

**DESIGN FACTORS INFLUENCING THE QUALITY OF GOVERNMENT FUNDED
BUILDING PROJECTS: A CASE OF ISIOLO COUNTY, KENYA**

BY

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**A Research Project Submitted In Partial Fulfillment of the Requirements for the
Award of the Degree of Master of Arts in Project Planning and Management of the
University of Nairobi**

2017

DECLARATION

I declare that this project is my own original work and it has not been presented in this or any other institution for any award.

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This research project has been presented for examination with my approval as the university supervisor.

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DEDICATION

This work is dedicated to my loving wife Lucy Makena and my children Ian Mutuma, Ivy Mwenda and Leon Koome for their moral support during the period of struggle for this degree. Their contribution towards my success is invaluable.

ACKNOWLEDGEMENT

I would like to thank The University of Nairobi for offering me a chance to take a course in Master of Arts degree in Project Planning and Management. I also would wish to acknowledge the efforts of all the lecturers who took me through the course and especially Dr. John Wanjohi who taught me Research Methods. I must be grateful to my supervisor Dr. Cavens Kithinji University of Nairobi for his encouragement, supervision and guidance from the formulation of my research topic to the conclusion of this research project. I would not have gone far without his support and constructive criticism.

I most sincerely appreciate the staff at The University of Nairobi Meru Extra-mural studies for the support and training I have received. They have impacted great knowledge in me.

Lastly, my regards goes to my peers in the Master of Arts degree in Project Planning and Management for their support and direction in any respect towards the completion of this research project.

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ABBREVIATIONS AND ACRONYMS

BIM	Building Information Modelling
CAs	Customer Attributes
CIDB	Construction Industry Development Board
DP	Design Parameters
F.R	Functional Requirements
GFBP	Government Funded Building Projects
K.A.R.I	Kenya Agriculture Research Institute
KMA	Korean Metrological Administration
NCC	National Construction Council
NHC	National Housing Corporation
NHCC	National Housing and Construction Company
PVs	Production Variables
RIBA	Royal Institute of British Architects
SPSS	Statistical Package for Social Scientists
U.E.A	United Arab Emirates
U.K	United Kingdom
U.S	United States
VIF	Variance Inflation Factor

ABSTRACT

Government funded building projects are designed and constructed to fulfill the demands of users, clients and society. Many of these demands are expressed as functional requirements through building codes, standards and local regulations. Successful management of the crucial and complex interface between design and pre-construction activities is particularly becoming increasingly important in the realization of quality public buildings. It is at this interface that various design factors have been found to influence the project deliverable quality through the introduction of various bottlenecks such as: schedule overruns, non-compliance incidences, poor site coordination and cost overruns. Specifically this study investigated the influence of: communication on design, design changes, design defects and design specifications on the quality of government funded building projects. The study was hinged on two theories; Bad Apple Theory of Human Error and Theory of Axiomatic Design. The study employed descriptive survey research design. Target population of Clients was 137, Contractors were 92 and Consultants were 16. The sample size was of 79 Clients, 58 Contractors and 12 Consultants that were selected to participate in the study. Stratified sampling and simple random sampling was used to pick the respondents. Questionnaires were used to collect data from Clients, Contractors and Consultants in the study locale. Data was analyzed qualitatively and quantitatively using Statistical Package for Social Scientists (SPSS) version 21.0. The study concludes that proper communication on design enhances the quality of government funded building projects in Isiolo County, inadequate and deficient design and documentation negatively affects the efficiency of the construction process well-written design specifications are essential to the efficient construction of a successful project and that design defects decreases project quality and increases in overall project costs result. 75.4% of clients agreed that reports on poor consultant communication in government funded building project existed and 76.0% contractors also reported the same. 81.25% of clients and 86% of contractors agreed that design changes influence the functionality of government funded projects. 88.4% clients agreed that there were reports of schedule overruns of government funded building project arising from variations in project design, the same was also reported by majority of contractors (86.0%) The study recommends that designers should be given sufficient time and fees in order for them to provide quality service needed to carry out the design function completely; there should be a design review before finally approving the design for construction, project designs and out-put should clearly state client's objectives and be concise and unambiguous, only contain affordable and deliverable requirements, highlight constraints which are essential to project, allow compliance with statutory requirements, ensure lifecycle coordination between design, construction and operation. There is need for proper consultation with all stake holders on project specifications, inclusion of all departments involved in project design in monitoring and evaluation process, proper testing and engaging of structural engineers tasked with design and advancement in technology to cater for alternative designs that are less costly.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

According to Newton, (2008) effective design management does mitigate the negative influence and enhance positive influence of design factors on the quality of building projects. Best, (2010) also did observe that the quality of most buildings is negatively influenced by design factors; design defects, design changes and ineffective communication on design between architect, client and contractor. Sinclair, (2011) did support this view by proposing architects should play a key leadership role in design management as a solution to the negative influence brought about by design factors on the quality of buildings.

Scholars in Europe report that design factors play an important role in influencing the quality of government funded building projects. For instance, in the U.K the performance of the contractor in delivering quality government funding buildings was determined by the specifications and architectural design given to him (Butcher & Sheehan,2010). However, the Royal Institute of British Architects (RIBA) emphasized that it was the role of architects to ensure that buildings were delivered at clients' design requirements for both public and private (Royal Institute of British Architects, 2013). In Italy, Gersup, (2010) did report that design errors were responsible for 33% of poor quality government funded buildings projects. In Germany, Tiedemann, (2012) did also point that adherence to specifications and minimal design changes and defects did positively influences the quality of government funded buildings projects implemented in most parts of the country.

1.1.1 Communication on Design

This is the process of giving information of making coordinator or knowledge exchange between the project stakeholders who include the client, project manager, architect, engineers and contractor for good execution of the building works (Emmitt & Gorse 2009).

In a study in Malaysia, Sahid (2008) did point out that the issue of communication in novation agreement design did adversely influence the quality of 33% of government funded buildings. In Hong Kong, Yu and Chan, (2010) reported that contractors were more likely to deliver building projects in line with private clients design requirements than for public

clients due to poor communication on design associated with public clients adversely affecting public buildings. Also in the Gaza strip Al-Najjar, Enshaasi and Kumaraswamy (2009) did point out that the quality of 73% of government funded buildings was adversely influenced by poor communication on design between the architect, contractors and government officials. In Iran, better communication on design did successfully reduce the number of poor quality government funded buildings projects by 23% as reported by (Pourrostan, Ismail & Mansouneja, 2011).

1.1.2 Design Changes

This is where drawings become different from the ones issued at the time of contract signing. Change in construction projects become almost unavoidable. Changes cause disruption of performance of construction project especially on time and cost. They occur by clients changing on the requirement, design consultants omissions, unforeseen site conditions and advancement in technology (Gray & Hughes, 2001). In a study in Korea, Ahadzie (2011) did post that design changes were major factors in the performance of contractors working in the Korean Metrological Administrations (KMA) government funded buildings and overall quality of these buildings. In China also, Yung and Yip, (2010) did report that design changes were major bottleneck in ensuring the successful completion of quality buildings by the Chinese Government. In India, Hementa, Ani, Iyer, and Sameer (2012), did observe that 47% of government funded projects were delivered below expected quality specifications emanating from different design factors mostly design changes.

In Jordan, Sweis, Sweis, Abu and Shboul (2008), did point out that the occurrence of numerous design changes were leading to delay in 69% of government funded buildings which also resulted to design defects contributed by lack of effective coordination about the variations in design which adversely influenced the quality of these projects. However, the united Arab emirates (UAE) Faridi and El Sayegh (2006) did point out frequent design variations were responsible to delays which adversely influenced the quality of 18% of government funded buildings. Similarly in Saudi Arabia Al-Kharashi and Skitmore (2009), did report that 14% of constant design variations were initiated by government architects and contractors. In South America, Pasquire and Garido (2011) did report that lean design approach was adopted to mitigate the negative effects on the quality of buildings meant for

social housing in Chile brought about by constant changes in design. On the other hand in Mexico, González, González, Molenaar and Orozco (2013), did report that design changes did result in delays in 63% of government funded buildings projects adversely influencing the quality of these buildings.

Oyedele, Jaiyeibo and Fadeyi (2012), did report that design changes were 78.93% responsible in influencing quality of government funded building projects. Scholars in East Africa have also highlighted the influence of design factors on the quality of government funded buildings.

For instance in Tanzania, Kikwasi, (2012) did report that despite the existence of a regulatory body; the National Construction Council 64% of government funded buildings were delivered in poor quality emanating from numerous design variations which also caused delays in construction process. In Uganda, Basheka and Tumutegyereize, (2012) reported that 81% of government funded building were delivered at poor quality standards due to the frequent design changes, design errors and unreliable communication on design about these changes.

1.1.3 Design Defects

Design defects are failures arising from omissions. A design is defective if it failures to meet the professional standard of care. Design also becomes defective if the contractor failures to execute work in accordance with the plans and specifications (Gray & Hughes, 2001). Construction defects can be visible to the eye or concealed deep within the structure. In Peru, Lopez, Love, Edwards and Davis (2010), did point out that design defects did adversely influence the quality of 75% of government funded building projects.

In Africa, Fugar and Agyakwan-Baah (2010) did report that design defects were responsible for delays in building construction projects funded by the government which adversely affected the quality of 73% of such projects in Ghana. In Nigeria, Adesoji (2011) did estimate that 81% of public housing projects were of poor quality due to numerous design defects, in Zambia, Muya Kaliba, Sichombo and Shakantu (2013), did report that design defects resulted in schedule overruns which was positively correlated to poor quality of government funded building. In Kenya, Matindi (2013) did point out that most public

buildings constructed through government funding were poorly maintained and were at poor quality standards as evidenced by the numerous defects found in these houses.

1.1.4 Design Specifications

Specifications are a detailed plan about how a building is to be constructed. Specifications describe the materials and workmanship required for a project. The specification one gives in form of a drawing and measured items in the tender documents like contract agreement and bills of quantities (Emmitt & Yeomans, 2008).

In South Africa Olaosebikar, (2010) in his evaluation of government funded peoples housing projects buildings inspected by the country's Construction Industry Development Board (CIDB) reported that 72% of the buildings were delivered in poor quality due to poor specifications.

1.2 Statement of the Problem

Quality is an important aspect and a key performance indicator for all projects. However, along with the aspiration of government world over, most government funded building projects not only fail to be delivered on time but they fall below set quality standards (Chan, Scot and Chan, 2004). The quality of building projects has been compromised due to issues such as deficiencies in scheduling which cause project delays emanating from; design changes, design defects, poor specifications and unreliable and inconsistency communication on design. This has also resulted to issues such as; cost overrun and time delays which adversely influenced the quality of public buildings.

The situation is worse in Isiolo County where a considerable percentage of government funded buildings construction projects are falling below set quality standards as most of these buildings have unpleasant aesthetics, most have poor and unsafe accessibility, undergo numerous re-works and exhibit poor functionality of most building parts like windows and doors. This is evidenced by a report done by the ministry of public works (2015) on fourteen (14) government funded buildings that had to be stopped due to quality issues (Ministry of Public works-Isiolo).

It is for this reason this study sought to investigate the design factors that influence the quality of government funded building projects in Isiolo County. Specifically the study

looked at the influence of; communication on design, design changes, design defects and design specifications.

1.3 Purpose of the study

The purpose of the study was to investigate how design factors influence the quality of government funded building projects in Isiolo County.

1.4 Objectives of the Study

The objectives of the study were as follows;

1. To determine the influence of communication on design on the quality of government funded building projects in Isiolo County.
2. To establish the influence of design changes on the quality of government funded building projects in Isiolo County.
3. To establish the influence of design defects on the quality of government funded building projects in Isiolo County.
4. To examine the influence of design specifications on the quality of government funded building projects in Isiolo County.

1.5 Research Questions

The study was guided by the following research questions;

1. To what extent does communication on design influence the quality of government funded building projects in Isiolo County?
2. What is the influence of design changes on the quality of government funded building projects in Isiolo County?
3. To what extent do design defects influence the quality of government funded building projects in Isiolo County?
4. What is the influence of design specifications on the quality of government funded building projects in Isiolo County?

1.6 Significance of the Study

The findings of the study would be useful to policy makers especially in the Ministry of Land, Housing and Urban Development because they would be helpful in addressing impediments to the successful implementation of quality buildings and in particular those funded by government. Useful recommendations and measures to aid in the sustainability of such projects within area of study and beyond will also be provided by the study. The study has availed information in some areas that has not been researched before. Current and future researchers would also make use of the findings of this study in identifying gaps for further research.

1.7 Limitation of the Study

The study was limited to design factors influencing the quality of government funded building projects in Isiolo county. Limitations of the study were minimal as the study was carried out using government officers who had implemented building projects earlier on and the target respondents were willing to give data, thus a high response rate was realized.

1.8 Delimitation of the Study

The quality of building projects funded by government in Isiolo County may also be influenced by other design factors not covered by the study.

The scope of the study was government funded public buildings in Isiolo County. The respondents were consultants and contractors working on government funded buildings projects and the clients of these projects. This study investigated on how communication on design, design changes, design defects and design specifications factors influence the quality of government funded building projects in Isiolo County.

1.9 Assumption of the Study

The study strongly assumed that other design factors not covered in the study do not have significance influence on the quality of government funded buildings. The researcher assumed that respondents were aware of how design factors covered in the study influence the quality of government funded buildings and that they were not barred by their contractual agreement to talk on the topic of study in a naturalistic way. The researcher also assumed that the respondents participated in the study by giving correct and reliable information or data on the research instruments especially that which relates to the topic under research.

1.10 Definition of significant terms used in the study

Communication on Design

In this study, this refers to the flow of information that relates to the architectural design of government funded buildings between architects and contractors.

Design Changes

Refers to alterations or variations made to initial architectural design of government funded buildings affecting the quality of these buildings.

Design Defects

These refer to those aspects of the design, building work or materials which do not conform to the requirements of the contract under which they were procured. These can either be patent or latent defects.

Design Factors

Those factors relating to design that influence the quality of government funded buildings. These may include but not limited to: design changes, design defects, communication on design and poor design specifications.

Design Specifications

This outlines the levels of quality and standards relating to qualitative requirements of materials that will meet the designer's requirements to be met in the construction of government funded buildings. Depending on the stage of construction this can either be performance or prescriptive specifications.

Quality Buildings

This refers to government funded buildings that have pleasant aesthetics, that are durable, that have safe access, delivered on time and have reliable security features.

1.11 Organization of the Study

This study is organized into five chapters. Chapter One is introduction covering; background to the study, statement of the problem, purpose of the study which explained what the study intended to accomplish, research objectives and research question, significance of the study. The significance of the study justifies the reason for my study. This chapter also highlights delimitation and limitation of the study, and assumptions of the study.

Chapter Two reviews literature of the study. This chapter brings out what previous researchers have found out in the area of study. This chapter covers how various independent variables: communication on design, design changes, design defects and design specifications factors influence the quality of government funded building projects in Isiolo County from a global point of view narrowing down to the local level. It also covers theoretical and conceptual frameworks.

Chapter Three is Research methodology covering; research design, target population, sampling procedure which discusses in detail how the sample for this study were selected. It also covers methods of data collection, validity and reliability of data collection instruments.

Chapter Four covers data analysis, presentation and interpretation of findings, based on background information and on four variables under study which include; communication on design, design changes, design defects and design specifications.

Chapter Five covers summary of findings, discussions of the findings, conclusions and recommendations. It also provides suggestions for further studies.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter contains pertinent literature information that correlates and is consistent with the objectives of the study. The section is imperative as it ascertains the information that link the current study with past studies and what future studies will still need to explore so as to improve the body of knowledge in relation to the topic of study. The chapter also discusses relating theories and the conceptual framework of the study.

2.2 Quality Government Funded Building Projects

The quality of buildings that are government funded projects entails various features that include; building safe access, reliable design in terms of cost, attractive finishing or pleasant aesthetics in the floor, walls and ceilings (Cardellino, Leiringer & Clements-Croome, 2009; Suratkon, Chan & Jusoh 2016). Quality of government funded public buildings is also defined in terms of; building reliable security, value for public financial investment and the delivery of the building project within schedule (Cardellino, et al., 2009; Suratkon, et al., 2016).

In their study, McAuley, Hore and West, (2012) observed the need to adopt Building Information Modeling (BIM) to enhance quality of government funded buildings projects in Ireland. They note this involved the use of BIM for the enhancement of; value for money and reliable design in relation to cost (McAuley, et al., 2012). In a study, Wanigarathna (2014) found evidence on the quality of government funded hospitals in England and Wales. He notes the hospitals buildings' quality was defined in terms of; reliable security they offered to patients, their accessibility by patients, reliable design in relation to cost and the delivery of the projects within schedule (Wanigarathna, 2014). In a study, Castro, Mateus and Bragança, (2012) also established the quality of government funded hospital buildings projects in Portugal was determined by design indicators. Further, they observe the quality of these government funded buildings projects was determined in terms of; building durability as a result of initial design and reliable design in relation to cost (Castro, et al., 2012).

In a study, Suratkon and Jusoh (2015) found evidence on quality indicators of government buildings projects in Malaysia. They observe these included; safe access to buildings, security of the buildings and the integration of pleasant aesthetics to the buildings (Suratkon & Jusoh, 2015). Similar evidence by Samah, Ibrahim, Othman and Wahab (2012) who observed the quality of a government funded outpatient unit in a public hospital in Malaysia. They note these included; building safe access by patients, pleasant finishes and reliable design in relation to cost (Samah et al., 2015). In a study, Juan, Cheng, Perng and Castro-Lacouture, (2016) also found the government was funding renovations of old buildings to improve on the quality of government funded building projects in Taiwan. They note these included enhancing quality in terms of; reliable design in relation to cost, building accessibility and security. However, they observe most of these building projects were finished behind schedule and the design prejudiced building durability adversely influencing on the overall quality (Juan, et al., 2016).

In a study, Cobbinah (2010) observed factors that define the quality of government funded building projects housing academic institutions in Ghana in relation to design. He notes that these included; pleasant aesthetic, building safe access and durability all of which are determined by initial design influencing the maintenance of these public institutions' buildings (Cobbinah, 2010). Similarly, Agyekum, Ayakrwa and Amoah (2016) found evidence on quality of government funded building projects in Ghana. He contends the indicators of quality in government funded building project were; building accessibility and durability and pleasant aesthetics that most buildings lacked (Agyekum, et al., 2016). In a study, Femi (2014) also observed faulty design issues influencing the quality of government funded building projects in Nigeria. He notes these influenced the quality of these building projects in terms of; pleasant aesthetic, building safe access and durability and value for money (Femi, 2014).

In a study, Gaetsewe, Monyane and Emuze (2015) found evidence on the quality indicators of government funded building projects in South Africa. They note the quality of these projects was defined by the delivery time that was behind schedule (Gaetsewe, et al., 2015). Similarly, De Klerk (2013) observed changes in design to a better model had influenced the quality of government funded public schools buildings projects in South Africa. He

established that the quality of these projects was determined by; safe access to these buildings and their durability, reliable design in relation to cost and project delivered on time (De Klerk, 2013).

In a study, Mhando, Mlinga and Alinaitwe (2017) observed quality disparities in government funded building projects in Tanzania. They note different public building projects exhibited variations in quality in terms of; their delivery schedules and design in relation to costs (Mhando, et al., 2017). Similarly in a study, Kakitahi, Alinaitwe, Landin and Mone (2016) found evidence on quality indicators of government funded building projects in Uganda. They note the quality of these building projects was determined by; delivery schedules which was in most case behind time and reliable design in relation to project cost (Kakitahi, et al., 2016). Further, Muguiyi (2012) also found evidence on quality of government funded buildings projects in Kenya. She notes quality was defined in terms of; delivery of building projects in time, building safe access and reliable design in terms of costs (Muguiyi, 2012).

2.3 Communication on Design and the Quality of Government Funded Building Projects

To achieve quality buildings Emmitt and Gorse, (2009) advised that effective communication should be part of the building and construction process. This view was re-emphasized by Gransberg and Windel, (2008) who in their study in Australia did suggest that communication on design requirements plays a pivotal role in the delivery of high quality public buildings. Hossain, (2009) did emphasize this by pointing out that effective communication on design does improve coordination of activities in building construction projects reducing cases of re-works on these buildings resulting to commissioning of high quality buildings. Mojahed and Aghazadeh, (2008) in their study in the U.S did find the link between communication on design requirements and quality of public buildings projects. They further pointed out that poor communication on design requirements had influenced the productivity of workers in a water and water treatment plant construction site which had adversely influenced the construction of drainage systems, underground concrete tanks and fitting of water pipes and waste pipes (Mojahed & Aghazadeh, 2008). These findings were also demonstrated in a study on public works buildings construction projects in California by

Gehrig, (2009) who posit that communication on design did positively result to public buildings with properly fitted building interiors and excellently done paint work.

In a study on the construction process of a public health care facility in the U.K, Khanzoode, Fischer and Reed, (2008) did also demonstrate that communication on design requirements was a prerequisite in ensuring that Mechanical, Electrical and Plumbing Systems were well co-ordinated. This they further argue did ensure that the public healthcare building had properly fitted water taps and sinks, fresh and waste water pipes, functioning electrical sockets and properly insulated electrical wires facilitating the commissioning of the hospital at high quality building standards (Khanzoode, et al., 2008). Similarly a Lithuanian study by Gudien , Ramelyt and Banaitis, (2013) did demonstrate the need for effective communication on design requirements in the delivery of high quality public buildings. It was further noted that communication on design requirements did positively influence the quality of building materials procured which resulted to quality schools' and public halls buildings (Gudien , et al., 2013). To achieve high standard building quality, Quanjel and Zeiler, (2007) in a study in Germany re-emphasized the need to communicate on design requirements. This they argued would mitigate re-works on buildings thereby effectively dealing with quality issues (Quanjel & Zeiler, 2007).

Alarcón, and Mardones, (2010) in a study on how to improve the design-construction interface did emphasize on the need of ensuring effective communication on design requirements to enhance the quality of public buildings in South America. Rivas, Borcharding, Gonzalez, and Alarcon, (2011) also found out that communication on design did affect the productivity of craftsmen working on government funded buildings in Chile which influenced the quality of these buildings. Further, they argued that poor communication on design did result to numerous reworks on these building construction projects resulting to a decline in productivity among craftsmen which had adversely influenced quality characterized by loosely fitted windows and doors, poorly done duct systems, poorly constructed stairways and incomplete ceilings and floor tiling (Rivas, et al., 2011). Ornstein and Rosaria, (2010) did also point out that effective communication on design requirements characterized by timely site delivery of drawings did have a positive influence the quality government funded public school buildings in Brazil.

Anu and Sudhakumar, (2014) in their study in India did postulate that communication on design did have a positive relationship with the productivity of craftsmen working on public buildings. They noted that poor communication on design requirements resulted to numerous re-works which did demotivate artisans and also contributed to misunderstandings between buildings' projects supervisors and the artisans resulting to adversarial relationships eventually leading to abandoned unfinished buildings with features such as loosely installed doors and decaying door frames, partly done paint work, hanging ceiling panels and cracking walls (Anu & Sudhakumar, 2014). Wang, (2000) had demonstrated the coordination challenges in China in the implementation of large public buildings projects emanating from unreliable communication on design. This is emphasized by Tai, Wang, and Anumba, (2009) who in their study on communication on large-scale building construction projects in China did demonstrate the differences in quality in those government funded building construction projects where effective communication on design requirements existed as opposed to those that did embrace communication and coordination. They further suggest that where poor communication on design existed characterized by late site delivery of drawings and procurement of poor quality materials, poor quality public buildings that had features such as; cracks on pillars and beams, loosely fitted windows and doors, loose electrical wires and poorly done plumbing were commissioned (Tai, et al., 2009). Mohamad,(2010) also observed that delays in government funded building projects was as a result of late site delivery of drawings. The need for effective communication was also suggested by Norouzia, Shabakb, Embic, and Khand, (2014) who contend that a reduction in reworks and the prevention of poorly done building aesthetics, cracks on beams and pillars can be achieved through effective communication on design requirements between architects and their clients. They also noted re-works can also be reduced through the timely site delivery of design drawings (Norouzia, et al., 2014)

The role played by communication on design in the commissioning of government funded quality buildings is also reported by different scholars in the Middle East. Enshassi, Mohamed, Mustafa, and Mayer, (2007) did for instance contend that language barrier had adversely influenced the productivity of craftsmen in government funded building projects in the Gaza strip since most of the artisans could not understand the instructions on the design requirements. These they posit did influence the proper fitting of buildings' interiors such as;

doors, windows and ceilings and it also affected the quality of work input on the paint work and other aesthetics (Enshassi et al., 2007). Further in a Kuwaiti study Jarkas and Bitar, (2012) found out that poor communication on design as a result of language barrier between government architects, structural engineers and craftsmen did negatively affect clarity of technical specifications resulting to poor quality government funded buildings characterized by cracks on walls, pillars and beams and poorly done ventilation. Faisal and Sadi (2007) also suggested that language barrier did lead to inconsistency in design implementation in government funded buildings in Saudi Arabia. These they observed did result to public buildings with poorly done plumbing characterized by poorly installed water taps, sinks and waste water pipes, poor electrical fittings, poorly constructed stairways that hindered accessibility of some building parts and unpleasant aesthetics mostly witnessed by poor paint quality (Faisal & Sadi, 2007).

In a Libyan study Denini, (2010) did posit that late site delivery of drawings was the major cause of delays in government funded construction projects which also adversely influenced the quality of these buildings. The quality of materials procured adversely influenced by the quality of communication on design requirements was reported to have negatively influenced the quality of public buildings in Nigeria (Olusegun, 2008). In a Ghanaian study Dumolga, Quartey and Bekoe (2013), pointed out that the late delivery of design drawings on site did adversely influence the implementation of government projects at the municipal level. This they contend did have a negative impact on the contractors' performance resulting to buildings with rough walls, cracked beams and loosely installed windows. Amoatey, Ameyaw, Adaku, and Famiyeh, (2015) did also demonstrate that poor communication on design requirements had negatively influenced the labor productivity of craftsmen in government funded housing projects resulting to delays in construction characterized by construction defects in stairways, loosely fitted door frames and windows and incomplete paintwork. Further, they advised that to enhance the commissioning of high quality government funded houses there was need to deliver design drawings in good time at the site of these projects (Amoatey, et al., 2015). Mbachu and Nkado, (2007) also their study demonstrated that poor communication on design characterized by untimely site delivery of design drawings did have adverse effects on the productivity of craftsmen negatively influencing the implementation of government funded building projects in South Africa.

Chileshe, and Kikwasi, (2014) did also demonstrate that risk assessment and management that would ensure the delivery of quality public buildings in Tanzania would only be enhanced by effective communication on design requirements. Further, Wanjau, (2015) in her study on factors influencing the completion of building projects under the ministry of housing, land and urban development did observe that unreliable communication on design between ministry architects, structural engineers and contractors characterized by untimely delivery of design drawings did have a negative influence on the quality of these government funded buildings. In her study, she further argued that poor communication on design also had a negative influence on the quality of materials procured leading to poorly constructed beams and pillars in these houses (Wanjau, 2015).

2.4 Design Changes and the Quality of Government Funded Building Projects

According to Armstrong, (2008) variations in design have both positive and negative influence on the quality of buildings construction projects. Keane, Sertyesilisik and Ross (2010), also emphasized that variation in design were in some cases reported to have positively influenced the quality of public buildings. They for instance observed that in Scotland, variations in design did positively influence the aesthetics of public buildings such as through repainting of walls and improvement of accessibility through improvement of alleviators and stairways and also the fitting to standard of doors and windows that were previously poorly installed (Keane et al., 2010). Haymaker, Chachere and Senecu (2011), in a study in Sweden demonstrated similar results by pointing out that design changes in the construction of an office in a public university did improve the building's interiors especially the ceiling, the construction of a disabled person's ramp, proper installation of windows and doors and the paint work. Further, in study in Finland on the life cycle of public buildings, Malmqvist, Gaulmann, Scarpellini, Zabalza, Arnada, Lliela and Diaz (2011), did demonstrate that variations in design in government funded buildings had improved previous construction work with significant improvement been reported in the ventilation rates in these buildings, light quality, duct systems, roof structure and roof insulation. The abrasive nature on the paint work on exterior walls was also reduced through the improved roof structure (Malmqvist et. al., 2011).

Design changes have been reported to have both positive and adverse effects on the quality of public buildings in Asia. For instance, in a multivariate regression model study on factors influencing the quality of public buildings in China, Bin, Qin, Yigxin, Li, Hongbo and Gaofeng (2011), did observe that, design changes had positively influenced the quality of most public buildings in Shanghai and that citizens were more satisfied with public buildings in Shanghai than those in Beijing. They further argue that changes in design of public buildings in Shanghai did do away with previously poorly constructed stairways, poorly fitted doors and windows and poorly done floor tiling which improved both the accessibility and aesthetics of buildings (Bin et. al., 2011). Doloi, Sawhney, Iyer and Rentala (2012), in their study did report that public buildings in India were delivered both behind schedule and at higher costs a situation that arose from the numerous design changes implemented by government architects and structural engineers. Further, they postulated that this did adversely influence the quality of these buildings leaving most of them with unpleasant aesthetics especially an undesirable paint work, inaccessible and poor functionality of windows, stairs and elevators (Doloi et. al., 2012).

Similarly in their study Pai and Bharath, (2013) did postulate that the numerous design changes effected by government architectures and structural engineers in India did cause delays in the implementation of government funded building infrastructural projects which had adverse effects on the quality of these buildings. Further, they observed that these changes on the design had a negative effect on the understanding of contractors on the final product resulting to buildings that had poorly fitted doors, windows and poorly done floor tiling (Pai & Bharath, 2013). Similar findings were reported in a study in Malaysia by Ibrahim, Roy, Ahmed and Imtiaz (2010), who did point out that design changes did majorly influence the quality of government funded buildings infrastructural projects as they adversely influenced the construction process. This they argue had adversely influenced the installation of interior features of these buildings resulting to poorly installed ceilings, doors and windows and also had influenced stairway construction which resulted to dangerous accessibility of these buildings (Ibrahim et. al., 2010). Alwi and Hampson, (2003) did also demonstrate that the quality of buildings' interiors in government funded buildings in Indonesia was compromised by the frequent design changes effected by government architects.

Arain and Pheng, (2005) in their study also found that variations in design had adversely influenced the quality of government funded institutions' buildings in Iran. Further, they demonstrate that design variations negatively influenced the installation of buildings interiors such as; doors and windows, influenced paint work and floor tiling (Arain & Pheng, 2005). Bon-Gang et. al., (2013) did also demonstrate that frequent variations in design did adversely influence the proper installation of buildings interiors in public housing projects in Kuwait which was evidenced by poorly and loosely fitted doors and windows and hanging ceiling parts. Further, they contend that delays caused by variations in design did affect paintwork as it exposed it to the abrasive effects of climatic conditions and the positioning of ventilations in these buildings (Bon-Gang et. al., 2013). However in Kuwait Rashid, Elmikawi and Saleh (2012), in his study did contend that variations in design did positively influence the quality of government funded sports facilities leading to the introduction of disabled people's ramps, improved paintwork and seating areas. The quality of public buildings in Oman was adversely influenced by numerous changes in design which resulted to schedule overruns that led to cracks on walls, beams and pillars (Alnuaimi,Taha,Mohsin & Alharti, 2010).

Design changes have also been found to have negative influence on the quality of government funded buildings in Africa. This is opined in a study in Egypt by El-Razek, Bassioni and Mobarak (2008), through which they pointed out that design changes did cause delays in government funded building construction projects in the country which had adverse effects on the quality of these projects. This they observe was evidenced by the poorly done paint work, ceilings and poorly constructed stairways that made the accessibility of these buildings dangerous (El-Razek et al., 2008). These findings were supported in a study by Marzouk and El-Rasas, (2014) who did postulate that government funded buildings in Egypt were delivered behind schedule as a result of the many design changes that were initiated by government architectures and structural engineers. This they contend did negatively influence the quality of these buildings evidenced by the undesirable paint work, incomplete stairs that made the accessibility of these buildings dangerous and poorly fitted doors and windows (Marzouk & El-Rasas, 2014). Cracks in beams, poorly fitted doors and windows were as a result of delays in the construction of public buildings in Libya arising from design changes effected by government officials (Tumi,Omran & Pakir, 2009).

Danso and Antwi, (2012) also in their study on the Telecom Tower Construction process in Ghana demonstrate the negative influence of design changes on the quality of government funded buildings. Further, they emphasize that changes in design were positively correlated with the installation of the building's interiors such as doors, windows, ceilings and also influenced floor tiling and stairways construction which affected the accessibility of the building (Danso & Antwi, 2012). The negative influence caused by design changes is also pointed out through a study on the quality of public housing projects in Nigeria by Adenuga, (2013) who observes that variations in design exposed exterior paint work to the abrasive effects of climatic condition causing it to lose its allure. He also emphasizes that variations in design were responsible for the difficulty in accessibility of these buildings and numerous cracks in pillars and beams in these buildings which compromised the durability of the buildings (Adenuga, 2013). Mbachu and Nkando, (2007) also demonstrated the negative influence of variations on design on the quality of government funded buildings in South Africa. They further contend that design changes resulted to the presence of beam cracking which compromised both the paint work and durability of building projects in the country (Mbachu & Nkando, 2007). Aigbavboa, Thwala and Mukuka (2014), did contend that numerous variations in design in the construction process of public buildings did lead to both schedule and cost overruns. They also argue that schedule overruns had adversely influenced the quality of these buildings which had been abandoned resulting to cracking walls and pillars (Aigbavboa, et al., 2014).

Fetene, (2008) did contend that numerous design changes effected by government architects and structural engineers had resulted to delays in the construction of government funded public buildings in Ethiopia which had contributed to cost overruns before the commissioning of these projects. They further argue that cost overruns had resulted to most of these buildings being abandoned resulting to decaying door frames, incomplete ceilings, incomplete glasswork, cracking walls and pillars and partly done paint work (Fetene, 2008). In a study in Uganda, Apolot, Alinaitwe and Tindiwensi (2011), demonstrated a strong link between variations in design and the quality of public buildings in the country. This they argued did cause delays during the construction process which also resulted to cost overruns and poor quality buildings evidenced by unfinished building interiors such as hanging ceiling panels, loosely fitted window panes and door frames and unpleasant aesthetics characterized

by poorly partly done paint work and floor tiling (Apolot et. al., 2011). Muhwezi, Acai and Otim (2014), did reiterate these findings by pointing out numerous changes in design implemented by structural engineers did result to delay in the construction process of public buildings which was positively correlated to the numerous quality issues in both the exterior and interior of these buildings.

Studies in Kenya also demonstrate that variations in design in public building projects also led to delays which eventually influence the quality of these buildings. Mbaluka and Bwisa, (2013) in their study for instance posit that numerous changes in design did result to schedule over-runs of Kenya Agriculture Research Institute's (K.A.R.I) building construction projects which had influence the quality of these buildings. Further, they observe that schedule over-runs did contribute to loosely hanging ceiling panels, uncompleted paint work and loosely fitted door frames (Mbaluka & Bwisa, 2013). Mono, (2013) in his study on the successful delivery of housing projects under the ministry of housing contends that numerous design changes effected by ministry design teams and other construction consultants had resulted to delays in the construction process. This he observes did not only lead to costs overruns but also contributed to the abandonment of these buildings for some time resulting to hanging ceiling panels, incomplete ventilation and unpleasant facades (Mono, 2013).

2.5 Design Defects and the Quality of Government Funded Building Projects

According to Christensen, (2010) design defects do adversely influence the quality of building projects and in the process lead to both a decrease in their functionality quality and increase their vulnerability of collapse. He for instance pointed out that design errors can result to cracks in beams and pillars, poorly installed interiors such as doors, windows and hanging ceilings (Christensen, 2010). Love, Lopeza, Goh and Tam (2011), also noted that design errors remain an innate feature of buildings construction and engineering projects particularly those under government supervision. For instance in a Danish study Pedersen, Aagaard and Neilsen (2009), demonstrated that cracks in beams and pillars that had arose from numerous design defects were responsible for the collapse of the government funded Rødovre Skating Arena. Reenberg, et al., (2010) who in their study on design errors in Danish public buildings did reiterate these findings by noting that design defects were responsible for collapse of government funded public recreation centres in the country.

Similarly Pedersen, Nielsen and Aagaard (2011), in his study on factors responsible for the collapse of the Club Denmark Sports Centre did demonstrate that design defects that had arose from supervision lapses that lead to artisan incompetence making the building more fragile leading to its collapse. This study concluded that errors in design were responsible for the many cracks on the building's pillars and beams which weakened the building (Pedersen, et. al., 2011).

In a study in Malaysia, Hassan, Isa, Mat, Ithnin and Sapisey (2009), did also posit the poor quality in which public hospitals buildings were in did arise from design defects. This was echoed in a study by Haryati, Masnizan, Zarina and Zulkifli (2011), who did contend that most government funded public hospitals buildings had poor functionality arising from design defects. Further, they pointed out that most of these public hospital buildings had some inaccessible parts and had salient unpleasant aesthetics arising from lapses in supervisions and incompetence artisans (Haryati et. al., 2011). Similar findings had been reported in an earlier study by Olanrewaju, Mohd Fris and Arazi (2010), who demonstrated that design defects were responsible for inaccessibility of some parts of public university buildings; as the stairways had been poorly constructed and the buildings had exhibited poor functionality as most doors and windows were loosely fitted and had unpleasant aesthetics in form of cracking floor tiles and poorly done paint work. In a bid to find the causes of latent defects in government funded buildings in Singapore, Low and Chong, (2006) observed that design errors did adversely influence the durability of paint work and interiors such as ceilings and pillars in these buildings. They therefore advised that quality can only be enhanced through the identification of design defects and dealing with them before project completion (Low & Chong, 2006).

Zou, Zhang and Wang, (2007) did demonstrate errors in design as one of the major key risk in the durability of government funded building construction projects in China. They did emphasize that these do have a negative influence on the aesthetics of the buildings as they expose paint work and vanish on door frames to climatic conditions which adversely affects their appearance (Zou et. al., 2007). In a Pakistani study Saqib, (2008) did observe that design errors arising from lapses in supervision and incompetence of building artisans were positively correlated with cracks in beams and pillars in government funded building

projects. This they observed did compromise the durability of these buildings forcing the Pakistani government to fund reworks on these buildings which resulted to schedule and cost overruns (Saqib, 2008).

Supervision lapses and artisan incompetence were found to be responsible for the many design errors in public universities in Iran forcing government to incur rework costs (Lateef,2009). Further, he argues that this involved redoing paint work, refilling of cracks on pillars and beams and replacing hanging ceiling parts (Lateef, 2009). However, in a study in Israel Shohet, Lavy-Leibovich, and Bar-On, (2010) postulated that excellence in supervision and the contracting of competent artisans did minimize design errors during construction which positively influenced the quality of public hospitals buildings thereby reducing government costs incurred during maintenance. Further, they observed minimal design defects during construction were positively correlated to the installation of high quality building interiors such as ventilation which enhanced the air circulation in these buildings (Shohet, et. al., 2010). Al Rubaiey, Ulanga and Baharum (2014) in their study on 15 public buildings in Oman found out that that poor design on public buildings coupled with supervisions lapses and artisan incompetence did result to numerous errors in design during the construction of these buildings which negatively influenced the quality of these buildings. Further, they contend that errors in design during construction presented numerous challenges for the maintenance of these public buildings thereby leaving most of them with poor ventilation, roofs, facades and the substructure of the buildings (Al Rubaiey, et. al., 2014).

Oyewobi and Ogunsemi, (2010) in their study on several government funded buildings projects in Nigeria demonstrated that design errors contributed to the poor inaccessibility of some of the buildings characterized by poorly installed doors and poorly constructed stairways, unpleasant aesthetics in paint work coupled with poor finishing of rough walls and ceilings. Further, they contend that to bring these buildings to quality standards, the government is forced to fund reworks in most of these buildings resulting to cost overruns for these buildings projects (Oyewobi & Ogunsemi, 2010). These findings were echoed in study by Shittu, Adamu, Mohammed, Sulieman, Isa, Ibrahim and Shehu (2013), who observed that most public buildings projects had building defects arising from poor

workmanship which had a positive relationship, with defects in design during construction. In a South African study Rhodes and Smallwood,(2003) found out that the quality of most government funded buildings was compromised by design defects which had resulted to fragile walls that placed these buildings in the vulnerability of collapse. Further they argued that the government was forced to fund reworks in these buildings contributing to cost overruns of most of these projects (Rhodes & Smallwood, 2003). Similarly in a separate study Zunguzane, Smallwood and Emuze (2012), did demonstrate that most government funded low-income houses in the country were delivered at poor quality and most buildings were at the verge of collapse due evidenced from numerous cracks on walls and pillars. Further, they contend that errors in design were responsible for the loss of the allure of paint work on the walls arising from exposure to the abrasive climatic conditions (Zunguzane et. al., 2012).

Studies in East Africa also emphasize on the adverse influence of design defects on the quality of government funded buildings and facilities. Kakitahi, Alinaitwe, Landin and Rodgriues (2014), found that numerous design errors in government funded buildings in Uganda did lead to numerous reworks on cracked walls, beams and pillars resulting to cost overruns. They also pointed out that design defects had also resulted to hanging ceiling panels and poorly fitted windows and doors which in some buildings were left like that during reworks as a result of limited funding (Kakitahi et al., 2014). Kimani and Kimwele, (2014) also demonstrated the link between supervision lapses and incompetent artisans had resulted to numerous design defects on housing buildings funded by the National Housing Corporation (NHC). They also argued that it is such defects that had resulted to reworks leading to delays in the construction process leading to most buildings being delivered with already decayed door frames, clogged ventilation and unpleasant façade due to poorly done paint work (Kimani & Kimwele, 2014).

2.6 Design Specifications and the Quality of Government Funded Building Projects

According to Love and Edwards, (2004) poor specifications do result to reworks in buildings which negatively influence the quality of these buildings. Palaneeswaran, (2006) advised on the different methods that can be used to reduce reworks such as; reducing the number of errors and omissions in contract documents, involving a team of technical expertise and

reducing non-compliance events. Sommerville, (2007) re-emphasized this view by contending that poor design specifications not only lead to reworks but they also influence the quality of buildings as they result building defects. This was highlighted in a study in The U.S by Feng, (2009) who observed that errors and omissions in the contract documents did result to an increase in the number of non-compliance events by construction contractors resulting to the occurrence of reworks on government funded healthcare buildings. He also argues that the quality of these buildings was also negatively influenced by an increase in the number of reworks incidences contributed by low levels of technical expertise among design teams and construction contractors charged with the responsibility of implementing the initial reworks (Feng, 2009).

Palaneeswaran, Ramanathan and Tam (2007), in their study did also demonstrate that poor specifications characterized by errors and omissions in contract documents did result to high number of non-compliance incidences in the construction process of public buildings in Hong Kong. However, they further observed that the high number rework incidences in public buildings that had had negative influence on the quality of these buildings were as a result of low levels of technical expertise among design teams and construction artisans charged with the responsibilities of implementing initial reworks on these buildings (Palaneeswaran, et al., 2007). Further Abdul-Rahman, Al-Tmeemy, Harun and Kho (2013), in their study on the major causes of quality failures in the Malaysian building construction industry posit that high number of non-compliance incidences were as a result of errors and omissions in contract documents which resulted to numerous reworks on these building projects. They also contend that low levels of technical expertise among design teams and construction expertise among craftsmen charged with the responsibility of implementing initial reworks on these buildings did adversely influence the quality of these buildings (Abdul-Rahman, et al., 2013).

Wasfy, (2010) in his study on the severity and impact of reworks on the quality of buildings did demonstrate that errors and omissions in contract documents did result to numerous non-compliance incidences which resulted to reworks in government funded residential commercial tower project in the Eastern province of Saudi Arabia. He further argues that absence of technical expertise among design teams and construction craftsmen charged with

the responsibility of implementing the reworks on these buildings did also adversely influence the quality of the residential buildings (Wasfy, 2010). Mahamid, (2015) in his study on analysis of reworks in residential building projects funded by the Palestinian government posit that poor specifications characterized by numerous non-compliance events and errors and omissions in the contractor documents did lead to the occurrence of high number of reworks in these building projects. This he argues was due to the low levels of technical expertise among design teams and craftsmen involved in the construction of these buildings and also responsible for the implementation of initial reworks which adversely influenced the quality of the buildings (Mahamid, 2015).

Oyewobi, Oke, Ganiyu, Shittu, Isa and Nwokobia, (2011) in their study in Nigeria on the effect of project type on the occurrence of rework postulated that poor specifications characterized by errors and omissions on the contract documents did result to technical issues in the construction process of government funded buildings due to low levels of technical expertise among design teams and construction craftsmen. Further, they argue that these did lead to an increase in rework incidents which negatively influenced the quality of these buildings (Oyewobi, et al., 2011). Similar findings were reported in a study by Ede, (2011) who did contend that most government funded buildings were collapsing due to the numerous rework incidences emanating from poor specifications characterized by errors and omissions in contract documents, high number of non-compliance incidences and low levels of technical skills among design teams and craftsmen that were responsible for implementing the reworks on these buildings. Dosumu and Adenuga,(2013) did demonstrate that the absence of technical expertise among design teams and craftsmen that were endowed with the responsibility of implementing reworks did result to numerous non-compliance to public buildings design specifications which resulted to other numerous reworks on these buildings adversely influencing the quality of these government funded buildings. Adinyira, Botchway and Kwofie (2012), in their study on the critical success determinants of public housing projects in Ghana demonstrated that errors and omissions on contract documents led to an increase in non-compliance to design specifications by construction contractors leading to an occurrence of rework incidences. They further argued that the number of reworks increased due to the low levels of technical expertise among design teams and construction contractors

and craftsmen working on previous reworks further causing negative effects on these buildings (Adinyira, et al., 2012).

Studies in South Africa also demonstrate the influence of poor specifications on the quality of government funded buildings. Simpeh, Ndiokubwayo, and Love, (2011) in their study on the causes and effects of rework in higher education residential facilities did observe that most of the reworks in these buildings had been caused by poor specifications characterized by numerous non-compliance issues. Further they argued that reworks did have adverse influence on the quality of the buildings and in particular the aesthetics (Simpeh, et al., 2011). Simpeh, (2012) in another study on the causes and impact of reworks also argued poor specifications characterized by errors and omissions in contract documents did lead to reworks in government funded building construction projects and in particular in two multiple storey education facilities in Cape town. In a separate study, Emuze and Smallwood, (2011) also observed that most government funded buildings were of poor quality due to the numerous reworks mostly arising from errors and omissions in contract documents and numerous non-compliance events by construction contractors charged with the responsibility of implementing initial reworks on these buildings.

Studies in East Africa also emphasize on the adverse influence of poor specifications on the quality of public buildings. In a Ugandan study Kakitahi, Landin, and Alinaitwe (2011), did for instance observe that poor specifications characterized by high numbers of non-compliance incidences and errors and omissions on contractor documents mostly in projects under the National Housing and Construction Company (NHCC) did lead to numerous reworks on public buildings. Further, they argued these did also occur due to the low levels of technical skills among design teams and craftsmen trusted with the responsibility of implementing the reworks on these buildings (Kakitahi, et al., 2011). In a study on the effects of delay on the quality of National Housing Corporation (NHC) building projects, Njau,(2014) also demonstrated the adverse influence of poor specifications in the form of poor designs resulted to numerous reworks on these housings buildings due to errors and omissions on the contract documents. He further noted that minimal technical expertise among design teams and construction contractors had also lead to an increase on reworks incidences on these buildings adversely influencing the quality of the buildings (Njau, 2014).

2.7 Theoretical Framework

According to Anfara and Mertz, (2006) a theoretical framework is an empirical or quasi-empirical theories of social or psychological processes which exist at a variety of different levels and apply to the understanding of phenomena. A theoretical framework gives the researcher a chance to “observe” and “perceive” just certain aspects of the phenomenon under study while some are concealed. However, a theoretical framework alone cannot provide a comprehensive explanation on the problem being studied.

This study will be pivoted on two theories; Bad Apple Theory of Human Error and Theory of Axiomatic Design

According to Reason, (1990) the Bad Apple Theory of human error fundamentally assumes that complex systems such as construction projects fail due to the unpredictable behavior of people; human errors cause accidents and failures are unexpected. The Bad Apple Theory of Human Error therefore puts its forward that failures come as unpleasant surprises. They are unexpected and do not belong in the system. Failures are introduced to the system only through the inherent unreliability of people. Another proponent of the theory argues that error is either the result of a bad apple, where disastrous outcomes could have been avoided if somebody had paid a bit more attention or made a little more effort. It is the result of people’s poor inaccurate assessments, wrong decisions and bad judgments (Dekker, 2006). However, Love, Edwards, and Han, (2011) proponents of the Bad Apple Theory of Human Error contend that errors are not a cause of an event but a symptom of a much deeper problem within a system. Human error is not a cause of failure. Human error is the effect, or symptom, of deeper trouble. Human error is not random. It is systematically connected to features of people's tools, tasks and operating environment. Human error is not the conclusion of an investigation. It is the starting point (Love, et al., 2011).

This theory addresses research questions three and four which seek to unpack the influence of design defects and poor specifications on the quality of government funded building projects, the theory will explain the important role that contractors and consultants play in the implementation of these projects as part of the overall system that makes up the environment they operate in and how specifications influences the operations of contractors in the

construction process of government funded buildings eventually influencing the quality of these buildings.

The theory of axiomatic design is a systematic method for the design transformation (alterations or changes) between the client, the functional, physical and production domains (Suh, 2001). The transformations between two domains, such as the functional and physical domains, represent the design task to interpret and translate functional requirements (FRs) into design parameters (DPs), from the most generic and top-level requirement to more detailed requirement levels using zigzag decomposition cycles. According to this theory to enhance quality in building and construction projects, there is need for reliable communication on design requirements and any variations or transformation between the client, the functional, physical and production domains be done in good time (Jensen, Olofsson & Johnsson, 2012). This can be done through Zigzag decomposition as illustrated in figure 1:

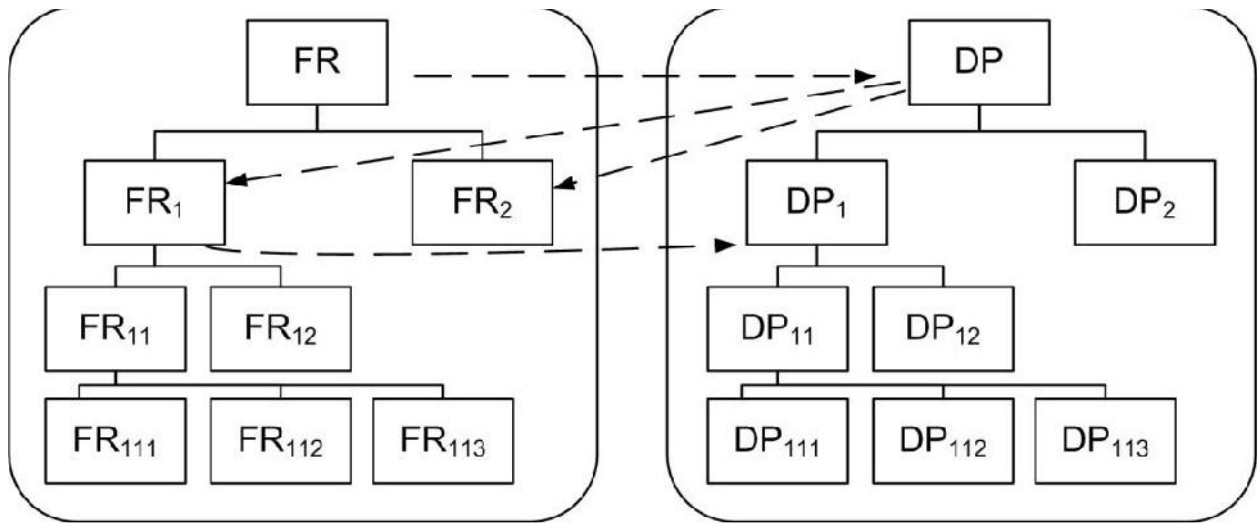


Figure 1: Zigzag decomposition in Axiomatic Design (Suh, 2001)

Zigzagging is one of three basic concepts in axiomatic design where the other two axioms are:

1. The independence axiom: Maintain the independence of the functional requirements (FRs).
2. The information axiom: Minimize the information content of the design. Reduce information for the design solution without affecting the independency of FRs (Suh,2001)

Decisions taken from higher levels stages act as constraints at lower levels (Suh, 2001).

The transformations between the domains are normally carried out by different actors with specific product views. In the context of construction, the *architectural view* describes the transformation from customer attributes (CAs) within the customer domain to functional requirements (FRs) within the functional domain. The *engineering view(s)* describes the transformation from functional requirements (FRs) to design parameters (DPs) in the physical domain and the *production view* describes the transformation work from design parameters (DPs) to production variables (PVs) in the process domain. Constraints (Cs) are limitations of downstream activities that have to be considered in upstream transformations. These constraints can arise as a result of the standardization of components, processes or organizational conditions. Constraints can also describe regulations used at the site or conditions for transportation (Jensen et al., 2012).

This theory addresses research questions one and two which seek to unpack the influence of communication on design and design changes on the quality of government funded building projects, the theory will explain the important role that communication on design between the client, contractors and consultants play in the implementation of these projects. It explains how communication on design between architects and clients influences the operations of contractors in the construction process of government funded buildings eventually influencing the quality of these buildings.

2.8 Conceptual Framework

David and Robert, (2007) define a conceptual framework as a model of presentation where a researcher represents the relationship between variables in the study and shows the relationship diagrammatically.

Effective implementation of quality government funded building projects is influenced by a multiplicity of design factors such as: Communication on design, Design Changes, Design defects and Design specifications. The influence brought about by these design factors either by causing positive or adverse impact on the quality of these buildings is the study's independent variables and their correlation with the study's dependent variable (quality of government funded building projects) is as illustrated in Figure: 2

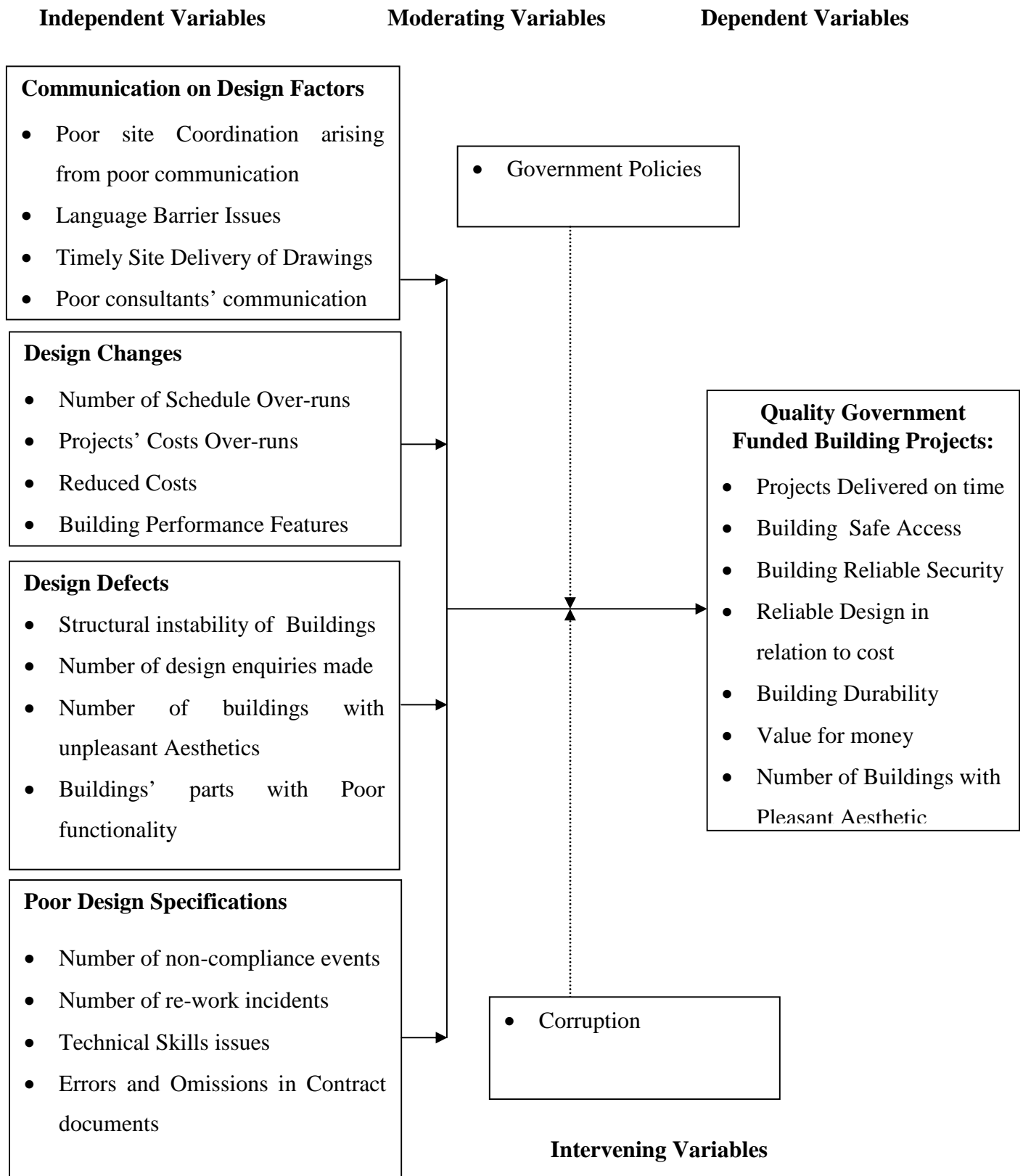


Figure 2: Conceptual Framework

2.9 Research Gap

The Zou, Zhang and Wang, (2007) study in China did not find out whether design defects influence the functionality of building parts on government funded buildings it only looks at the influence of design defects on the aesthetics of the buildings. The Lateef, (2009) study in Iran did not also find out whether errors in design influence the functionality of building parts it only highlights symptoms of the design defects. This research study sought to fill this gap.

The Khanzoode, Fischer and Reed, (2008) study in U.K only looks at how communication on design influences the implementation of building fittings it does not look at how this influences the implementation of building aesthetics. The Haymaker, et al., (2011) in a study in Sweden study only looks at how design changes improved the building interiors of an office in a university but doesn't look at how these changes reduced project funds. This study sought to fill this research gap.

The research also sought to fill a research gap on whether the same findings by Mahamid, (2015) in Palestine; Faisal and Sadi (2007) in Saudi Arabia, Oyewobi and Ogunsemi, (2010) in Nigeria and Keane et al., (2010) in Scotland can be replicated on government funded building projects in Isiolo County.

Most of these studies have been done in far off countries and regions; through this study the researcher sought to fill a research study gap on design factors influencing the implementation of government funded building projects in Isiolo County.

2.10 Summary of the Chapter

Saqib, (2008) did observe that design errors arising from lapses in supervision and incompetence of building artisans were positively correlated with cracks in beams and pillars in government funded building projects in Pakistan. Feng, (2009) who observed that errors and omissions in the contract documents did result to an increase in the number of non-compliance events by construction contractors resulting to the occurrence of reworks on government funded healthcare buildings in the U.S. Cracks in beams and pillars that had arose from numerous design defects were responsible for the collapse of the government funded Rødovre Skating Arena in Denmark Pedersen, et al., (2009) and in South Africa design errors were reported to be the cause of the poor state of government funded low income housing projects (Zunguzane et al., 2012).

Numerous design changes did lead to schedule overruns and influenced quality in the construction of the Telecom Tower project in Ghana Danso and Antwi, (2012) and in Nigeria's public housing projects Adenuga, (2013). Malmqvist, et al., (2011) reported different results in Finland by arguing that variations in design in government funded buildings had improved previous construction work in the country.

Norouzia, et al., (2014) did emphasize on the need for constant communication between architect and client for quality realization in building and construction, Faisal and Sadi (2007) did demonstrate how language barrier influenced the interpretation of design requirements in Saudi Arabia and Olusegun, (2008) did point out how communication on design influenced the quality of materials procured in Nigeria.

This chapter has reviewed literature on how communication on design, design changes, design defects and design specifications influence the implementation of government funded building projects in Isiolo County. To this effect, the chapter also comes up with a theoretical framework and a conceptual framework.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter contains the research design that was used in the study, the target population, sampling procedure and methods of data collection, validity and reliability of the questionnaire which were used for data collection. It also contains the operationalization table of variables and objectives under study and methods of data analysis plus ethical considerations observed.

3.2 Research Design

According to Fellows and Liu, (2008) a research design is the plan adopted by a research study which enables a researcher to carry out various research operations, hence creating a favorable environment to access sufficient information with very little expenditure on effort, time and financial resources. This study adopted the descriptive survey research design to assess the influence of design factors on the quality of government funded building projects. Descriptive survey research design assisted the researcher to gather both qualitative and quantitative data on how study variables such as; communication on design, design changes, design defects and design specifications influence the quality of government funded building projects in Isiolo County. Further, this design is more specific and accurate because it involves description of events in a conscientiously outlined way (Fellows & Liu, 2008). This research design also portrays the characteristics of a population fully and it also enabled the researcher to establish the link between study variables and study problem (Leedy & Ormrod, 2005).

3.3 Target Population

According to the National Construction Authority there are 92 registered building and construction contractors and 16 building and construction consultants in Isiolo County. This study concentrated on these respondents because they are expected to have a wealth of information on the research topic from their experiences in working on government funded building projects. The study also sought information regarding the research topic from

government funded building projects clients which are: the 121 public academic institutions who constructed classrooms in public schools and the Department of Health Isiolo County who constructed 16 public dispensaries.

This is summarized in Table: 3.1 on target population

Table 3.1 Target Population

Respondents	Target Population
Clients who constructed Public Schools and Public Dispensaries	137
Contractors	92
Consultants (Architects, Structural Engineers, Inspectors and Quantity Surveyors)	16
Total	245

3.4 Sample Size and Sampling Procedure

Latham, (2007) defines sampling as the procedure of selecting a number of study units from a defined study population. This research study used probability sampling technique. Specifically Stratified and Simple Random sampling was used.

3.4.1 Sample Size

The sample size for the study was 149 drawn from a targeted population of 245 respondents. This sample size was obtained by applying the formula:

$$N_s = (Np) / (p)(1-p)$$

$$(Np - 1) / (B/C)^2 + (p)(1-p)$$

$n = (Z^2 \cdot PQ / \alpha^2)$ by Dillman, (2007) as shown in 3.4.2 sampling procedure.

The formula is suitable when researchers using a descriptive survey research design, need to; minimize sampling error and obtain a relatively large sample size from a small target population. It also helps in the minimization of potential problems related to coverage, non response, and measurement errors ensuring that the sample data may be representative of and generalizable to the target population (Dillman, 2007).

3.4.2 Sampling Procedure

The sampling techniques that were used in this study are Stratified and Simple Random sampling techniques. This is because the target population is grouped into three different categories; stratified sampling ensured proper representation of the different study's respondents to enhance representation of variables related to them. Simple random sampling was then used to select the final subjects proportionately from different strata.

The sample size was computed as follows:

At 95% confidence level or probability of 0.05, sample size n can be calculated as:

$$\text{Desired sample } n = (Z^2 \cdot PQ / \alpha^2)$$

Where Z= Critical value of Z at 0.05 which is equal to 1.96

P=Accessible proportion of the target population= 50%

Q= In accessible proportion of the target population=50%

The acceptance error estimate = α .

Using the above formula, the maximum sample size (n_o) required from a large population of 10,000 or more units would be 384 units. The sample size can be adjusted with respect to target population as:

The adjusted sample size $n_1 = n_o / (1 + n_o / N)$. Where N is the size of the target population in the area of study

$$\text{The adjusted sample size } n_1 = 1 + 384 / (1 + 384 / 245) = 149$$

The sample size is as shown in Table 3.2. On Sampling Frame

A sampling frame is a list of population from which a sample was drawn. It's a published list in which or a set of directions for identifying a population (Osborne, 2008).

Table 3.2 Sampling Frame

Respondents	Target Population	Sample Size
Clients	137	79
Contractors	92	58
Consultants	16	12
Total	245	149

3.5 Research Instruments

The researcher used questionnaires to collect the data required for this study. Saris, (2007) define a questionnaire as a self-report data collection device that each research participant fills out as part of a research study. Questionnaires were used because they are free from the bias of the interviewee and respondents had adequate time to give well thought out answers. The questionnaires also provide relatively straight forward information to analyze (Leedy & Ormrod, 2010). Primary data was collected using a structured questionnaire. Structured questionnaires were used because they were easy to administer as each item is accompanied by choice answers and they were also economical in terms of time and money. The questionnaire consists of both closed and open ended questions. Closed questions consist of a fixed set of questions to be answered by clients and contractors in a specified sequence and with a pre-designated response options. Open ended questions were not restrictive to the respondents. Open ended questions provided respondents with opportunities to reveal information in a naturalistic way. The questionnaire was divided in 5 sections. Section one requested the respondent to fill in his or her background information, whereas the remaining 4 sections consisted of variables which the researcher intends to research on. The sections were; Communication on Design, Design Changes, Design Defects and Design Specifications and influence of quality of building projects. Questionnaires were administered in person through the use of the drop and pick later method to the sampled respondents. A register of the questionnaires were maintained to facilitate tracking of the research collection instrument.

3.6 Validity of Research Instruments

According to Neuman, (2011) validity is a means of assessing that the instrument in question gathers the data it attempts to gather. This study adopted content validity which was examined through qualitative approach. Qualitative content validity was determined using the experts' opinions as recommended by (Drost, 2011). The experts were requested to perform a qualitative examination of the questionnaire based on the rules of grammar, wording, item allocation and proper scaling and then present their feedback on which recommended corrections was implemented. The validity of the research instruments was also established

by holding discussion and seeking counsel with the researcher's supervisor and modification of the instrument was implemented after supervisor's approval.

3.7 Instrument Reliability

A reliable instrument is one that gives consistent results. It is these consistent results that gave the researcher confidence that the results actually represent what was measured (Babbie, 2010). Reliability was established by using more than one questionnaire to the group of individuals during the same time. Further, to check reliability of the research instruments and address any deficiencies in the research instruments, a pilot study was conducted using 10–20% of the main sample size as recommended by (Neuman,2011). Therefore, this study's pilot was conducted on 30 respondents from the target population. To enhance reliability of the instrument, the researcher employed split-half technique. This method was used to estimate internal consistency by dividing the scale into halves, and then correlating the scores on these two halves.

To calculate the reliability coefficient the researcher used the Spearman-Brown formula as suggested by (Mugenda and Mugenda, 2008):

$$r_n = \frac{n \times r}{n - 1 r + 1} = \frac{2 \times 0.06}{2 - 1 \ 0.06 + 1}$$

$$r_n = 0.78$$

Where: r = the original reliability

r_n = reliability of the test n items

n = number of items in the instrument

A high correlation indicates that the two sets yield consistent information (Somekh, 2006) and 0.8 or higher will indicate good reliability (Mugenda and Mugenda, 2008). The research instruments used in this study have a reliability coefficient of 0.78 which indicate they are reliable.

3.8 Data Analysis Techniques

Data analysis is the procedure that involves creating order, structure and meaning to the mass of information collected by a researcher (Jackson, 2012). To ensure that data is entered correctly, scores of high or low and how many in each category, the researcher constructed frequency and percent distribution using Statistical Package for Social Scientist (SPSS) version 21.0. SPSS was used because it helps to spot data entry errors or unusual data points and has full set of statistical tests. Data collected was analyzed to get statistical measures such as correlations among different variables, mean and standard deviations for easy interpretation of the study findings. Further, the analysis helped the researcher to make valid inference on the topic of study.

Content analysis was used to analyze data from open ended questions by presenting these data in themes as per the research objectives (Franzosi, 2008). This was done through inductive content analyses which involved open coding, creating categories and abstraction. Open coding involved the writing of notes and headings in the text while reading it. The written material were read through again, and as many headings as necessary were written down in the margins to describe all aspects of the content collected from the margins on to coding sheets. After open coding, categories were created which guided the abstraction process which involved the formulating of a general description of the research topic by naming each category using content-characteristic words as recommended by (Hsieh & Shannon, 2005). Frequencies and percentages tables were used to summarize the information.

To establish the significance of each of the study's four variables with respect to quality of government funded building projects, the study adopted a multivariate regression model. This is a flexible method of data analysis that is suitable in situations when quantitative variables (the dependent) are to be examined in relation to any other factors. Further, the model shows relationship between the independent variables and the dependent variable. Correlations may be linear or non-linear, independent variables may be quantitative or qualitative and one can examine the effects of a single variable or multiple variables with or without the effects of other variables taken into consideration (Tabachnick & Fidell, 2013).

The regression model is presented as:

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

Where:

Y = Quality of Government Funded Building Projects

β_0 = Constant Term

$\beta_1, \beta_2, \beta_3$ and β_4 = Beta coefficients

X1= Communication on Design

X2= Design Changes

X3= Design Defects

X4= Design Specifications

3.9 Ethical Considerations

Consent was sought from the participants to indicate the willingness to participate; the researcher also ensured anonymity when it came to answering the study questionnaire. The researcher ensured that the information was used for research purposes only (Macfarlane, 2009). To conduct this study, the researcher also sought permit from the National Commission for Science, Technology and Innovation.

3.10 Operational Definition of Variables

The variables are defined as shown on Table 3.3

Table 3.3 Operational Table of Variables

Objectives	Variable	Indicators	Measurement	Measurement Scale	Data Analysis
To determine the influence of communication on design on the quality of government funded building projects in Isiolo County.	<u>Independent Variable</u> Communication on Design	Poor Site Coordination	Number of contractors and consultants reporting that poor communication on design leads to poor site coordination which influences the quality of government funded building projects.	Nominal Scale	Descriptive Statistics
		Timely site delivery of drawings	Clients, contractors and consultants reporting ways in which timely site delivery of drawings influences the quality of government funded building projects.	Interval Scale	Descriptive and Inferential Statistics
		Poor Consultant Communication	Number of contractors and clients reporting that poor consultant communication on design does influence the quality of government funded building projects.	Nominal Scale	Descriptive Statistics
		Language barrier issues	Contractors reporting ways in which language barrier influences the quality of government funded projects.	Interval Scale	Descriptive and Inferential Statistics
To establish the influence of design changes on the quality of government funded building projects in Isiolo County.	<u>Independent Variable</u> Design Changes	Number of schedule overruns	Number of clients, contractors and consultants reporting that design changes lead to schedule overruns on government funded building projects and the influence of this on their quality.	Nominal Scale	Descriptive Statistics
		Projects' Costs overrun	Clients, contractors and consultants reporting ways in which design changes lead to cost overruns on government funded building projects and the influence of these on the quality.	Interval Scale	Descriptive and Inferential Statistics
		Building Safe Access	Number of contractors and consultants reporting that design changes improve building accessibility and the influence of these on the quality of government building funded projects.	Nominal Scale	Descriptive Statistics
		Building performance features	Clients, contractors and consultants reporting that design changes improve building functionality and the influence of these on the quality of government building funded projects.	Nominal Scale	Descriptive Statistics
		Reduced Projects' Costs	Clients, contractors and consultants reporting ways in which design changes reduce projects costs on government funded building projects and the influence of these on their quality.	Interval Scale	Descriptive and Inferential Statistics

To establish the influence of design defects on the quality of government funded building projects in Isiolo County.	<u>Independent Variable</u>	Fragility of buildings	Number of consultants and contractors reporting that fragility of government funded buildings emanates from design defects.	Nominal Scale	Descriptive Statistics
	Design Defects	Number of design enquiries	Clients and contractors reporting the number of design enquiries and the influence of this on the quality of government funded building projects.	Nominal Scale	Descriptive Statistics
		Number of buildings with unpleasant aesthetics.	Number of clients, contractors and consultants reporting that design defects lead to a number of government funded buildings with unpleasant aesthetics.	Nominal Scale	Descriptive Statistics
		Building parts with poor functionality.	Number of clients and contractors reporting building parts with poor functionality on government funded buildings influenced by design defects.	Nominal Scale	Descriptive Statistics
To examine the influence of poor specifications on the quality of government funded building projects in Isiolo County.	<u>Independent Variable</u>	Number of non-compliance events	Clients and consultants reporting that the high number of non-compliance events by contractors working on government funded building projects do influence the quality of these buildings.	Nominal Scale	Descriptive Statistics
	Design Specifications	Number of re-work incidents.	Number of clients, contractors and consultants reporting that design specifications influence the number of reworks occurring which influence the quality of government funded building projects.	Nominal Scale	Descriptive Statistics
		Errors and Omissions in Contract documents	Contractors and consultants reporting ways in which errors and omissions in contract documents influence the quality of government funded projects.	Nominal Scale	Descriptive Statistics
		Number of Buildings with pleasant Aesthetics	Number of clients and contractors reporting that design specifications influence the number of government funded buildings with pleasant aesthetics.	Nominal Scale	Descriptive Statistics
		Technical skills issues	Clients and contractors reporting that design specifications emanating from lack of technical skills and the influence of this on the quality of government funded buildings.	Nominal Scale	Descriptive Statistics

Quality of Government Funded Building Projects	<u>Dependent Variable</u>	Projects delivered on time	Clients, contractors and consultants reporting that the quality of government funded buildings is defined in terms of projects delivered on time.	Nominal Scale	Descriptive Statistics
		Building Safe Access	Clients, contractors and consultants reporting that the quality of government funded buildings is defined in terms of building safe access.	Interval Scale	Descriptive and Inferential Statistics
		Building Reliable Security	Number of clients, contractors and consultants reporting that the quality of government funded buildings is defined in terms of building reliable security.	Nominal Scale	Descriptive Statistics
		Reliable Design in relation to cost.	Number of clients, contractors and consultants reporting that the quality of government funded buildings is defined in terms of reliable design in relation to cost.	Nominal Scale	Descriptive Statistics
		Building Durability	Clients, contractors and consultants reporting that the quality of government funded buildings is defined in terms of building durability.	Interval Scale	Descriptive and Inferential Statistics
		Value for Money	Number of clients, contractors and consultants reporting that the quality of government funded buildings is defined in terms of value for money.	Nominal Scale	Descriptive Statistics
		Number of Buildings with Pleasant Aesthetic	Number of clients, contractors and consultants reporting that the quality of government funded buildings is defined in terms of value for money.	Nominal Scale	Descriptive Statistics

**CHAPTER FOUR:
DATA ANALYSIS, INTERPRETATION AND PRESENTATION**

4.1 Introduction

The chapter dealt with the analysis of the data. Specifically, the data analysis was in line with specific objectives which were investigated, interpreted and implications drawn on them. This chapter represents the empirical findings and results of the application of the variables using descriptive, qualitative and quantitative research designs.

The study targeted a sample size of 149 respondents from which 128 filled in and returned the questionnaires making a response rate of 85.9 %. This response rate was satisfactory to make conclusions for the study as it acted as a representative. According to Mugenda and Mugenda (2003), a response rate of 50% is adequate for analysis and reporting, a rate of 60% is good and a response rate of 70% and over is excellent. Based on the assertion, the response rate was excellent. This is presented in Table 4.1 on response rate

Table 4.1: Response Rate

Cluster	Targeted Sample Size	Response	Percentage	Composite Percentage
Clients	79	69	87.3	85.9%
Contractors	58	50	86.2	
Consultants	12	9	75.0	
Total	149	128	85.9	

Problem may arise when two or more predictor variables are correlated. Heteroscedasticity means that previous error terms are influencing other error terms and this violates the statistical assumption that the error terms have a constant variance. Graham (2003) argues that the prediction is not affected, but interpretation of, and conclusions based on, the size of the regression coefficients, their standard errors, or the associated z-tests, may be misleading because of the potentially confounding effects of multi collinearity. In the presence of multi collinearity, Dormann Elith and Bacher, (2013) demonstrate that the coefficient estimates may change erratically in response to small changes in the model or the data. However, the decision

to finally drop an item also depends on a second step, where the variance inflation factor (VIF) is applied according to (Dormann et al., 2013). The VIF detects multi collinearity by measuring the degree to which the variance has been inflated. A VIF greater than 10 is thought to signal harmful multi collinearity as suggested by (Baum, 2006).

Table 4.2 Design factors Collinearity

Model	Collinearity Statistics	
	Tolerance	VIF
Communication on design	0.924	2.728
Design changes	0.786	1.423
Design defects	0.634	1.352
Design specifications	0.780	3.427

The Variance inflation factor (VIF) was checked in all the analysis which is not a cause of concern as recommended by Baum, (2006) who indicated that a VIF greater than 10 is a cause of concern. The basic assumption is that the error terms for different observations are uncorrelated (lack of autocorrelation).

4.2 Background Information (Biodata)

Deferent age groups are perceived to hold different opinion on dissimilar matters, in view of ensuring that all these opinions were captures in this research, the study requested the respondents (clients, contractors and consultants) to indicate their age group. Results on age distribution as per the respondent's category are as presented in Table 4.3

Table 4.3: Distribution of respondents in terms of their age group

Age group	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
20-29 years	10	14.5	9	18.0		
30-39 years	23	33.3	21	42.0	2	22.2
40-49 years	24	34.8	13	26.0	3	33.3
50 and above	12	17.4	7	14.0	4	44.4
Total	69	100.0	50	100.0	9	100.0

Investigations on age distribution under clients category showed that most the clients as shown by 34.8% aged between 40-49 years while the least on the same category were aged between 20-29 years, results on category of contractors, show that most of the contractors as shown by 42.0% were age between 30-39 years while least whereas aged between 50 years and above, results under the category of consultants, most of the consultants as shown by 44.4% were aged above 50 years while least whereas aged between 30-39 years. The findings show that fair age distributions of all respondents (clients, contractors and consultants) involved in execution of government funded building projects.

All Respondents were requested to indicate their gender category, this was sought in view ensuring gender equity amongst the respondents under each respondent’’ sub category. Results are as presented in Table 4.4

Table 4.4: Gender category

Gender	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Male	53	76.8	36	72.0	7	77.8
Female	16	23.2	14	28.0	2	22.2
Total	69	100.0	50	100.0	9	100.0

Results obtained showed that; majority of the respondents under every respondents sub category (clients, 76.8% contractors 72.0% and consultants 77.8%) was dominated by males. This shows unfair engagement of both genders signifying that the execution of government funded building projects was mostly dominated by males.

The level of education is perceived to influence individual’s perception on different issues. In view of gauging the respondents answerability and understanding execution of government funded building projects, respondent were requested to indicate the highest level of education attained. Results are as presented in Table 4.5

Table 4.5: Level of Education

Level of Education	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Certificate	7	10.1	7	14.0		
Diploma	18	26.1	10	20.0		
Degree	23	33.3	16	32.0		
Masters and Above	21	30.4	17	34.0	9	100.0
Total	69	100	50	100.0	9	100.0

Results on education levels showed that majority of the client respondents as shown by 36.2% held masters degrees and above, majority of the contractor respondents as shown by 46.0% held masters and above while all of the contractors respondents held masters and above, the results show that all the respondents were literate which implies that there were in a position to comprehend the matter under investigation and respond appropriately and effortlessly.

Respondents were requested to indicate the period which they had worked in public institution. Results obtained showed that considerable number of the respondents had served in public institution for more than 10 years which implies that majority of the participants in this study were in a position to give credible information based on the experience in their service term.

4.3 Analysis by the Research Question

This sub section explores on the relationship between, design communication and quality of government funded building projects.

The study sought to establish whether there were reports on poor communication of design of government funded building project. Results are as presented in Table 4.6

Table 4.6: Reports on poor communication of design in GFBP

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	51	73.9	37	74.0	4	44.4
No	18	26.1	13	26.0	5	55.6
Total	69	100.0	50	100.0	9	100

From the study results, majority of the clients as shown by 73.9% agreed that reports on poor design in government funded building project were always communicated. The same was also reported by majority of contractors (74.0%) This signifies that; reports on poor design in government funded building project were always communicated to ensure high quality standards of government funded building project. The study noted that a few complains of poor design in government funded building project were reported yearly. Among the complains raised include lack of clear specification on quality of building materials, Inaccurate dimension on drawings, ignorance on the impact of load on the building stability and strength and all which compromised the quality of the building. respondents reported that timely site delivery enable the contactors to start the project on time, purchase the right materials, provide realistic progress chart. The contractor and other stake holders are able to study the drawing in good time and minimise the errors during the time of implementation, timely site delivery of drawings also helps to limit cost as contractors can assess the ant estimate the cost in good time.

From the research findings, contractor’s consultants and clients acknowledged that language barrier in design negatively affected the quality of government funded buildings. The study noted that language barriers lead to poor translation and interpretation of design specification; language barriers lead to time wastage especial in interpretation process in leading to project delay and increase of cost

The study sought to establish whether there were reports on poor consultant communication in government funded building project. Results are presented in Table 4.7

Table 4.7: Reports on poor communication of design in GFBP

Opinion	Clients		Contractors	
	Frequency	Percentage	Frequency	Percentage
Yes	52	75.4	38	76.0
No	17	24.6	12	24.0
Total	69	100.0	50	100.0

From the study results, majority of the clients as shown by 75.4% agreed that reports on poor consultant communication in government funded building project. The same was also reported by majority of contractors (76.0%) This signifies that; reports on poor design in government

funded building project where reports on poor consultant communication in government funded building project. Contractors and clients added that poor drawing meant that designers never consulted which in future crippled the implementation process.

Table 4.8: Influence of design factors on communication on quality of GFBP in Kenya

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Mean
The quality of government funded building projects is influenced by timely site delivery of drawings.	3.1%	2.3%	8.6%	66.4%	19.5%	4.15	0.12
Site coordination does influence the quality of government funded building projects.	4.7%	6.3%	12.5%	56.3%	20.3%	4.29	0.14
Consultant communication on design influence the delivery schedule of government funded building projects.	7.0%	7.0%	14.8%	50.0%	21.1%	4.29	0.15
Language barrier does influence the understanding of design requirements and the overall quality of government funded building projects.	0.8%	5.5%	12.5%	62.5%	18.8%	4.23	0.36

Results obtained on influence of design factors on communication on quality of government funded building projects, showed that majority of the respondents agreed that site coordination influences the quality of government funded building projects, consultant communication on design influence the delivery schedule of government funded building

projects as shown by a mean of 4.29 in each case, language barrier does influence the understanding of design requirements and the overall quality of government funded building projects as shown by a mean of 4.23, the quality of government funded building projects is influenced by timely site delivery of drawings as shown by a mean of 4.15.

Respondents were requested to indicate some of the measure that can be adopted to improve communication on design of government funded building projects, from the opinions collected, respondents suggested that there is need for proper consultation with all stake holders on project specifications, inclusion of all departments involved in project design in monitoring and evaluation process, proper testing and engaging of structural engineers tasked with design and advancement in technology to cater for alternative designs that are less costly.

4.4 Design Changes and Quality of Government Funded Building Projects

This sub section investigated the effect of design changes on quality of government funded building projects.

The research sought to determine whether there were reports of schedule overruns arising from variations in design in government funded building projects. Results are shown in Table 4.9

Table 4.9: Reports of Schedule Overrun Arising From Design Changes

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	61	88.4	43	86.0	9	100
No	8	11.6	7	14.0	0	00
Total	69	100.0	50	100.0	9	100

From the study results, majority of the clients as shown by 88.4% agreed that there were reports of schedule overruns of government funded building project arising from variations in project design, the same was also reported by majority of contractors (86.0%) and consultants as shown by 100% as well. This signifies that there were reports on schedule overruns of government funded building project arising from variations in project design. The study noted that many reports of schedule overruns of government funded building project arising from variations in project design have reported in several incidents in the last decade. Respondents

also admitted that quality of the design and documentation produced has a major influence on the overall performance and efficiency of government construction projects.

Respondents reported that changes lead work repetition involving new materials, labour and time resources which are expensive and extra costly design changes affects workmanship or quality of materials. Where the quality of material or workmanship has been over estimated, design changes will call for standardization which will lower the cost of project whereas the opposite will lead to increase in project cost.

The research sought to establish whether design changes improved building functionality. Results are as presented in Table 4.10

Table 4.10: Influence of design changes of building performance features

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	56	81.2	43	86.0	0	0
No	13	18.8	7	14.0	9	100
Total	69	100.0	50	100.0	9	100

The research sought to establish effects of design changes on building functionality. From the results respondents explained that design changes always interfered with specific estimates provides thereby affecting standardization of materials thus affecting the quality of the building further the contractors admitted that any design changes accompanies with the right amendments improve the quality of the structure which is very rare.

The study sought to determine the extent to which respondents agreed with the following statements assessing on influence of design changes on quality of government funded building projects as shown in Table 4.11

Table 4.11: Influence of design changes on quality of GFBP

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Deviation
Design changes leading to schedule overruns on government funded building projects influence the quality of these types of projects.	3.9%	6.3%	10.9%	62.5%	16.4%	4.18	0.16
Design changes lead to improvement in the functionality of buildings which influence the quality of government funded building projects.	4.7%	5.5%	12.5%	68.8%	8.6%	4.29	0.11
Design changes leading to reduced projects costs on government funded building projects influence the quality of these types of projects.	1.6%	3.1%	10.2%	46.1%	39.1%	4.33	0.40
Design changes leading to cost overruns on government funded building projects do influence the quality of these types of projects.	3.1%	5.5%	7.8%	65.6%	18.0%	4.35	0.08
Average mean						4.29	0.19

Results obtained on effect of design changes government funded building projects, showed that majority of the respondents agreed that design changes leading to cost overruns on government funded building projects do influence the quality of these types of projects as shown by a mean

of 4.35, design changes leading to reduced projects costs on government funded building projects influence the quality of these types of projects as shown by a mean of 4.33, design changes lead to improvement in the functionality of buildings which influence the quality of government funded building projects as shown by a mean of 4.29 and that design changes leading to schedule overruns on government funded building projects influence the quality of these types of projects as shown by a mean of 4.28.

The average mean for sub measure assessing the effect of design changes on quality of government funded building projects was 4.29 and STD deviation 0.19. This translates to agree as per the measurement scale. in other word this mean that design changes had a significant effect on quality of government funded building projects. The findings are in support of the research by Gray and Hughes, (2001) design changes were major factors in the performance of contractors working in the Korean Metrological Administrations (KMA) government funded buildings and overall quality of these buildings

Respondents were required to suggest measures that can be put in place to reduce the influence of design changes implemented by clients that affect the quality of the quality of government funded building projects. From the views gathered, respondents suggested that any changes in project design should reflect in project cost, there is need to embrace technology in project design to enhance accuracy, Proper consultation and pre-survey of all necessities were highly advocated for

4.5 Design Defects and Quality of Government Funded Building Projects

Results obtained from various reports showed a many design defects were raised in the last decade. From a contractor's perspective, the deficiencies occur in design and documentation being provided by consultants, have been steadily increasing over the past 12–15 years and are causing corresponding increases in the extent of inefficiency within the construction process.

The study sought to establish how design defects influence the quality of government funded building projects. From the research findings, respondents explained that consequence, design defects decreases project quality and increases in overall project costs result. Respondents acknowledged that one of the major concern of design defects are the additional costs of caused

by the delays and disruption in trying to clarify inadequate, impractical, conflicting or ambiguous design and specification documentation.

The research sought to determine whether there were reports of design defects on government funded projects. Results are shown in Table 4.12

Table 4.12: Reports of design defects on government funded projects

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	56	81.2	42	84.0	6	66.7
No	13	18.8	8	16.0	3	33.3
Total	69	100.0	50	100.0	9	100.0

From the study results, majority of the clients as shown by 81.2% agreed that there were reports of design defects of government funded building project, the same was also reported by majority of contractors (84.0%) and consultants as shown by 66.7% as well. This signifies that there were reports on design defects of government funded building project.

From the findings all the respondents acknowledge that defects in a project design have been escalating in the recent in the recent past. Most of the design defects were reported include inadequate provision for movement due to thermal effects, ignoring changing environmental weather condition, ignoring the impacts of load on the building stability, poor dimensions, overlooking the changes in soil conditions and poor structural design.

The research sought to determine whether design defects on government funded building projects influence the functionality of some building parts. Results are shown in Table 4.13

Table 4.13: Influence of design defects on quality of GFBP

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	63	91.3	42	84.0	7	77.8
No	6	8.7	8	16.0	2	22.2
Total	69	100.0	50	100.0	9	100.0

From the study results, majority of the clients as shown by 91.3% agreed that design defects on government funded building projects influence the functionality of some building parts, the

same was also reported by majority of contractors (84.0%) and consultants as shown by 77.8% as well. This signifies that design defects on government funded building projects influence the functionality of some building parts. Respondents also explained that design defects lead to compromised the project implementation time frame and project cost and sometimes leading to high maintenance cost like case of roads

The study sought to determine the extent to which respondents agreed with the following statements relating to design changes. Results are shown in Table 4.14

Table 4.14: Statements relating to effect of Design defects on quality of GFBP

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Deviation
Design defects make government funded buildings fragile thereby influencing the quality of these buildings.	2.3%	5.5%	4.7%	42.2%	45.3%	4.34	0.53
Number of enquiries emanating from design defects does influence the quality of government funded building projects.	3.9%	4.7%	6.3%	53.9	31.3%	4.26	0.50
Design defects influence the functionality of buildings' parts of government funded building projects.	1.6%	2.3%	9.4%	50.0%	36.7%	4.36	0.53
Design defects do influence the occurrence of unpleasant aesthetics in government funded building projects.	3.1%	3.1%	4.7	60.2%	28.9%	4.28	0.50
Average mean						4.31	0.52

Results obtained on effect of design changes on government funded building projects, showed that majority of the respondents agreed that; design defects influence the functionality of buildings' parts of government funded building projects as shown by a mean of 4.36, design defects make government funded buildings fragile thereby influencing the quality of these buildings as shown by a mean of 4.34, design defects do influence the occurrence of unpleasant aesthetics in government funded building projects as shown by a mean of 4.28 and that the number of enquiries emanating from design defects does influence the quality of government funded buildings as shown by a mean of 4.26.

The average mean for sub measure assessing the effect of design defects on quality of government funded building projects was 4.31 and STD deviation 0.5. This translates to agree as per the measurement scale. In other word this mean that design defects had a significant effect on quality of government funded building projects in Isiolo. The findings concur with the research by, Muya Kaliba, Sichombo and Shakantu (2013) that design defects resulted in schedule overruns which was positively correlated to poor quality of government funded building

4.6 Design Specifications and Quality of Government Funded Building Projects

The study sought to determine whether there were reports of non-compliance events by contractors working on government funded building projects. Results are shown in Table 4.15

Table 4.15: Influence of Design Specifications and Quality of GFBP

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	53	76.8	45	90.0	8	88.9
No	16	23.2	5	10.0	1	11.1
Total	69	100.0	50	100.0	9	100

From the study results, majority of the clients as shown by 76.8% agreed that there were reports of non-compliance events by contractors of government funded building project, the same was also reported by majority of contractors (90.0%) and consultants as shown by 88.9% as well. This signifies that there were reports on non-compliance events by contractors of government funded building project.

The research sought to establish the number of non-compliance events by contractors of government funded building project, from the research findings, respondents reported that the complains of non-compliance events by contractors of government funded building project have been escalating in the recent past. Respondents reported that non-compliance events by contractors have led to an increase in increased number of accidents and fatalities witnessed in construction industry. Therefore Construction firms should take a more proactive approach towards implementing the H&S plans on site through the integration of H&S procedures into the overall project management plans. This will help companies to obtain a better safety record and lower incident rate on their sites

The research sought to establish whether there were reports of reworks emanating from design specifications on government funded building projects. Results are analyzed in Table 4.16.

Table 4.16: Reports of reworks emanating from design specifications on GFBP

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	62	89.9	45	90.0	9	100.0
No	7	10.1	5	10.0		
Total	69	100.0	50	100.0	9	100

From the study results, majority of the clients as shown by 89.9% agreed that there were reports of reworks emanating from design specifications on government funded building projects, the same was also reported by majority of contractors (90.0%) and all the consultants as shown by 100.0% as well. This signifies that there were reports on reworks emanating from design specifications on government funded building projects of government funded building project.

The study sought to establish whether design specifications influenced the number of government funded buildings with pleasant aesthetics. Results are analyzed in Table 4.17

Table 4.17: Influence Design Specifications on Government Funded Buildings

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	62	89.9	45	90.0	7	77.8
No	7	10.1	5	10.0	2	22.2
Total	69	100.0	50	100.0	9	100.0

From the study results, majority of the clients as shown by 89.9% agreed that design specifications influenced of government funded building project with pleasant aesthetics, the same was also reported by majority of contractors (90.0%) and consultants as shown by 77.8% as well. this signifies that design specifications influenced of government funded building project with pleasant aesthetics. Further Respondents explained that the influence of design specifications on government funded buildings. From the research findings, respondents reported that design specifications have a big role in final product and therefore affects aesthetics.

The study sought to establish whether design specifications emanating from technical skills influenced the quality of government funded buildings. Results are analyzed in Table 4.18

Table 4.18: Influence of design specifications emanating from technical skills on quality of GFBP

Opinion	Clients		Contractors		Consultants	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	67	97.1	46	92.0	9	100.0
No	2	2.9	4	8.0	0	0
Total	69	100.0	50	100.0	9	100.0

From the study results, majority of the clients as shown by 97.1% agreed that there design specifications emanating from technical skills influenced the quality of government funded building project with pleasant aesthetics; the same was also reported by majority of contractors (92.0%) and consultants as shown by 100.0% as well. This signifies that design specifications emanating from technical skills influenced the quality of government funded building project.

Respondents explained that those Architectures with high technical competency and understanding of their work are likely to give high standard quality designs leading to quality structures.

Respondents were requested to suggest some of the design specifications measures that can enhance the quality of government funded building projects. Results are as shown in Table 4.19

Table 4.19: Statements assessing the effect of design specifications on quality of GFBP

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Deviation
The high number of non-compliance events by contractors working on government funded building projects influences the quality of these buildings.	4.7%	6.3%	3.9%	51.6%	33.6%	4.29	0.21
Design specifications influence the number of reworks occurring which influences the quality of government funded building projects.	6.3%	5.5%	3.1%	55.5%	29.7%	4.46	0.22
Design specifications influence the number of government funded buildings with pleasant aesthetics	2.3%	0.8%	7.0%	66.4%	23.4%	4.43	0.14
Design specifications emanating from lack of technical skills does influence the quality of government funded buildings.	3.9%	5.5%	6.3%	65.6%	18.8%	4.21	0.33

Results obtained on effect of design specifications on quality of government funded building projects, showed that majority of the respondents agreed that; design specifications influence the

number of reworks occurring which influences the quality of government funded building projects as shown by a mean of mean of 4.46, design specifications influence the number of government funded buildings with pleasant aesthetics as shown by a mean of mean of 4.43, the high number of non-compliance events by contractors working on government funded building projects influences the quality of these buildings as shown by a mean of 4.29 and that design specifications emanating from lack of technical skills does influence the quality of government funded buildings as shown by a mean of mean of 4.21. The average mean for sub measure assessing the effect of design specifications on quality of government funded building projects was 4.35 and STD deviation 0.23. This translates to agree as per the measurement scale. in other word this mean that design specifications had a significant effect on quality of government funded building projects in Isiolo. The findings concur with the research by Olaosebikar, (2010) in his evaluation of government funded peoples housing projects buildings inspected by the country's Construction Development Board (CIDB) reported that 72% of the buildings were delivered in poor quality due to poor specifications.

4.7 Measures of the quality in government funded building projects

Respondents were requested to highlight on quality indicators of government funded building projects. Results are as shown in Table 4.20

Table 4.20: Measures of the quality for government funded building projects

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Deviation
Projects delivered on time	1.6%	4.7%	8.6%	57.8%	27.3%	1.66	0.23
Building Safe Access	2.3%	3.9%	9.4%	50.8%	33.6%	1.65	0.15
Building Reliable Security	1.6%	3.1%	10.2%	46.1%	39.1%	1.79	0.36
Reliable Design in relation to cost	3.1%	5.5%	7.8%	65.6%	18.0%	1.68	0.31
Building Durability	2.3%	7.0%	5.5%	73.4%	11.7%	1.66	0.11
Value for Money	3.9%	6.3%	10.9%	62.5%	16.4%	1.69	0.74
Number of buildings with pleasant Aesthetics	4.7%	5.5%	12.5%	68.8%	8.6%	1.69	0.18

The study sought to establish the extent to which the above measures of the quality were ensured in government funded building projects. From the research findings, majority of the respondents agreed to a great extent the following measures were highly taken in consideration in government funded building projects; building safe access as shown by a mean of mean of 1.65, building durability, projects delivered on time as shown by a mean of 1.66 in each case, reliable design in relation to cost as shown by a mean of 1.68, value for money , number of buildings with pleasant aesthetics as shown by a mean of mean of 1.69 in each case, building reliable

security as shown by a mean of mean of 1.79. This means that most building in Isiolo County are of moderate quality. The findings also signify that effective communication on design has a positive impact on successful project execution; the efficiency and effectiveness of the construction process strongly depend on the quality of communication on design in government funded building projects.

4.8 Regression Results

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 4.21

Table 4.21: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.864 ^a	.746	.741	1.45642

Adjusted R squared is coefficient of determination which tells us the variation in the dependent variable due to changes in the independent variable. From the findings in the above table the value of adjusted R squared was 0.741 an indication that there was variation of 74.1 percent on quality of government funded building projects due to changes in communication on design, design changes, design defects and design specifications at 95 percent confidence interval. this shows that 74.1 percent changes in quality of government funded building projects are as a result of communication on design, design changes, design defects and design specifications.

The study further tested the significance of the model by use of ANOVA technique. The findings are tabulated in Table 4.22

Table 4.2: Summary of One-Way ANOVA results

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	20.292	4	0.987	5.545	.000 ^b
1	Residual	20.292	114	0.178		
	Total	40.584	118			

Critical value = 2.46

From the ANOVA statistics, 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 (5.545 > 2.46) an indication that communication on design, design changes, design defects and design specifications all affects quality of government funded building projects. 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 4.23

Table 4.23: Coefficients^a

Model	Unstandardized		Standardized	t	Sig.	
	Coefficients		Coefficients			
	B	Std. Error	Beta			
	(Constant)	-4.273	1.266		-3.375	0.023
	Communication On Design	0.525	0.150	0.585	3.500	0.000
1	Design Changes	-0.437	0.144	0.193	3.035	0.000
	Design Defects	-0.416	0.121	0.391	3.438	0.010
	Design Specifications	0.398	0.075	0.305	5.307	0.000

From the data in the above table the established regression equation was

$$Y = - 4.273 + 0.525 X_1 + (-0.437 X_2) + (-0.416 X_3) + 0.398 X_4$$

From the above regression equation it was revealed that failure to account for communication on design, design changes, design defects and design specifications, the quality of government funded building projects would stand at - 4.273, this implies that in absence or failure to account for communication on design, design changes, design defects and design specifications the quality of government funded building projects would register a negative value and poor performance.

Further results show that a unit increase in communication on design would lead to an increase in quality of government funded building projects by a factor of 0.525, this implies that putting up strategies the promote communication on design will positively promote the quality of government funded building projects

The study also noted that unit increase in design changes would lead to decrease in quality of government funded building projects by a factor of -0.437, in other words this means that that increase in design changes will natively or lower the quality of government funded building projects.

The study also noted that unit increase in design defects would lead to decrease in quality of government funded building projects by a factor of - 0.416, in other words this means that that increase in design defects will adversely or lower the quality of government funded building projects.

And finally a unit increase in application of better control analysis would lead to increase an in a unit increase in design specifications would promote the quality of government funded building projects by a factor of 0.398, all the variables were significant as their significant value was less than ($p < 0.05$).

4.9 Summary of the Chapter

Indeed it is clear, based on the findings of this study, that communication on design factors, design changes, design defects, poor design specifications all affected that quality of government buildings in Isiolo County. To sum up the study concludes that poor site coordination arising from poor communication, language barrier issues, untimely site delivery of drawings and poor consultants' communication all had a negative effect on quality government funded building projects. The study also concludes that design defects like structural instability of buildings, unpleasant aesthetics and buildings' parts poor functionality compromised that quality government funded building projects in Isiolo County and finally the study concludes that poor design specifications including non-compliance events, construction re-work incidents, technical skills issues and errors and omissions in contract documents compromised that quality government funded building projects Isiolo County.

**CHAPTER FIVE:
SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION AND
RECOMMENDATIONS**

5.1 Introduction

From the analysis and data collected, the following discussions, conclusion and recommendations were made. The responses were based on the thematic objectives of the study. The study sought to determine the influence of communication on design on the quality of government funded building projects in Isiolo County, to establish the influence of design changes on the quality of government funded building projects in Isiolo County, to establish the influence of design defects on the quality of government funded building projects in Isiolo County and to examine the influence of design specifications on the quality of government funded building projects in Isiolo County.

5.2 Summary of the Findings

In line with the first objective, the study revealed that during the execution of government funded building projects; project deliveries should adhere to design quality standards as well as specific client requirements. Deliveries should be validated and verified before delivering to the client. Therefore there should be a quality assurance function, which runs from start to the end of the project. The study also noted that quality of the deliveries matter the most. The processes or activities that produce deliverables should also adhere to certain quality guidelines as well. Government funded building projects in Isiolo rarely adhere to quality standards (process quality standards), which increases the probability government project deliverables not meeting the delivery quality standards. poor design in government funded building project were always communicated to ensure high quality standards of government funded building project, complains of poor design in government funded building project in Isiolo were reported yearly, Contractors and clients added that poor communication on drawing meant that designs never consulted was engaged which in future crippled the implementation process, site coordination influences the quality of government funded building projects and that inclusion of all departments involved in project design in monitoring and evaluation process is vital in promoting building quality standards. The findings are in line with the research by Malaysia,

Sahid (2008) who did point out that the issue of communication innovation agreement design did adversely influence the quality of 33% of government funded buildings and the findings by in the study in Iran by Pourrostam, Ismail & Mansouneja, (2011) who found that communication on design did adversely influence the quality government funded buildings projects by 23% .

In line with the second objective, the study results show that there were reports of schedule overruns of government funded building project arising from variations in project design, quality of the design and documentation produced has a major influence on the overall performance and efficiency of government construction projects, changes lead to work repetition involving new materials, labour and time resources which are expensive and extra costly design changes affects workmanship or quality of materials. Results also show that where the quality of material or workmanship has been over estimated, design changes will call for standardization which will lower the cost of project whereas the opposite will lead to increase in project cost. design changes always interfered with specific estimates provides thereby affecting standardization of materials thus affecting the quality of the building further the contractors admitted that any design changes accompanies with the right amendments improve the quality of the structure which is very rare. The findings are in support of the research by Faridi and El Sayegh (2006) frequent design variations were responsible to delays which adversely influenced the quality of 18% of government funded buildings in the United Arab Emirates (U.A.E) and that of Kikwasi, (2012) in Tanzania who 64% of government funded buildings were delivered in poor quality emanating from numerous design variations which also caused delays in construction process.

In line with the third objective, the research also noted that there were reports on design defects of government funded building project, respondents acknowledged that defects in a project design have been escalating in the recent in the recent past. Most of the design defects were reported include inadequate provision for movement due to thermal effects, ignoring changing environmental weather condition, ignoring the impacts of load on the building stability, poor dimensions, overlooking the changes in soil conditions and poor structural design. The findings concur with the research by Pedersen, Aagaard and Neilsen (2009), who reported that design errors were responsible for the collapses of various government funded buildings in Denmark emanating from cracks in beams and pillars another study by Muya Kaliba, Sichombo and Shakantu (2013) that design defects resulted in schedule overruns which was positively

correlated to poor quality of government funded building and that by Adesoji (2011) who did estimate that 81% of public housing projects in Nigeria were of poor quality due to numerous design defects.

In line with the fourth objective, the study also revealed that design specifications influenced the number of government funded buildings with pleasant aesthetics, design specifications have a big role in final product and therefore affects aesthetics design specifications emanating from technical skills influenced the quality of government funded building project, Architects with high technical competency and understanding of their work are likely to give high standard quality designs leading to quality structures. The findings concur with the research by Sommerville, (2007) who observed that poor design specifications not only lead to reworks but they also influence the quality of buildings as they result building defects and that by Olaosebikar, (2010) in his evaluation of government funded peoples housing projects buildings inspected by the country's Construction Development Board (CIDB) reported that 72% of the buildings were delivered in poor quality due to poor specifications.

5.3 Discussion of the Findings

Investigation on the relationship between, design communication and quality of government funded building projects in Isiolo County showed that reports on poor design in government funded building project were always communicated to ensure high quality standards of government funded building project, complains of poor design in government funded building project were reported yearly. Among the complains raised include lack of clear specification on quality of building materials, Inaccurate dimension on drawings, ignorance on the impact of load on the building stability and strength and all which compromised the quality of the building. The findings are contrary to the research by Gudien , Ramelyt and Banaitis, (2013) who did point out that effective communication on design requirements did lead to the delivery of high quality public buildings in Lithuania but are in line with findings by the study by Rivas, Borcharding, Gonzalez, and Alarcon, (2011) that poor communication on design did result to numerous reworks on these building construction projects resulting to a decline in productivity among craftsmen adversely influencing the quality of government funded projects in Chile.

The study also noted that timely site delivery enable the contactors to start the project on time, purchase the right materials, provide realistic progress chart. The contractor and other stake holders are able to study the drawing in good time and minimise the errors during the time of implementation, timely site delivery of drawings also helps to limit cost as contractors can assess the ant estimate the cost in good time. Contractor's consultants and clients acknowledged that language barrier in design negatively affected the quality of government funded buildings. The study noted that language barriers lead to poor translation and interpretation of design specification; language barriers lead time wastage especial in interpretation process in leading to project delay and incursion of cost. The findings are in support of the research by Jarkas and Bitar, (2012) who found out that poor communication on design as a result of language barrier between government architects, structural engineers and craftsmen did negatively affect clarity of technical specifications resulting to poor quality government funded buildings characterized by cracks on walls, pillars and beams and poorly done ventilation.

The study further noted that there were reports on poor design in government funded building project, there were reports on poor consultant communication in government funded building project. Contractors and clients added that poor communication on drawing meant that designs never consulted was engaged which in future crippled the implementation process, site coordination influences the quality of government funded building projects, consultant communication on design influence the delivery schedule of government funded building projects, language barrier does influence the understanding of design requirements and the overall quality of government funded building projects and that the quality of government funded building projects is influenced by timely site delivery of drawings. The findings are contrary to the research by Ornstein and Rosaria, (2010) who did point out that effective communication on design requirements characterized by timely site delivery of drawings did have a positive influence the quality government funded public school buildings in Brazil however they agree with the findings by the study by Denini, (2010) did posit that late site delivery of drawings was the major cause of delays in government funded construction projects which also adversely influenced the quality of these buildings in Libya.

In order to improve communication on design government funded building projects, respondents suggested that there is need for proper consultation with all stake holders on project

specifications, inclusion of all departments involved in project design in monitoring and evaluation process, proper testing and gauging of structural engineers tasked with design and advancement in technology to cater for alternative designs that are less costly.

From the findings the researcher noted that there were reports on schedule overruns of government funded building project arising from variations in project design. Study respondents also admitted that quality of the design and documentation produced has a major influence on the overall performance and efficiency of government construction project and that changes in design lead to work repetition involving new materials, labour and time resources which are expensive and extra costly. The findings are in support of the research by Doloi, Sawhney, Iyer and Rentala (2012), who noted that public buildings in India were delivered both behind schedule and at higher costs a situation that arose from the numerous design changes implemented by government architects and structural engineers consequently influencing the quality of these buildings.

The study also established that that design changes affects workmanship or quality of materials, where the quality of material or workmanship has been over estimated, design changes will call for standardization which will lower the cost of project whereas the opposite will lead to increase in project cost, design changes always interfered with specific estimates provides thereby affecting standardization of materials thus affecting the quality of the building further the contractors admitted that any design changes accompanies with the right amendments improve the quality of the structure which is very rare. The researcher therefore notes that most design changes implemented in government funded buildings in Isiolo County did not improve on the quality of the building structure. The findings concur with the research by Apolot, Alinaitwe and Tindiwensi (2011), that design changes cause delays during the construction process which also resulted to cost overruns and poor quality buildings in Uganda but are contrary to findings by Chachere and Senecu (2011), who noted that design changes did improve the quality of an office in a public university did improve the building's interiors especially the ceiling, the construction of a disabled person's ramp, proper installation of windows and doors and the paint work.

Further the study noted that design changes lead to cost overruns on government funded building projects do influence the quality of these types of projects, design changes leading to

reduced projects costs on government funded building projects influence the quality of these types of projects, design changes lead to improvement in the functionality of buildings which influence the quality of government funded building projects and that design changes leading to schedule overruns on government funded building projects influence the quality of these types of projects, respondents suggested that any changes in project design should reflect in project cost, there is need to embrace technology in project design to enhance accuracy, Proper consultation and pre-survey of all necessities were highly advocated for. The findings concur with the research by Iyer, and Sameer (2012), observed that 47% of government funded projects were delivered below expected quality specifications emanating from different design factors mostly design changes

The results obtained from various reports revealed that many design defects arise from consultants. Additionally, from the findings especially contractor's perspective, the researcher notes that the deficiencies in terms of design defects occur in design and documentation being provided by consultants, and these have been steadily increasing over the past 12 to 15 years and that these increase the extent of inefficiency within the construction process. Respondents explained that consequence, design defects decreases project quality and increases in overall project costs result. In line with these findings, the researcher authoritatively notes that one of the major concern of design defects are the additional costs majorly caused by the delays and disruption in trying to clarify inadequate, impractical, conflicting or ambiguous design and specification documentation. The findings concur with the research by Kakitahi, Alinaitwe, Landin and Rodgruius (2014), report that design defects were responsible for poor quality government funded buildings.

The research also noted that there were reports on design defects of government funded building project, respondents acknowledged that defects in a project design have been escalating in the recent past. Most of the design defects were reported include inadequate provision for movement due to thermal effects, ignoring changing environmental weather condition, ignoring the impacts of load on the building stability, poor dimensions, overlooking the changes in soil conditions and poor structural design. The findings concur with the research by Oyewobi and Ogunsemi, (2010) demonstrated that design errors contributed to the poor inaccessibility of some of the

buildings characterized by poorly installed doors and poorly constructed stairways, unpleasant aesthetics in paint work coupled with poor finishing of rough walls and ceilings.

The study also revealed that design defects on government funded building projects influence the functionality of some building parts, contractors explained that design defects lead to compromised the project implementation time frame and project cost and sometimes leading to high maintenance cost like case of roads, design defects influence the functionality of buildings' parts of government funded building projects, design defects make government funded buildings fragile thereby influencing the quality of these buildings, design defects do influence the occurrence of unpleasant aesthetics in government funded building projects and that the number of enquiries emanating from design defects does influence the quality. The findings concur with the research by, Haryati, Masnizan, Zarina and Zulkifli (2011), that design defects resulted in schedule overruns which was positively correlated to poor quality public hospital buildings. From the findings, it is therefore correct to note that design defects are responsible for schedule overruns in most government funded building projects in Isiolo County leading to increased project costs which adversely influence the installation of building aesthetics and other important building parts.

The research revealed that there were reports on non-compliance events by contractors working on government funded building project, complains of non-compliance events by contractors of government funded building project have been escalating in the recent past, there were reports on reports of reworks emanating from design specifications on government funded building projects of government funded building project and that reworks emanating from design specifications have been increasing in the last decade. The findings concur with the research by Wasfy, (2010) who in his evaluation on the severity and impact of reworks on the quality of buildings did demonstrate that errors and omissions in contract documents did result to numerous non-compliance incidences which resulted to reworks in a government funded residential commercial tower project.

The study also revealed that design specifications influenced the number of government funded buildings with pleasant aesthetics, design specifications have a big role in final product and therefore affects aesthetics design specifications emanating from technical skills influenced the

quality of government funded building project, Architectures with high technical competency and understanding of their work are likely to give high standard quality designs leading to quality structures. These findings are in line with a study by Palaneeswaran, Ramanathan and Tam (2007), who noted poor specifications characterized by errors and omissions in contract documents did result to high number of non-compliance incidences in the construction process of public buildings.

Further the study noted, that design specifications influence the number of reworks occurring which influences the quality of government funded building projects, design specifications influence the number of government funded buildings with pleasant aesthetics, the high number of non-compliance events by contractors working on government funded building projects influences the quality of these and that design specifications emanating from lack of technical skills does influence the quality of government funded buildings. The findings concur with the research by Adinyira, Botchway and Kwofie (2012), who reported that errors and omissions on contract documents led to an increase in non-compliance to design specifications by construction contractors leading to an occurrence of rework incidences adversely influencing the quality of government funded buildings.

5.4 Conclusions

The study concludes that proper communication on design enhanced the quality of government funded building projects in Isiolo County. Communication on design did ensure that the essential information reaches the stakeholders at the right time, ineffective communication on design has a negative impact on successful project execution, the efficiency and effectiveness of the construction process strongly depend on the quality of communication on design in government funded building projects

The study concludes that inadequate and deficient design and documentation impacts directly on the efficiency of the construction process by leading to delays rework and variations, which in turn, contribute to increases in project time and cost, deficient design have negatively influenced the quality of government funded building projects in Isiolo County.

The study concludes that the quality of the design and documentation produced has a major influence on the overall performance and efficiency of government construction projects, it is vitally important that issues affecting design and documentation quality be identified and addressed. Designers should provide clear graphic and written representations which will allow contractors and subcontractors to transform concepts and ideas into physical reality in execution of government funded building projects in Isiolo County.

The study concludes that well-written design specifications are essential to the efficient construction of a successful project, the quality of the design specifications and documentation provided which determines how effectively and efficiently the transformation occurs, Well-written design specifications inform the Contractor of the work to be performed, the conditions and restrictions on performance of the work, the expected quality of the work, and the manner in which the work will be measured for payment.

5.5 Recommendations

Based on the study findings, the study makes the following recommendations

5.5.1 Government / policy makers

The study recommends that the project designs and out-put should clearly state Client's objectives and be concise and unambiguous, only contain affordable and deliverable requirements, highlight constraints which are essential to project, allow compliance with statutory requirements, ensure lifecycle coordination between design, construction and operation, and the government should give bidders sufficient information to prepare their offers including identification of service areas which are most critical and will be given most importance in the payment structure and performance monitoring.

5.5.2 Project Designers

Designers should be given sufficient time and fees in order for them to provide quality service needed to carry out the design function completely; there should be a design review before finally approving the design for construction.

In order to minimize defects in government structural design, the study recommends that, there should be a design review before finally approving the design for construction, maintenance

expert should not be overlooked in the planning stage of the project, selection of contractors should be based on competency and potentials for performance and quality not favours registered professional should be employed to handled building projects

Specifications should be structured according to work packages mirroring the separation of the works into sub-contracts. This makes it easier for the contractor to price and so may result in a more accurate tender.

5.6 Recommendations for further studies

The study sought to investigate on how design factors influence the quality of government funded building projects in Isiolo County. The study variables (communication on design, design changes, design defects and design specifications) accounted for 74.1 percent changes in quality of government funded building projects. The study therefore recommends that other variable accounting for 25.9 should be established and assed as well.

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APPENDICES

Appendix I: Letter of Transmittal

Mbijiwe Lawrence

P.O BOX 160- 60200,

Meru- Kenya.

Dear Respondent,

DESIGN FACTORS INFLUENCING THE QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS: A CASE OF ISIOLO COUNTY

I am a student at the University of Nairobi and currently pursuing a course of study for the degree in Master of Arts in Project Planning and Management. Pursuant to the pre-requisite course work, I am currently carrying out a study on the design factors influencing the quality of government funded building projects in Kenya. The focus of my research will be of government funded building projects in Isiolo County and this will involve use of questionnaires and an interview guide administered to clients, contractors and consultants.

There are no correct and wrong answers to these statements and they are intended just to obtain opinions, views feelings. Kindly provide data which I require for this study through the provided study instruments. The data you provide will be used for research purpose only and your identity will be held confidential.

Thank you for your cooperation.

Yours Faithfully,

Mbijiwe Lawrence

L50/70418/2013

**Appendix II:
Clients' Questionnaire**

This questionnaire is to collect data for purely academic purposes. You are kindly requested to answer the questions as sincerely as possible. The information you will give will only be used for research purposes and your identity will be treated with confidentiality.

Fill the questionnaire by putting a tick in the appropriate box or by writing your response in the provided spaces.

PART A: PERSONAL INFORMATION

1. Please indicate your age?

20-29 30-39 40-49 50 and above

2. Indicate your Gender.

Male Female

3. What is your level of education?

Certificate Diploma Degree Masters and Above

Any other please specify

4. How long have you worked in this public institution/organization? Please write down in the space provided?

PART B: COMMUNICATION ON DESIGN AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

5. Are there reports on poor communication of design in government funded building project?

Yes. No.

If yes what is the approximate number of these complains in a project.

6. How does timely site delivery of drawings influence the quality of government funded buildings?

7. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
The quality of government funded building projects is influenced by timely site delivery of drawings.					
Site coordination does influence the quality of government funded building projects.					
Consultant communication on design influence the delivery schedule of government funded building projects.					
Language barrier does influence the understanding of design requirements and the overall quality of government funded building projects.					

8. Suggest measures that design consultants can adopt to improve on communication on design for government funded building projects

PART C: DESIGN CHANGES AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

9. Are there reports of schedule overruns arising from variations in design in government funded building projects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the quality of government funded building projects?

10. In what ways do design changes lead to cost overruns on government funded building projects and how do these influence the quality of these projects?

11. In what ways do design changes reduce or increase projects' costs on government funded building projects and how do these influence the quality of these projects?

12. Do design changes improve building performance features and what is the influence of this on the quality of government funded building projects?

Yes. No.

Explain your answer.

13. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Design changes leading to schedule overruns on government funded building projects influence the quality of these types of projects.					
Design changes lead to improvement in the performance features of buildings which influence the quality of government funded building projects.					
Design changes leading to reduced projects costs on government funded building projects influence the quality of these types of projects.					
Design changes leading to cost overruns on government funded building projects do influence the quality of these types of projects.					

14. Suggest measures that can be put in place to reduce the influence of design changes implemented by clients on the quality of government funded building projects?

PART D: DESIGN DEFECTS AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

15. What is the number of enquiries emanating from design defects made in a project and how do they influence the quality of government funded building projects?

Explain your answer.

16. Are there reports of design defects on government funded projects?

Yes. No.

If yes what is the approximate number of these defects in a project and how do they lead to a high number of government funded buildings with unpleasant aesthetics?

Explain your answer.

17. Do design defects on government funded building projects influence the functionality of some building parts and what is the influence of this on the quality of these buildings?

Yes. No.

Explain your answer.

18. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Design defects make government funded buildings fragile thereby influencing the quality of these buildings.					
Number of enquiries emanating from design defects does influence the quality of government funded building projects.					
Design defects influence the functionality of buildings' parts of government funded building projects.					
Design defects do influence the occurrence of unpleasant aesthetics in government funded building projects.					

PART E: DESIGN SPECIFICATIONS AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

19. Are there reports of non-compliance events by contractors working on government funded building projects?

Yes. No.

If yes what is the approximate number of these events in a project and how do they influence the quality of these projects?

Explain your answer.

20. Are there reports of reworks emanating from design specifications on government funded building projects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the quality of government funded buildings?

Explain your answer.

21. Would you say that design specifications do not influence the number of government funded buildings with pleasant aesthetics?

Yes. No.

Explain your answer.

22. Would you say that design specifications emanating from technical skills do influence the quality of government funded buildings?

Yes. No.

Explain your answer.

23. Suggest design specifications measures that would be put in place that would positively influence the quality of government funded building projects?

24. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
The high number of non-compliance events by contractors working on government funded building projects influences the quality of these buildings.					
Design specifications influence the number of reworks occurring which influences the quality of government funded building projects.					
Design specifications influence the number of government funded buildings with pleasant aesthetics.					
Design specifications emanating from lack of technical skills does influence the quality of government funded buildings.					

25. To what extent do you think these variables as measures of the quality for government funded building projects?

Parameter	Very great extent 1	Great extent 2	Moderate extent 3	Low extent 4	Very low extent 5
Projects delivered on time					
Building Safe Access					
Building Reliable Security					
Reliable Design in relation to cost					
Building Durability					
Value for Money					
Number of buildings with pleasant Aesthetics					

Thank you for your cooperation.

Appendix III:

Contractors' Questionnaire

This questionnaire is to collect data for purely academic purposes. You are kindly requested to answer the questions as sincerely as possible. The information you will give will only be used for research purposes and your identity will be treated with confidentiality.

Fill the questionnaire by putting a tick in the appropriate box or by writing your response in the provided spaces.

PART A: PERSONAL INFORMATION

1. Please indicate your age?

20-29 30-39 40-49 50 and above

2. Indicate your Gender.

Male Female

3. What is your level of education?

Certificate Diploma Degree Masters and Above

Any other please specify

4. How long have you worked as a contractor in this county? Please write down in the space provided?

PART B: COMMUNICATION ON DESIGN AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

5. Are there reports on poor communication of design in government funded building project?

Yes. No.

If yes what is the approximate number of these complains in a project and how do they influence site coordination and the quality of these projects. Explain your answer.

6. How does timely site delivery of drawings influence the quality of government funded buildings?

7. Are there reports on poor consultant communication in government funded building project?
Yes. No.

If yes what is the approximate number of these complains in a project and how do they influence the quality of these projects. Explain your answer.

8. In what ways does language barrier influence the understanding of design requirements and the overall quality of government funded building projects?

9. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
The quality of government funded building projects is influenced by timely site delivery of drawings.					
Poor site coordination as a result of poor communication on design does influence the quality of government funded building projects.					
Poor consultant communication on design influences the delivery schedule of government funded building projects.					
Language barrier does influence the understanding of design requirements and the overall quality of government funded building projects.					

10. In what ways would you recommend on how communication on design on government funded building projects would be improved?

PART C: DESIGN CHANGES AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

11. Are there reports of schedule overruns arising from variations in design in government funded building projects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the quality of government funded building projects?

12. In what ways do design changes lead to cost overruns on government funded building projects and how do these influence the quality of these projects?

13. Would you say variations in design on government funded buildings do improve the accessibility of these buildings?

Yes. No.

Explain your answer.

14. In what ways do design changes reduce or increase projects' costs on government funded building projects and how do these influence the quality of these projects?

15. Do design changes improve building performance features and what is the influence of this on the quality of government funded building projects?

Yes. No.

Explain your answer.

16. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Design changes leading to schedule overruns on government funded building projects influence the quality of these types of projects.					
Design changes lead to improvement in the performance features of buildings which influences the quality of government funded building projects.					
Design changes leading to reduced projects costs on government funded building projects influence the quality of these types of projects.					
Design changes leading to cost overruns on government funded building projects influence the quality of these types of projects.					

PART D: DESIGN DEFECTS AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

17. Are there reports of design defects in government funded building projects emanating from design defects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the structural fragility of government funded building projects?

18. What is the number of enquiries emanating from design defects made in a project and how do they influence the quality of government funded building projects?

Explain your answer.

19. Are there reports of design defects on government funded projects?

Yes. No.

If yes what is the approximate number of these defects in a project and how do they lead to a high number of government funded buildings with unpleasant aesthetics?

Explain your answer.

20. Do design defects on government funded building projects influence the functionality of some building parts and what is the influence of this on the quality of these buildings?

Yes. No.

Explain your answer.

21. In what ways in do supervision lapses influence the quality of government funded building projects?

22. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Design defects make government funded buildings fragile thereby influencing the quality of these buildings.					
Number of enquiries emanating from design defects influence the quality of government funded building projects.					
Design defects influence the functionality of buildings' parts of government funded building projects.					
Design defects influence the occurrence of unpleasant aesthetics in government funded building projects.					

23. Suggest measures that can be put in place to reduce the occurrence of design defects on government funded building projects.

PART E: DESIGN SPECIFICATIONS AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

24. Are there reports of reworks on government funded building projects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the quality of government funded buildings?

Explain your answer.

25. In what ways do errors and omissions in contract documents influence the quality of government funded building projects?

26. Would you say that design specifications do not influence the number of government funded buildings with pleasant aesthetics?

Yes. No.

Explain your answer.

27. Would you say that design specifications emanating from technical skills do influence the quality of government funded buildings?

Yes. No.

Explain your answer.

28. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Errors and omissions in contract documents influence the quality of government funded projects.					
Design specifications influence the number of reworks occurring which influences the quality of government funded building projects.					
Design specifications influence the number of government funded buildings with pleasant aesthetics.					
Design specifications emanating from lack of technical skills influence the quality of government funded buildings.					

29. To what extent do you think these variables as measures of the quality for government funded building projects?

Parameter	Very great extent 1	Great extent 2	Moderate extent 3	Low extent 4	Very low extent 5
Projects delivered on time					
Building Safe Access					
Building Reliable Security					
Reliable Design in relation to cost					
Building Durability					
Value for Money					
Number of buildings with pleasant Aesthetics					

30. Suggest measures that can be put in place to reduce the occurrence of design specifications on government funded building projects.

Thank you for your cooperation.

Appendix V:

Building Consultant's Questionnaire

This questionnaire is to collect data for purely academic purposes. You are kindly requested to answer the questions as sincerely as possible. The information you will give will only be used for research purposes and your identity will be treated with confidentiality.

Fill the questionnaire by putting a tick in the appropriate box or by writing your response in the provided spaces.

PART A: PERSONAL INFORMATION

1. Please indicate your age?

20-30 30-39 40-49 50 and above

2. Indicate your Gender.

Male Female

3. What is your level of education?

Certificate Diploma Degree Masters and Above

Any other please specify

4. How long have you worked as an architect/ quantity surveyor/structural engineer in this county? Please write down in the space provided?

PART B: COMMUNICATION ON DESIGN AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

5. Are there reports on poor communication of design in government funded building project?

Yes. No.

If yes what is the approximate number of these complains in a project and how do they influence site coordination and the quality of these projects. Explain your answer.

6. In what ways does timely site delivery of drawings influence the quality of government funded buildings?

7. Are there reports on poor consultant communication in government funded building project?

Yes. No.

If yes what is the approximate number of these complains in a project and how do they influence the quality of these projects. Explain your answer.

8. In what ways does language barrier influence the understanding of design requirements and the overall quality of government funded building projects?

9. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
The quality of government funded building projects is influenced by timely site delivery of drawings.					
Site coordination influences the quality of government funded building projects.					
Consultant communication on design influence the delivery schedule of government funded building projects.					
Language barrier does influence the understanding of design requirements and the overall quality of government funded building projects.					

10. In what ways would you recommend on how communication on design on government funded building projects would be improved?

PART C: DESIGN CHANGES AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

11. Are there reports of schedule overruns arising from variations in design in government funded building projects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the quality of government funded building projects?

12. In what ways do design changes lead to cost overruns on government funded building projects and how do these influence the quality of these projects?

13. Would you say variations in design on government funded buildings do improve the accessibility of these buildings?

Yes. No.

Explain your answer.

14. In what ways do design changes reduce or increase projects' costs on government funded building projects and how do these influence the quality of these projects?

15. Do design changes improve building functionality and what is the influence of this on the quality of government funded building projects?

Yes. No.

Explain your answer.

16. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Design changes leading to schedule overruns on government funded building projects influence the quality of these types of projects.					
Design changes lead to improvement in the performance features of buildings which influence the quality of government funded building projects.					
Design changes leading to reduced projects costs on government funded building projects influence the quality of these types of projects.					
Design changes leading to cost overruns on government funded building projects do influence the quality of these types of projects.					

PART D: DESIGN DEFECTS AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

17. Are there reports of design defects in government funded building projects emanating from design defects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the structural fragility of government funded building projects?

18. What is the number of enquiries emanating from design defects made in a project and how do they influence the quality of government funded building projects?

Explain your answer.

19. Are there reports of design defects on government funded projects?

Yes. No.

If yes what is the approximate number of these defects in a project and how do they lead to a high number of government funded buildings with unpleasant aesthetics?

Explain your answer.

20. Do design defects on government funded building projects influence the functionality of some building parts and what is the influence of this on the quality of these buildings?

Yes. No.

Explain your answer.

21. In what ways in do supervision lapses influence the quality of government funded building projects?

22. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Design defects make government funded buildings fragile thereby influencing the quality of these buildings.					
Number of enquiries emanating from design defects influence the quality of government funded building projects.					
Design defects influence the functionality of buildings' parts of government funded building projects.					
Design defects influence the occurrence of unpleasant aesthetics in government funded building projects.					

23. Suggest measures that can be put in place to reduce the occurrence of design defects on government funded building projects.

PART E: DESIGN SPECIFICATIONS AND QUALITY OF GOVERNMENT FUNDED BUILDING PROJECTS

24. Are there reports of reworks emanating from design specifications on government funded building projects?

Yes. No.

If yes what is the approximate number of these in a project and how do they influence the quality of government funded buildings?

Explain your answer.

25. In what ways do errors and omissions in contract documents influence the quality of government funded building projects?

26. Would you say that design specifications do not influence the number of government funded buildings with pleasant aesthetics?

Yes. No.

Explain your answer.

27. Would you say that design specifications emanating from technical skills do influence the quality of government funded buildings?

Yes. No.

Explain your answer.

28. To what extent do you agree with the following statements?

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree 5
Errors and omissions in contract documents influence the quality of government funded projects.					
Design specifications influence the number of reworks occurring which influences the quality of government funded building projects.					
Design specifications influence the number of government funded buildings with pleasant aesthetics.					
Design specifications emanating from lack of technical skills influence the quality of government funded buildings.					

29. To what extent do you think these variables as measures of the quality for government funded building projects?

Parameter	Very great extent 1	Great extent 2	Moderate extent 3	Low extent 4	Very low extent 5
Projects delivered on time					
Building Safe Access					
Building Reliable Security					
Reliable Design in relation to cost					
Building Durability					
Value for Money					
Number of buildings with pleasant Aesthetics					

30. Suggest measures that can be put in place to reduce the occurrence of design specifications on government funded building projects.

Thank you for your cooperation.