AP housing at N gando chief s camp	Construction of AP houses	3,000,000
		4) **LANGATA CONSTITUENCY**	
46	Madaraka primary school	Construction of modem kitchen to completion	2,200,000
47	Highrise primary school	Construction of 2 classrooms to completion	4,200,000
48	Karen C primary school	Construction of a perimeter wall	2,000,000
49	Langata west primary school	Construction of an ablution block to completion	2,000,000
50	Langata Barracks primary school	Renovation of 2 classrooms	700,000
51	Karen C secondary school	Construction of an ablution block	1,600,000
52	Langata high school	Construction of a perimeter wall	2,150,000
53	Langata DCC office	Office completion	7,500,000
54	N geno estate post	Construction of a police post to completion	2,600,000
55	Nairobi west prison	Construction of a perimeter wall	2,150,000

5) **KIBRA CONSTITUENCY**			
56	Kibera primary school	First phase funding for construction of lavatory block	1,000,000

57	Olympic primary school	Construction of a perimeter wall	500,000
58	Mbagathi secondary	Final phase funding to carry out finishes in the school	8,921,650
59	Raila educational centre	Construction of a perimeter wall	6,500,000
60	Kibera secondary	Second phase funding for the of new secondary school in Kibera primary school	16,073,735
6) **ROYSAMBU CONSTITUENCY**			
61	Garden estate secondary school (phase 3)	Construction of a 3 - storey building	6,000,000
62	Kiwanja secondary school (phase 2)	Construction of a 3 - storey building	14,500,000
63	Kamiti secondary school	Completion of dining hall	2,000,000
64	Kiwanja primary school	Construction of ablution block	1,279,010
65	Githurai Chief and AP houses camp	Construction of 6 AP houses	4,000,000
7) **KASARANI CONSTITUENCY**			
66	Athi primary school	Construction of a perimeter wall	3,000,000
67	Njiru primary school	Construction of 4 classrooms with a slab	7,800,000
68	Highway Manyatta	Construction of 4 classrooms with a slab	7,800,000

	primary school		
69	St. Dominic secondary school	Construction of 4 classrooms with a slab and a 4 door latrine	8,720,000
70	Ruai DCC's office	Construction of 4 door latrine	920,000

8) **RUARAKA CONSTITUENCY**			
71	Drive Inn primary school	Completion of the hall	2,000,000
72	Mathare North primary school	Construction of a perimeter wall and retaining wall	9,000,000
73	Ngomongo police station staff houses	Construction of 6 AP houses	9,076,420
9) **EMBAKASI SOUTH**			
74	Njenga primary school	School playing field rehabilitation	7,400,000
75	Embakasi girls secondary school	Completion of dormitory and construction of drainage channels	13,220,000
'76	AA villa police post	Construction of a perimeter wall	9,800,000
77	Pipeline police post	Construction of a strong room to host hub	2,000,000
78	K wa Reuben chief office	Construction of a strong room to host hub	2,000,000
79	Imara Daima chief office	Construction of a strong room to host hub	2,000,000
80	K wale chief camp	Construction of a strong room to host hub	2,000,000
10) **EMBAKASI NORTH CONSTITUENCY**			
81	James Gichuru primary school	Additional funds for construction of a perimeter wall	300,000
82	Tom Mboya primary school	Completion of the playing ground and construction of a perimeter wall	11,000,000
83	Kariobangi North	Construction of a perimeter wall	1,500,000

	primary school		
84	Dndora primary school	Completion of 2 classrooms	3,100,000
85	Dandora girls	Construction of a 3-storey building	9,300,000

	secondary school		
86	Ushirika secondary	Completion of the administration block	1,500,000
87	Dandora secondary	Completion of perimeter wall	1,000,000
88	K~obangi police station	Completion of office	500,000
89	Kinyago police station	Completion of the prison cell including the armory	5,000,000
90	Kariobangi North area chief's office	Construction of 4 door toilet	1,000,000
91	Dandora 1 area chief's office	Construction of office to completion	3,000,000
92	Dandora phase 2 area chief's office	Construction of office to completion	3,000,000
93	Dandora phase 4 and 5 chief's office	Construction of 4 door toilet	1,000,000
11) **EMBAKASI CENTRAL CONSTITUENCY**			
94	Kayole north primary school	[Construction of 3 new classrooms	5,000,000
95	Imara primary school	Construction of a perimeter wall	15,295,000
96	Bondeni primary school	Construction of 3 new classrooms	4,500,000
12	**EMBAKASI EAST**		
97	Donholm primary	Renovations	15,964,672

	school		
98	school upper and lower	Construction of toilet blocks	8,297,478
13) **EMBAKASI WEST CONSTITUENCY**			
99	Unity primary school	Construction of a perimeter wall	5,000,000
100	Kwa Maji police post	Construct~on of the police post	7,000,000
101	City cotton chiefs camp	Construction of the chiefs office and a multipurpose hall	8,000,000
102	Access roads from Busara primary, Peter Kibukosya secondary and pnmary	Construction of access roads	9,379,007
14)MAKADARA **CONSTITUENCY**			
103	Star of hope primary school	Construction of 8 new classrooms	5,500,000
104	Joseph apundo primary school	Renovations	4,218,841
105	Dr. Livingstone primary school	Renovation of 4 classrooms	3,000,000
106	Kaloleni primary school	Rehabilitation of toilet block	700,000
107	St. Paul primary school	Renovation of school	3,000,000
108	Baraka primary	Construction of 4 new classrooms	2,000,000

	school		
109	Star of hope secondary school	Renovation of toilets	5,800,000
;,			
15) **KAMUKUNJI CONSTITUENCY**			
110	Moi forces primary school	Rehabilitation of 6 classrooms	1,400,000
112	Muthurwa primary school	Construction of boundary wall and school gate	1,100,000

113	Eastleigh airport primary school	Rehabilitation of 10 classrooms	1,000,000
114	Heshima primary school	Rehabilitation of the school	8,000,000
115	Kamukunji secondary school	Renovation of the school and of school kitchen	8,000,000
116	Eastleigh high school	Construction of school games store	500,000
117	Zawadi secondary	Construction of 4 classrooms	5,300,000
118	California resource centre	Construction of parking bay and boundary wall	5,000,000
119	Pumwani district officer offices	Renovation of the office block	800,000
120	Kamukunji sub-county Offices	Construction works	7,100,000
		16) **STAREHE**	
121	Mariakani primary school	Construction of a perimeter wall	3,000,000
122	St. Peter primary school	Renovation of 4 classrooms	1,500,000
123	River bank primary school	Construction of a perimeter wall	1,500,000
124	Our lady of mercy secondary school	Construction of dormitory (phase	3,005,863

12~	Ngara girls high school	Construction of dining hall	4,000,000
126	Dr, Ribiero complex	Construction of a perimeter wall	2,000,000
127	Pangani girls secondary	Construction of 4 door toilet	1,000,000
128	Pumwani girls secondary	Construction of home science laboratory phase 1	2,000,000
129	Ngara police post	Construction of 24 door ablution block	3,000,000
130	Hazina chief s camp	Construction of chief scamp	3,000,000
131	Kariokor AP camp	Construction of 10 AP houses and ablution block	6,500,000
132	Pangani police station	Construction of child protection unit and perimeter wall	4,170,000
17) **MATHARE CONSTITUENCY**			
133	Huruma primary school	Renovation of three classrooms	900,000
134	St. Theresa primary school	Renovation of two classrooms and remodeling of the swimming pool	3,000,000
135	Ndururuno primary school	Construction of 2 classrooms phase 1	2,771,551
136	Huruma secondary	Construction works and renovations in the school	6,000,000
137	Upgrading of the Old Mathare sec.	Construction works and renovations in the school	3,000,000
138	Huruma police station	Fencing and construction of2 staff houses	6,000,000

139	NG-CDF office Mathare	Completion of the office with perimeter wall and gate	4,038,186
140	Mathare social hall	Renovations	2,400,000