FACTORS INFLUENCING CONSTRUCTION OF IRRIGATION PROJECTS: A CASE OF NATIONAL IRRIGATION BOARD, KENYA

BY

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DECLARATION

This research project report is my original work and it has not been presented for an award in any other university or institution of higher learning.

Signature..... Date.....

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

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DEDICATION

This work is dedicated to my wife Isabell Njeri for her prayers, encouragement and support.

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TABLE OF CONTENT

LIST OF FIGURE

Page

LIST OF TABLES

Page

ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
FAO	Food Agricultural Organization
KV	Kenya Vision 2030
IFAD	International Fund for Agricultural Development
IFPRI	The International Food Policy Research Institute
MDGs	Millennium Development Goals
MTP	Medium Term Plan
NIB	National Irrigation Board
UK	United Kingdom
UN	United Nations
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences

ABSTRACT

The study investigated factors influencing construction of irrigation projects taking a case of National Irrigation Board. The study was guided by four specific objectives; to establish the influence of managerial planning on construction of irrigation project; to determine the influence of financial resources on construction of irrigation project; to examine the influence of equipment on construction of irrigation project and to establish the influence of project staff on construction of irrigation project. The researcher adopted descriptive survey research design. The target population of the study was 80 participants from ten projects who are directly involved in construction of projects funded by NIB in first and Second Medium Term Plan (MTP) 2008 – 2014. The target population included project staff from National Irrigation Board, consultants, contractors and representatives of farmers. Due to the small size of the population, the researcher undertook a census as the sampling technique. Data collection included personal interviews and personally administered questionnaires. To ensure validity and reliability of the research instrument, precise terminologies were used in the questionnaire, participants were subjected to the same questionnaire and ethical issues were observed. In analysis of data, descriptive analysis which include mean, mode and median were used to measure the central tendency and Standard Deviation (SD) to measure dispersion. In order to measure the relationship between variables, Pearson's *r* correlation method was used and regression analysis was used to identify the influence of independent variables on the dependent variable. The study findings show that there was a significant relationship between the independent (financial resources, managerial planning, staff related factors and equipment factors) variables and the dependent variable (construction of irrigation projects). The findings show that financial resources (β=0.138; p = 0.000) are the most significant factor, followed by managerial planning (β=0.087*;* p = 0.002), project staff (β=0.039*;* p = 0.035) and the least was equipment factors (β=*0.043;* p = 0.048). The study recommends that management of the construction project should develop a change order process with a defined set of procedures. There should be rigorous monitoring and evaluation of construction of irrigation projects. That contractor should adhere to the agreed mobilization guidelines. That project managers of the irrigation projects should motivate staff by providing sufficient working terms and working environment. The study was limited to project execution construction phase there is need for study suggests for further study from project initiation to project handing over.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

In a meeting held in 2000 by member states of UN (United Nations) to discuss commitment to human development, suppression of poverty and lack of food were found to be most important and therefore declared as the first Millennium Development Goal (MDG). In the shorter run, agriculture can achieve more and urgent gains in improving the warfare of poor rural households while structural changes will play a big role in the longer run. (IFPRI, 2006). Irrigated agriculture contributes 40% of the world's food production (IFAD, 2009).

In Goal 7 of the Millennium Development Goals which concerns environmental sustainability UN, (2006) reflects that water is a scarce resource in many countries and this scarcity is of particular concern in the Sub-Saharan Africa. The UN report also affirms that the manner in which water scarcity issues are addressed will influence successful achievement of most of the Millennium Development Goals. Hussain and Hanjra, (2004) records that there is direct and indirect linkage between access to water, poverty and people's livelihoods where direct linkages operate at household level and indirect linkages operate at national level.

IFAD (2009) records that the world uses 70% of its fresh water for irrigated agriculture. IFAD further emphasizes the importance of irrigation by noting that it multiplies yields of most crops by 2 to 5 times. Irrigation has been a key factor behind the almost tripling of grain production since 1950. According to Gao (2012) irrigation will continue to play an important part in meeting world food demands because the projected increase in global population will require doubling of cereal production to meet the food demand by 2050. He estimates that 90% of the increase in cereal production will be from land under cultivation. Out of which Irrigated land will contribute 70% while 20% will come from land reclamation.

However, according to FAO (1993) the trends in irrigated area is worrying in that irrigated area increased by an average 1 percent per year during the 1960s and reached maximum annual rate of 2.3% in 1975 and is currently less than 1 % per year per annum. The major

reasons of this decline are the increased implementation costs and the sharp fall of world cereal prices over the past four decades (FAO, 1993). In a more recent, FAO (2002), reports that globally, potential for use of land and water resources for agriculture has not been fully exploited. The FAO report is careful to point out that agriculture in large areas of the developing world has hit the limits due to lack of undeveloped water or good land (FAO, 2002). According to Jubilee (2012) the government of Kenya made irrigated agriculture a priority in transforming agriculture with aim of achieving food security. The government plan to increase irrigation and reduce emphasis on rain fed agriculture in order to boost food production and meet the food demand of Kenyans (Jubilee Manifesto, 2012).

Rosegrant et al, (2005) reason that agricultural development is paramount to rural poverty reduction in Africa and will make significant contribution to achieving Millennium Development Goals. About 85% of African poor live in poor areas and mostly depend on agriculture for their livelihood. Irrigation can boost agricultural productivity by over 50%. Currently only 6% of the total cultivated land is equipped for irrigation (Liaangzhi et al, 2005). Yahaya (2000) observed that agricultural use of surface irrigation in sub-Saharan Africa is underdeveloped compared to Asia and large-scale irrigation developments have repeatedly resulted in expensive failures. Examples of attempted efforts are Bura and Bakolori schemes in Kenya and in Nigeria respectively. (Yahaya, 2000; NIB Strategic Plan 2008-2012). The most expensive and challenging phase of irrigation development is the construction phase of an irrigation project.

According to Alaghbari et al., (2005), construction, though common, its costly, complex and risky. Construction challenges are a global phenomenon but more pronounced in Asian and Southern developing countries. This was affirmed by Sambasivan and Soon (2007) by noting that seven out of ten projects surveyed in Nigeria suffered challenges in their execution. In their study Sambasivan and Soon (2007) found out that in the USA, Scandinavia and UK up to 30% of construction works is redone, labour use efficiencies ranges between 40 and 60%, accidents 3 to 6%, and material waste up to10% of total project costs. They also reported that in Malaysia, 17.3% of government projects either experience delay of up to three months or are completely abandoned. (Sambasivan & Soon, 2007). In

their report, Assaf & Al-Hejji, (2006) record that in Saudi Arabia, only 30% of construction projects were completed in time and the average time overrun was between 10 and 30% (Assaf & Al-Hejji, 2006).

Frimpong, Oluwoye & Crawford (2003) noted that construction project has two distinctive phases: the preconstruction phase (starting from project initiation, prefeasibility and feasibility studies, through the engineering design to awarding of works contract) and the construction phase (from awarding works contract to handing over of completed works to the client). They observed that delays and cost overruns occurred in both phases but noted that project overruns were more frequent in the construction phase (Frimpong et al., 2003). Vyas, (2013) identified challenges in project construction as extended construction time, loss of both capital and revenue, increasing market risk, material cost, delay in production and low efficiency. Timely completion of project means more profit, growth in the market, increased client trust and increasing stakeholder's confidence. Due to the above facts, Vyas records that, irrigation construction projects are commonly undertaken by government agencies because they are of national interest (Vyas, 2013).

Studies (Kapulula, 2008; Ngoma, 2006; and Ofori, 2009) indicate that the construction industry has many challenges which include poor management, low skills, corruption, low technology, inadequate credit facilities, delayed payments to contractors and inadequate project financing. Projects are rarely completed on time, budgets are exceeded and expected quality of works is not met. Chilipunde (2010) noted that, construction does not meet the requirements of modern businesses neither does it influence the international markets and in most cases does not give best value for money (Chilipunde, 2010).

Ramanathan et al. (2012) observed that project delays mainly occurred during construction phase because there're are so many factors that cannot be foreseen due to the dynamic nature of the phase. In construction, delay is defined as time overrun either beyond contract completion or beyond the date agreed by contractor and client for project completion. Assaf and Al-Hejji (2006) found that in Saudi Arabia about 30% of construction projects were completed within the time allocated and on average construction period exceeded time

allocated by between 10 and 30%. In Nigeria, performance of the construction industry in terms scheduled time was generally found to be poor (Sambasivan & Soon, 2007).

Kenya Vision 2030 (GoK, 2013) formulated in 2008 and adopted by government as the roadmap for delivering change has scaled up investments in irrigation and provided for its development at a rate of 32,000 hectares. The Jubilee government through its manifesto, elements of which have been mainstreamed into the Second Medium Term Plan of 2013-2017 (MTP2013-17) has adopted an accelerated approach to irrigation expansion. A target of 1,000,000 acres to be realized over the next five years has been factored in as the ultimate output. National Irrigation Board is mandated to develop and improve irrigated agriculture in Kenya (NIB, Strategic Plan 2008-2012).

A review of National Irrigation Board quarterly reports (2011 to 2014) on progress of irrigation projects indicate that construction takes longer than planned. Muringa Banana irrigation project planned to develop 1000 acres in 12 months from December 2011 to December 2012 was completed in March 2014, it took 27 months. Rapsu Irrigation project was planned to be implemented in 12 months, in April 2014, about 26 months after commencement construction status was at 85 %. Expansion of Mitunguu irrigation project was planned to take 15 months but it took 32 months. Lower Sio Irrigation project commenced in June 2012 and was planned to be complete in September 2013, by April 2014, six months after the expected completion date, progress was at 20 %. This is an indication that there is need to investigate and correct gaps in construction of irrigation projects in Kenya.

1.2 Statement of the Problem

Kenya's irrigation and drainage potential is estimated at 1.3 million hectares. The currently irrigated area is only 130,000 hectares (Norken 2012).In their study on irrigation potential in Kenya, Norken and Frame(2012) found that conducted feasibility studies have identified 350,000 ha for irrigation development, 440,000 ha are at design stage and 370,000 ha are ready for construction. The area that is ready for construction is about three times the total area under irrigation in the country.

The Kenyan population growth was estimated at 2.7% in 2011. To cater for this population growth, Kenya has to increase her food production. Rain fed agricultural production cannot bridge existing food deficit gap. This can be achieved through irrigation (World Bank, 2012). Kenya Vision 2030 requires developing 1.2 million hectares by the year 2030, an average of 32,000 ha per year. During the First Medium Term plan (2008 to 2012), an average of 15,000 ha per year was achieved. Second Medium Term Plan (2013 to 2017) aims to put under irrigation 81,000 ha per year (GoK, 2013). The current rate of development is lower than Vision 2030 target.

For three decades, Kenya did not develop any irrigation project despite many famines experienced during the same period. Major Irrigation projects like Mwea, Perkerra and Hola were developed between 1954 and 1963 by the colonial governments. Other projects like the Bura, Bunyala, Ahero and West Kano developed between 1964 and 1978 were funded by donors (NIB Strategic Plan, 2008-2012).

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In the reviewed literature, there are no studies on factors influencing construction projects in National Irrigation Board which is mandated to develop irrigation by Irrigation Act Cap 247. It is against this background that the researcher seeks to establish factors influencing construction of irrigation projects in Kenya, a case of National Irrigation Board.

1.3 Purpose of the Study

The purpose of the study was to investigate factors influencing construction of irrigation projects, a case of National Irrigation Board.

1.4 Research Objectives

The study was guided by the following specific objectives;

1. To establish the influence of managerial planning on construction of irrigation project
2. To determine the influence of financial resources on construction of irrigation project
3. To examine the influence of equipment on construction of irrigation project
4. To establish the influence of project staff on construction of irrigation project.

1.5 Research Questions

The study aimed to answer the following research questions;

1. To what extent does managerial planning affect construction of irrigation project?
2. How does allocation of financial resources affect construction of irrigation project?
3. To what extent does equipment affect construction of irrigation project?
4. How does project staff affect construction of irrigation project?

1.6 Significance of the Study

The study may be useful to policy makers in the development of food security strategies. Decision makers in the agricultural sector may use the study results in planning and allocation of resources for successful construction of irrigation projects. In addition, the study result will provide insight to project managers into factors that contribute to project construction. The study result may also benefit stakeholders by providing information on mitigation measures required to improve irrigation projects delivery. Scholars and academicians will use the study result in advancing the knowledge in the field of project implementation.

1.7 Delimitations of the Study

The researcher limited investigation to irrigation projects initiated and constructed by the National Irrigation Board between 2010 and 2014 including ongoing irrigation construction projects. Ten projects the size of 150 hectares and 700 hectares and costs ranging from 150 million to one billion Kenya shillings were used for the study. The researcher investigated construction phase of projects only.

1.8 Limitations of the Study

During the study the respondents seemed to think that they were being investigated, criticized and even deny them opportunities for promotions and recognition. Contractor and consultants may fear future loss of business. To overcome this problem, the researcher explained to the respondents the purpose of the study and confirmed confidentiality to the respondents. The time available was short and the required budget was high. To address this issue the researcher supplemented the information collected from the field with literature review and researcher's experience in project management.

1.9 Assumptions of the Study

The researcher assumed that the projects to be reviewed were true representatives of the projects being under taken by National Irrigation Board and the results were applicable to all the projects. The researcher assumed that the respondents were willing to participate in the data collection exercises and the information provided by the study participants were a true representation of the facts.

1.10 Definitions of Significant Terms Used in the Study

Construction - Putting in place infrastructure for irrigation use as per design specifications

Equipment - All machinery mobilized by the contractor to execute construction tasks in an irrigation project

Financial resources - Money in form of cash required for construction of an irrigation project.

Irrigation project –This is a system for abstraction, conveyance and distribution of water for crop growth.

Managerial planning- Day to day responses to situations in an irrigation construction project

Millennium Development Goals (MDGs) – These are the eight international development goals established in 2000 by member states of the UN.

Project staff – These are the people directly involved in the construction projects on day to day basis.

1.11 Organization of the Study

The study comprises of five chapters. Chapter one presents the background of the study, statement of the problem, objectives, research questions, delimitation and limitations of the study and definition of significant terms. Chapter two comprise of the literature review which included the conceptual framework and empirical literature of the subject of the study. Chapter three cover the research techniques adopted by the researcher in the course of the study. Chapter four presents the data analysis, presentation, interpretation and discussion and chapter five presents a summary of the findings, conclusions and recommendations by the researcher.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents literature reviewed on the factors influencing construction of irrigation projects. The literature reviewed ensured that the researcher did not duplicate work that already has been done, lay the ground work for the study, increase researcher's knowledge on the research problem and increase his understanding of research question. To have a clear understanding of factors influencing project construction, the researcher reviewed previous work carried out by different researchers and scholars. These included managerial, financial allocation, equipment and staff factors. More specifically the review acknowledge the researchers, the methods used and the results compared so that the researcher can identify knowledge gaps for each of the study factor. The literature is presented in terms of the study objectives. The chapter also presents the conceptual framework on which the study is based.

2.2 Influence of Managerial Planning on Irrigation Construction Projects

Tang et al. (2009) view decision-making in construction projects as management of many interconnected components like site layout, deployment of optimum equipment, management of labour, unforeseen occurrences, resource allocation and activity scheduling. The uncertainties associated with each of these components, their interdependence and pressure to complete the project within time and the required quality and beneficiaries expectations explains the complexity in managing construction projects. Landlin, (2000) adds that stakeholder communication by project decision makers will determine the long-term performance of construction project and beneficiaries satisfaction (Landlin, 2000).

According to Yang et al. (2009) project managers have the responsibility to address conflicts among stakeholders, and to come up with ways and means of managing stakeholders. During the process of decision-making, a project manager is expected to imagine the reaction of stakeholders and come up with workable solution for managing stakeholders. Munns and Burjeimi (1996) advocate the use of appropriate management techniques in management of construction projects to increase their completion success. Enhassi et al. (2009) also found that decision-making will lead to better implementation and performance of construction

projects. According to Datta (2008) construction industry has no ability to develop and sustain supervisory and management skills because it has no elaborate career structure.

Debra and Ofori (2005) assert that in recent years the basis of firms' competitive advantage is moving from capital and natural resources to human capital. Therefore, effective and efficient use of human capital in the form of managerial competencies is becoming crucial in competitive environment. This reiterates the importance of the managerial factors on the management of irrigation construction projects. Hillebrandt, (2000) conclude that construction management sector is more dependent on professional and technical expertise reinforced by managerial competencies, than work in other industries (Hillebrandt, 2000). Debrah & Ofori, (2005) explain this by identifying such factors as nature of sector, complexity of tasks involved, the numerous regulations to comply with and rules involved and the large number of stakeholders and participants undertaking interdependent tasks. (Debrah & Ofori, 2005).

Christodoulou, (2004) retaliate that growing complexity of construction industry has forced professional engineers to advance and adjust to the industry needs. This adjustment has raised the level of education for project manager in construction industry (Christodoulou, 2004). Gann (2000) opines the size and complexity of construction projects have increased, this has demanded more specialized expertise in project management. Milosevic et al. 2007; Arditi & Polat (2010) notes that managers currently working in the construction industry are confronted with many issues concerning management and administrative activities, this call for extra expertise deal with marketing, finance, accounting, human resources, contract law, economics, and environmental analyses, among others. This requires construction project managers to effectively handle technical tasks and in addition to have acquired managerial competencies in order to navigate the life cycle of the construction project (Trejo, Patil, Andersen & Cervantes, 2002).

Amoah, Ahadzie and Ayirebi (2009) while looking at factors influencing construction performance in Ghana concluded that construction projects were affected by fiscal and managerial related factors. Ahadzie, (2011) concluded that in Sub Saharan Africa

construction firms lack the essential managerial skills to effectively face up to the many challenges in the construction industry in a characteristic developing economy such as Ghana (Ahadzie, 2011).

2.3 Influence of Financial Resources on Construction of Irrigation Projects

According to Fugar and Agyakwah (2010), projects are propelled by financial resource in that other resources like human, land and equipment are acquired and mobilized using financial resources. Trying to implement a project without money is like driving a car without fuel or energy. Insufficient cash flow has adverse effect on human as well as any other resource required to propel a project. Fugar and Agyakwah (2010) studied thirty two (32) factors influencing construction projects in Uganda and placed delay in honoring certificate first. In their conclusion the finance factors were found to be the most influencing factors causing project delays. In this study consultant ranked poor design highest, client ranked underestimation of construction cost highest and contractors ranked lack of skills highest (Fugar and Agyakwah, 2010).

Zayyana and Akintola, (2012) found out that project delays mainly originate from contractors and are generally associated with money. In their study of factors contributing to project time and cost overruns in the Malaysian construction industry Zayyana and Akintola (2012) found cash flow problems faced by the contractors to be the major factor which contributed to project delays. This study results are not conclusive because it has a regional focus and factors may change due to such differences as regulations and nature of the projects.

Ruth et al. (2008) investigated from literature the causes of delay and cost overrun in Uganda Public sector construction projects by studying twenty factors considered most important. The researchers' findings ranked change of scope of works followed by payments delays, inadequate monitoring and evaluation, high cost of capital and political instability as the most important cause of delay in construction projects. The researchers used Civil Authority as case study to validate the findings. The findings are specific because civil aviation is a specialized field which may be different from irrigation projects (Ruth, Henry & Dan, 2008).

In studying the causes of delays in implanting infrastructural projects, different scholars and researchers differ in their findings. This makes it difficult to conclude on factors that causes delay in project construction for all situations, environments and sectors. Different sectors may require carrying out studies to identify factors that delay project construction. Marvin and Leighton (2013) identified 84 factors from literature and ranked the top 20 that delay major agricultural infrastructure projects in Guyana. Weather condition was the main factor followed by poor access to site and optimistic estimate of project duration as the major causes of delay. Although Yokub (2009), found weather conditions followed by shortage of materials as the major factors, he did not find poor access to site as a factor delaying construction road projects in the same country. Interestingly, Marvin and Leighton (2013) ranked shortage of material at the 27th position.

In regard to irrigation construction projects Frimpong et al. (2003) conducted a survey to identify and evaluate the relative importance of the significant factors contributing to delay and cost overruns in Ghana groundwater construction projects. Varma (2012) reports that in India, all, 77 major and 86 medium irrigation projects are running delayed by anything from a few years to as much as 40 years in some cases. The cost of these 163 projects was pegged at Rs 47,864 lakh crore at the time they were started. Now their combined cost is estimated at Rs 1.58 lakh crore. That's an escalation of a phenomenal 231 % (Varma, 2012).

According to Flyvbjerg (2009) delay in project completion in the construction industry is a common occurrence. He notes that delay and cost overrun are characteristic part of most projects despite the much expertise in project management. Ramanathan, Narayanan & Idrus, (2012) has stated that some people see this as negligible and owners, contractors and consultants may not even like it, but majority of government projects experience extensive delays and thereby exceed the initial time and cost estimates (Ramanathan, Narayanan & Idrus, 2012). Irrigation project are unique in that they consume public funds and are targeted towards improving livelihoods and providing food security (Flyvbjerg, 2009).

2.4 Influence of Equipment Related Factors on Irrigation Construction Projects

Jaselskis and Ashley (1991) stated that construction projects experience uncertainty mainly due to shortages of resources and the nature of the project. Further, Burningham and Stankevich (2005) observe that construction projects require specialised equipment and skilled personnel. They cost more than routine maintenance works and require careful identification, design, monitoring and evaluation, and construction planning. According to Njuguna (2008) equipment accounts for a much higher percentage and is critical to the timely completion of the construction. Equipment costs account for 20 -25 % of the work. Studies have shown that contractors in most developing countries do not have adequate equipment (Adnan et al., 2011; Frimpong & Oluwoye, 2003).

Studies in Latin America show that uncertain and irregular availability of funds to sustain developed work plans and fuel and other supplies is a cause of low equipment utilization rates and low production per employee (Gyamfi et al., 1992). Contrary, data collected from the field does not show a significant difference in low productivity of employees. Ampadu, (2003) reports that research conducted on 18 labor-based and 16 equipment-intensive projects shown that, equipment-intensive methods rehabilitated only 1.74 Km more road in 20 workdays per month than labor-based approach (Ampadu, 2003). Uriyo et al. (2004) in Angola found access to equipment by contractors difficult due to the high cost. Leasing and purchasing are also not feasible options due to high costs and required collateral. Hire of equipment is also not a reliable option because the equipment may not be available during the contract period at times hire-company demand guarantees or up-front payment, which contractors may not afford due to tight cash-flow. In addition small contractors have limited access to finance and credit (Uriyo et al., 2004).

2.4.1 Cost of Equipment

Yeo and Ning (2006) estimate that equipment costs constitute up to 36% of the total construction project cost. Due to this high initial cash requirement, contractors are rarely able to mobilise optimum number of equipment, (Basheka & Tumutegyereize, 2011). Small construction firms that wish to use equipment-based methods face high variable costs because they are either forced to own older, less-efficient equipment with high maintenance

costs or must rent equipment at a high cost (Gwilliam et al., 2008). This has ultimately pushed management of construction firms to concentrate on the control and flow of funds as most critical to their existence.

Brushet and Kumar (2004) suggest that more effort is put to investigate low cost technical options for road maintenance with a view to reducing unit costs. He suggests an increase in use of labour based and reduced equipment use in the execution of works. Use of labor-based methods for rural road construction show promise but have not yet been widely applied. This labour intensive method may not guarantee equal quality to those produced using equipment-based methods, but will generate rural employment in a cost-effective manner (Brushet & Kumar, 2004).

According to Stock and de Veen (1996) these methods have not been applied on large scale because contractors have been reluctant to use them for a good reason. They believe the cost of learning this new technology is high. It has been argued that the cost of managing large labor forces makes labor-based methods less competitive than equipment-based methods. Comparisons of labor-based and equipment-based methods, therefore, may not determine firm behavior. However, labor-based methods are a choice to small firms because the small firms are able to supervise their small sites with fewer people better and it is easier to increase worker productivity and control truancy (Stock & de Veen, 1996 cited in Gwilliam et al., 2008).

2.4.2 Quality of Equipment

In a study of factors influencing construction projects Enshassi et al. (2009) found that mangers of construction companies' alleged quality of equipment and raw materials has a high contribution to performance of a project. Farid and El-Sayegh (2006) found that inadequate equipment and frequent breakdown as the major causes of delayed project completion. In their study of construction businesses, Prasertrungruang and Handikusumo (2007) observed that construction depend on level of machinery use. In a similar study of causes of delay in completion of construction projects, Gann& Senkar (1998) in Basheka &

Tumutegyereize (2011) concluded that breakdown of equipment and accidents mainly caused by low skill of operators were the main causes of the delays.

2.5 Influence of Staff-Related Factors on Construction of Irrigation Projects

The construction industry offers significant employment opportunities in the developing world where most people are poor (Basheka & Tumutegyereize, 2011). In the developing world about fifty percent of the construction involves civil works in the transport, power, irrigation, drainage and water infrastructure (Salleh, 2009). It is estimated that construction industry has an annual value of 1.5 trillion dollars of which constitutes 8 % GDP and 60% fixed.

According to Adnan et al. (2011) the number of staff and their skill levels are major contributing factors to the successful completion of construction projects. They suggested that staffs need to be well trained and given the required skills for success of construction projects. Lack of skilled labour and lack of experience in selecting materials according to the specifications have been identified as factors that contribute to the poor performance of medium sized contractors (Adnan et al., 2011). The vast majority of firms rely on outsourcing personnel which has made employees highly mobile moving from one sector to another depending on the performance of the sector. The impact is clearly seen in the firm loyalty to management techniques and construction practices that were taught during colonial time. This is a sign of inadequate skills and low level of capacity (Naserolmemar et al., 2013). In regard to challenges facing contractors Laryea (2011) found out that professionals in construction are insufficient to meet the demand in the market.

2.5.1 Terms of Employment

According to English (2002) outsourcing has substantially reduced the number of formally employed from attending training. He found out that most workers are engaged as casual employees and almost half of these casual employees do not work for the same employer for more than a year. He added that when workers are engaged on temporary basis, they rarely have opportunities to develop skills and do not progress. They retain the role of labourers.

2.5.2 Level of Education and Training

According to Lazarus (2007), workers improve their skills when working at site rather than in classroom. English (2002) found that, most workers have low level of education and therefore it is expected that most of them will be interested in improving and enhancing skills workers, it is unsurprising that few show interest in acquiring skills other than building ones related to their jobs rather than acquiring new skills. This has been attributed to the ease at which employees join construction labour without being asked for any qualifications. Employees are mainly employed without skill and gain skills on site. English (2002) sought to establish how workers had acquired their skills found that 34 % had acquired their skills formally most of them at an old age while 66% had acquired their skills informally.

2.5.3 Size of Workforce

According to Abu Bakar et al. (2012), inadequate staff skills to implement works has hinders the performance of especially small-scale contractors. This affects both contractors who never employ qualified staff with an aim of reducing costs and even those contractors who employ qualified staff but stretch them a lot. This is mainly caused by employers failing to recruit when staffs leave employment or contractors using some staff in more than one project. The contractor may also be forced to allocate tasks to staff that are not qualified. Firm growth can viewed in many dimensions such as the increase of asset and employment size. This implies that the size of the workforce can be used as an indicator of the firm's ability to perform its contractual obligations (Abu Bakar et al., 2012).

2.5.4 Employee Development

Schneider et al. (2007) stated that employee development is a key factor for start-up companies in achieving the requisite performance, and in most cases is high growth. This implies that there is a need for employees to advance their technical skills and knowledge in any sector. but particular to the construction industry which has experienced tremendous growth as shown in the Economic Survey (2012/2013) highlights that the construction sector grew from 4.3 % in 2011 to 4.8 percent in 2012. In 2011/12 the Ministry of Roads spent Kshs 91.5 billion and is expected to rise to Kshs 117.6 billion in the 2012/13 which offers opportunities for small contracting firms (GoK, 2013).

2.5.5 Staff Motivation

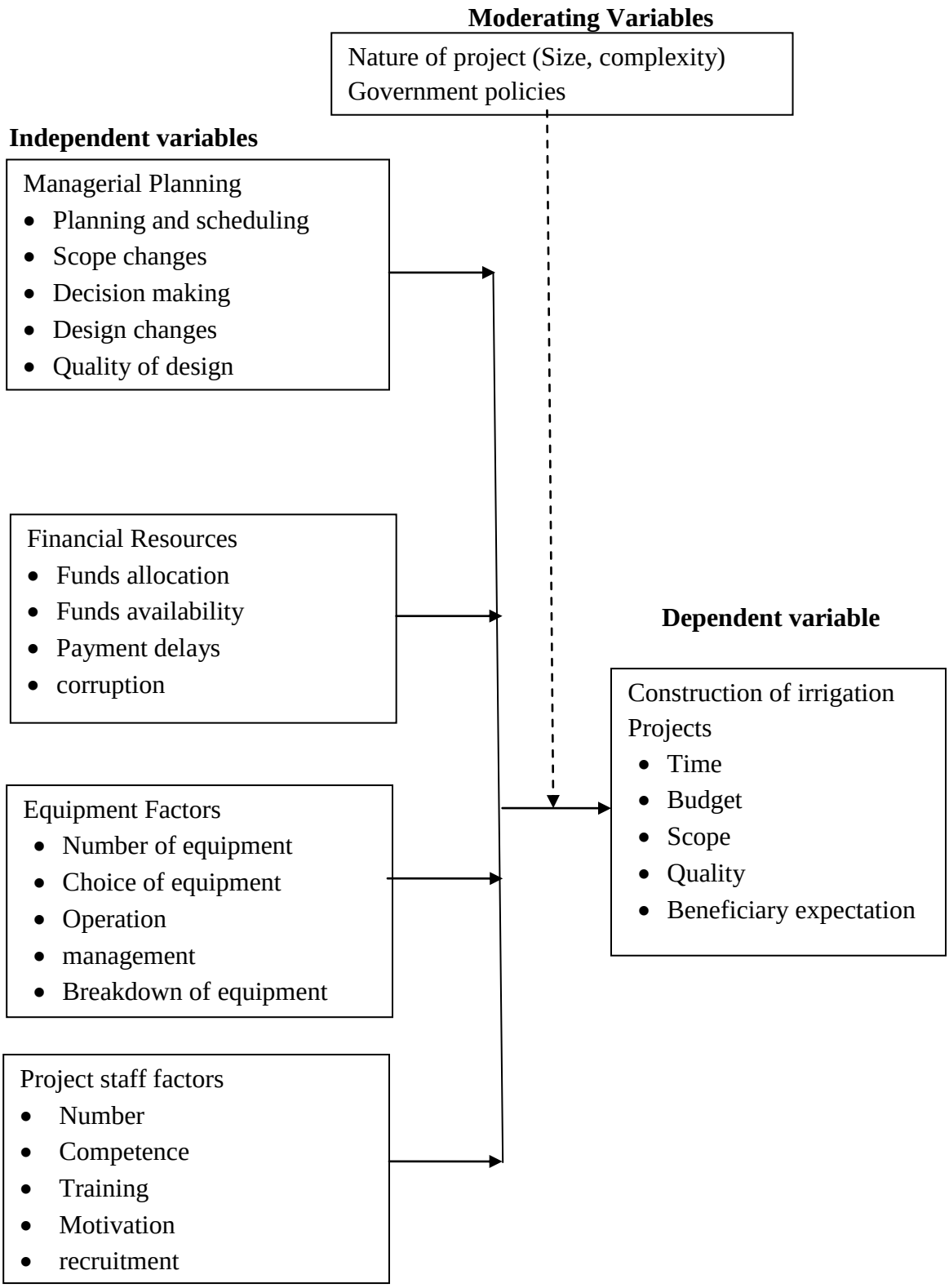
Project staff plays a vital role in efficient and effective use of all other resources in construction projects. Therefore, improving productivity of staff in a project is a sure way to achieving good project outcome (Bajaj, 2006; Kazaz, et al., 2008).Chan and Kumaraswamy (2011) research also found out that commitment of project team is a significant factor in achieving project success. Darrington (2010) reasons that motivation arrangements of construction site workers with emphasis in monetary incentives destroys essential motivation, leading to low productivity of site workers.

Darrington (2010) suggests that intrinsic motivation is promoted so that matching of incentive structures with motivation lead to successful implementation of the project for both the client as well as the contractor. Lewis (2003) is of the opinion that pointed that a project manager should understand the needs and expectations of each team member. Therefore, to adequately motivate the project team, project managers have to address the needs and expectations of the team members.

2.6 Conceptual Framework Description

The conceptual framework for the study is shown in figure 1 below. In the figure, independent variables namely; 1) managerial planning includes the owner-related factors that are assumed to contribute to project construction challenges which include the allocation of resources and decision –making on the irrigation projects, 2) Financial factors that include budget availability, payment delays, and misappropriation of the finances, 3) Equipment factors related to machinery required to deliver the project these include number, choice, operation and quality of equipment, 4) Staff capacity refers to the factors influencing the personnel required to deliver the project and include availability of staff and their mobilization and qualifications. The moderating variables for the study are the nature of the project which include its size and complexity and the accuracy of the design of the irrigation project. The dependent variable for the study is the construction of irrigation projects in relation to time, budget, and scope and beneficiaries expectations.

Figure 2.1: Conceptual Framework



CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights the approaches that the researcher adopted in order to meet the study objectives. These included the research design, target population, the sampling techniques and sample size, data collection methods, validity and reliability of the research instruments, data collection procedures and data analysis methods.

3.2 Research Design

The researcher adopted descriptive research design. Descriptive research design allows analysis of the relationship between variables (Creswell, 1999). This design was appropriate for this study as the researcher sought to determine the frequency with which specific factors affect the construction of irrigation projects. In addition, it was adequately used to investigate the relationship between independent variables and their influence on dependent variables. Descriptive research design allowed the researcher to develop instruments to collect and analyze data thereby enabling interpretations and recommendations.

3.3 Target Population

The target population was 80 participants who comprise all the people directly involved in constructing projects funded by NIB in MTP 2008 – 2014 which were either complete or more than 80% physically complete. The completion progress was obtained from NIB progress reports. The target population comprised National Irrigation Board as the client, consultants, contractors and farmers representatives. The researcher targeted 10 irrigation projects that were identified as projects under the First Medium Term Plan 2008-2014. The target population for this study was stakeholders directly involved in Construction of individual irrigation projects. Table 3.1 shows the identified projects and the number of people who are directly involved in the Construction of the study projects.

S/No	Project Name	Farmer Rep	NIB Staff	Contractors	Consultants	Total
1	Muringa Phase 1	2	2	2	2	8
2	Muringa Phase II	2	2	2	2	8
3	Kagaari Gaturi	2	2	2	2	8
4	Lower Kuja	2	2	2	2	8
5	Lower Sio	2	2	2	2	8
6	Ihindu	2	2	2	2	8
7	Kibwezi drip	2	2	2	2	8
8	Riamukurwe	2	2	2	2	8
9	Rapsu	2	2	2	2	8
10	Mitunguu	2	2	2	2	8
	Total	**20**	**20**	**20**	**20**	**80**

Table 3.1: Target Population *Source: National Irrigation Board (2015)*

3.4 Sample Size and Sampling Procedure

Table 3.1 shows the target population of the study as identified for each of the targeted projects undertaken by the National Irrigation Board. The target population is distributed among the different respondents who are the farmer representatives, NIB staff, consultants and contractors. The population size was small and therefore the researcher undertook a census.

3.5 Data Collection Method

The researcher used survey as the data collection method for both quantitative and qualitative data. The researcher also verified the ongoing and completed irrigation construction projects through field observations.

3.5.1 Quantitative Data Collection Method

In order to collect quantitative data the researcher adopted personally administered questionnaire. Quantitative methods are primarily concerned with numerical data and seek to gather data that can be quantified and can be manipulated through various statistical tools. According to Leary (1995), there are distinct advantages in using a questionnaire. An interview methodology questionnaire is cheaper and easier to administer than personal interviews and questionnaire are more confidential than personal interviews.

Questionnaire for the study comprised of five sections which included, background information, questionnaire items dealing with managerial factors, financial related factors, and equipment factors and staff-related factors. The questionnaire was close ended, presented in 5 point Likert scale which the respondents were required to indicate their attitudes towards the most significant factors perceived to affect construction of irrigation projects. The questionnaire was administered to the farmer representatives, NIB staff, contractors and consultants.

3.5.2 Qualitative Data Collection Method

The researcher collected qualitative data using personal interviews. This method is time consuming and expensive. However, the reliability of data is enhanced because the researcher may adjust language, establish a rapport with the respondent, clarify answers and have control over the subject. The researcher developed a semi-structured key informant guide based on the study objectives. The key informants of the study were Deputy General Manager –Technical (NIB), Chief Engineer – Construction (NIB) and the Director for Ministry of Water and Irrigation involved in the project cycle and are able provide in-depth information on construction of irrigation projects. This approach is preferred as the researcher was able to probe for more information from the interview interaction with the key informants of the study.

3.5.3 Field Observation

The researcher developed an observation checklist of the irrigation projects in order to observe and verify the construction stage of the study projects. According to Laurel (2003) observation occurs when an observer (usually the researcher or trained observers) methodically plans and implements observations of people and their behaviors or vobserving how an environment is used.

3.6 Validity and Reliability of Research Instruments

The researcher established reliability of the questionnaire and was keen on validity of the questionnaire items.

3.6.1 Reliability

In order to establish reliability of the questionnaire the researcher administered the survey instrument to 10 members of the study participants. The researcher used the test-retest reliability coefficient approach. Test retest involved giving the same test to the same respondents on two separate occasions. The scores from the first test and the second test were then correlated using Pearson correlation method. The scores of the two tests gave a correlation coefficient *r* of 0.73. This is acceptable in research as suggested by Bryman (2006) as acceptable reliability and therefore the survey instrument was reliable.

3.6.2 Validity

To ensure validity, the researcher adopted clear and precise terminology, interpreted questionnaire items as intended and ensured questionnaire items had a natural relationship to the study objectives. I addition the researcher used multiple questions to assess the same construct.

3.7 Data Collection Procedures

The researcher presented each study participant with an introduction letter that provided information regarding the purpose, authorization to conduct the study and a request seeking the study participants consent to participate in the study. The data collection procedures were performed in a sequential approach. First, the researcher administered the questionnaire to the respondents (consultants, client, beneficiaries and contractors). Second, the researcher interviewed key informants that comprised the Technical Manager (NIB), two chief engineers (NIB) and Director of Irrigation Ministry of Water and Irrigation.

3.8 Data Analysis and Presentation

The researcher adopted the mean, mode and median as measures for central tendency and the standard deviation as a measure of dispersion. These descriptive statistics procedures summarized, organize, and make sense of set of scores. Descriptive statistics were presented in tabular form and summary statistics. The researcher used the Pearson *r*, to measure the strength of relationship between the two variables where the absolute value of the correlation determined the relationship between the study variables. The regression analysis was adopted

to establish causality between the independent and dependent variables. Likert scale data was analyzed at the interval measurement scale.

The researcher has presented data in tables and frequency tables which are accompanied by researchers own interpretation and discussion.

Objectives	**Variables**	**Indicators**	**Measurements**	**Scale**	**Analysis Tools**
To establish the influence of managerial planning in Construction of irrigation project	Managerial planning	Planning and scheduling, Scope changes, Decision making, design quality	Design changes Decision making Planning and scheduling Design changes Quality of design	Interval scale	Descriptive statistics ANOVA Pearson *r*
To determine the influence of financial resources in Construction of irrigation project	Financial resources	Allocation Availability Delay Corruption	Financial flow Disbursement of funds procedures Availability of project funds Payment of IPC	Interval scale	Descriptive statistics ANOVA Pearson *r*
To examine the influence of mobilized equipment in Construction of irrigation project	Equipment related factors	Number Choice Operation Management Breakdown of equipment	Schedule of mobilization Quality of equipment Adequacy of equipment	Interval scale	Descriptive statistics ANOVA Pearson *r*
To establish the influence of skill level of project staff in Construction of irrigation project	Staff related factors	Number, Competence, Experience, Motivation, recruitment of project staff	Mobilization of project staff Training and experience of project staff Staff motivation	Interval scale	Descriptive statistics ANOVA Pearson *r*

Table 3.2: Operationalization of Variables

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the results from the data collection which is presented according to the study objectives. The data is presented in tables and by the researchers own interpretation.

4.2 Questionnaire Return Rate

The study was able to collect 79 fully complete questionnaires which were used for analysis. This represented 99 % response rate which was achieved through self-administration of the instrument to the respondents. Steeh, Kirgis, Cannon & DeWitt, 2001) agree that a response rate of above 70 % as adequate for research.

4.3 Characteristics of the Respondents

The importance of having demographic information of the respondents is to have a summary of the respondents involved in the study. In this study, demographic information provides us with a glimpse of the irrigation construction industry.

4.3.1 Gender of the Respondents

As shown by Table 4.1, 67.1 % of respondents were male and 32.9 % were female respondents. This finding is attributed to the high level of male professionals in the engineering field as compared to women.

Gender	Frequency	Percent
Male	56	67.1
Female	23	32.9
Total	**79**	**100.0**

Table 4.1: Gender Distribution of Respondents

4.3.2 Age of the Respondents

Table 4.2 show that 19.0 % were 25-34 years old, 29.1 % were 35-44 years old, 39.2 % were 45-54 years old and 12.7 % were 55-64 years old. Most of the respondents were 45-54 years of age which means that they had vast experience in construction of irrigation projects. The

second highest group of respondents was 35-44 years old which represents the most productive population in Kenya.

Age	Frequency	Percent
25-34	15	19.0
35-44	23	29.1
45-54	31	39.2
55-64	10	12.7
Total	**79**	**100.0**

Table 4.2: Age distribution of respondents

4.3.3 Educational Qualification of the Respondents

In terms of their educational qualification, 12.7 % were certificate, 20.3 % were diploma, 45.6 % were degree and 21.5 % were postgraduate as shown in Table 4.3.

Education level	Frequency	Percent
Certificate	10	12.7
Diploma	16	20.3
Degree	36	45.6
Postgraduate	17	21.5
Total	**79**	**100.0**

Table 4.3: Educational Qualification Distribution of Respondents

4.3.4 Category of the Respondents

Table 4.4 shows the respondents' category where 25.3 % were NIB staff, Contractors and Beneficiaries whereas 24.1 % were project consultants.

	Frequency	Percent
NIB staff	20	25.3
Consultant	19	24.1
Contractors	20	25.3
Beneficiaries	20	25.3
Total	**79**	**100.0**

Table 4.4: Respondents Category

4.3.5 Job-Related Experience of the Respondents

Table 4.5 shows that 31.6 % were had less than 10 years' experience, 43.1 % had more than 10 years' experience and 25.3 % were not applicable responses which were attributed to the beneficiaries involved in the irrigation projects and had no job-related experience at the National Irrigation Board.

Job related experience	Frequency	Percent
Less than 10 years	25	31.6
More than 10 years	34	43.1
Not Applicable	20	25.3
Total	**79**	**100.0**

Table 4.5: Job-Related Experience

4.4 Influence of Managerial Planning On Construction of Irrigation Project

The researcher assumed that managerial planning was a significant variable influencing construction of irrigation projects. Studies reviewed showed that managerial planning has an influence on construction. Table 4.6 shows the study findings which were based on a Likert scale and where the researcher used percentages, mean and standard deviation to present the data on managerial planning factors influencing construction of irrigation projects.

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Standard Deviation
Poor project planning & scheduling	20.9	38.5	15.4	18.7	6.6	2.52	1.205
Poor design	13.2	17.6	22.0	35.2	12.1	3.15	1.238
Change in project scope	9.9	33.0	23.1	25.3	8.8	2.90	1.155
Low speed of decisions making	7.7	18.7	28.6	25.3	19.8	3.31	1.208
Frequent design changes from designer	1.1	33.0	19.8	4.4	41.8	3.53	1.353

Table 4.6: Influence of managerial planning on construction of irrigation project

The highest mean score observed in the data showed that change orders from designers (M=3.53; SD=1.353) had the highest influence to construction of irrigation projects. This was followed by Low speed of decisions making (M=3.31; SD=1.208), Poor design (M=3.15; SD=1.238), Change in the scope of the project (M=2.90; SD=1.155), and the least mean score poor project planning and scheduling (M=2.52; SD=1.205). From analysis, all observations results were concentrated around the mean.

According to the key informants of the study;

> Change orders from the designers of the project are a significant factor that affects the construction of irrigation projects. Multiple interests from politicians and beneficiaries bring about these change orders during the life of the construction phase of projects. These change orders affect the construction phase of projects.

Quantitative and qualitative results are in congruence that change orders from the designers is the most significant managerial factor affecting construction of irrigation projects.

4.5 Influence of Financial Resources on Construction of Irrigation Project

In projects, financial resources have been shown to have an influence and in this study we perceived a relationship between financial resources as affecting construction of irrigation projects. Table 4.7 shows the influence of financial resources on construction of irrigation projects.

Employee performance	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Standard Deviation
Inadequate funds allocated to the project	3.3	1.1	5.5	14.3	75.8	4.58	0.908
Inflation of budget allocation	3.3	1.1	15.4	36.3	44.0	4.16	0.958
Unavailability of finances as planned	2.2	1.1	9.9	18.7	68.1	4.49	0.887
Payment delays	2.2	1.1	9.9	17.6	69.2	4.51	0.887
Bureaucratic procedures	2.2	4.4	17.6	31.9	44.0	4.11	0.994
Misappropriation of project funds	2.2	3.3	16.5	17.6	60.4	4.31	0.008

Table 4.7: Influence of Financial Resources on Construction of Irrigation Project

From Table 4.7, the most determinant factor was inadequate funds allocated to the project (M=4.58; SD=0.908), followed by payment delays (M=4.51; SD=0.887), Unavailability of finances as planned (M=4.49; SD=0.887), Misappropriation of project funds (M=4.31; SD=0.008), Inflation of budget allocation (M=4. 16; SD=0.958), Bureaucratic procedures (M=4.11; SD=0.994). From analysis, all observations results were concentrated around the mean.

According to the key informants;

NIB projects they are funded from National Treasury. The National Treasury releases money to the parent ministry, the Ministry of Agriculture and Livestock as per approved budget. The ministry releases money to NIB as per the budget and NIB request. Most times these requests are not met in due time to provide finances to the projects.

Another issue is the contractor's poor management of project finances. For big projects, contractors are paid advance to help start off the work, some contractors divert this money to either pay loans or complete other projects. The final outcome is that resources into the target projects reduces and therefore the construction rate.

The qualitative analysis and imitative results are congruent. Qualitative analysis further explains why inadequate funds availed to the projects are the most significant financial factor influencing the construction of irrigation projects

4.6 Influence of Equipment on Construction of Irrigation Project

In construction projects, equipment is an important resource. Several activities of construction projects rely on use of equipment. In this study, it was important to establish the relationship between equipment and construction of irrigation projects. Table 4.8 shows the influence of equipment factors on construction of irrigation projects.

Equipment factors	Strongly Disagree (%)	Disagree (%)	Neutral(%)	Agree (%)	Strongly Agree (%)	Mean	Standard Deviation
Inadequate number of equipment	12.3	24.6	4.6	40.0	18.5	3.27	1.352
Use of proper equipment	1.5	7.7	3.1	58.5	29.2	4.06	0.881
Poor management of equipment	12.3	27.7	12.3	32.3	15.4	3.10	1.312
Poor condition and frequent breakdown of equipment	3.1	16.9	12.3	56.9	10.8	3.55	1.000
Poor operation of equipment	10.8	7.7	3.1	56.9	21.5	3.70	1.208

Table 4.8: Influence of Equipment on Construction of Irrigation Project

From table 4.8, the most significant factor was Use of proper equipment (M=4.06; SD=0.881). This factor was followed by Poor operation of equipment (M=3.70; SD=1.208), Poor condition and frequent breakdown of equipment (M=3.55; SD=1.000), Inadequate number of equipment (M=3.27; SD=1.352) and the least contributing factor was Poor management of equipment (M=3.10; SD=1.312). From analysis, all observations results were concentrated around the mean.

Interviews with the key informants revealed that;

> In civil works equipment are very important. The level of mobilized equipment, the working conditions of the equipment and the skill of operators affects working construction projects. In some cases supply of fuel for earth moving and other equipment is a challenge. Contractors have cheated in their bids of the level of equipment. Tender evaluators are influenced to overlook this fact.

The quantitative results do not fully agree with qualitative results. Qualitative analysis showed that proper use of the equipment as opposed to level of mobilized equipment was the most significant factor influencing construction of irrigation projects. The reason could be that the respondents lacked skills on equipment use and had no knowledge of the level anticipated in the contract.

4.7 The influence of Project Staff on Construction of Irrigation Project

Project management is the accomplishment of project objectives through people. In construction projects, people are engaged in implementing project activities. The researcher therefore sought to measure the relationship between project staff and construction of irrigation projects. Figure 4.9 show the influence of project staff on construction of irrigation projects.

Project staff factors	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Standard Deviation
Staff has relevant training	4.6	24.6	4.6	44.6	21.5	3.53	1.212
There is availability of competent staff	16.9	41.5	12.3	21.5	7.7	2.61	1.220
Shortage of site workers	6.2	20.0	4.6	44.6	24.6	3.61	1.233
Poor motivation of staff	4.6	7.7	15.4	63.1	9.2	3.64	0.925
Lack of staff experience	10.8	24.6	7.7	38.5	18.5	3.29	1.319
Recruitment & competence development	9.2	16.9	15.4	38.5	20.0	3.43	1.249

Table 4.9: The influence of project staff on construction of Irrigation Project

The highest mean score was observed for poor motivation of staff (M=3.64; SD=0.925). This was followed by shortage of site workers (M=3.61; SD=1.233), Staff has relevant training (M=3.53; SD=1.212), recruitment & competence development (M=3.43; SD=1.249), Lack of staff experience (M=3.29; SD=1.319) while the least contributing factors was availability of competent staff (M=2.61; SD=1.220) as seen in Table 4.9. From analysis, all observations results were concentrated around the mean.

According to key informants;

> Most staffs are employed on temporary terms and they do not feel they belong to the company and are therefore not motivated to achieve the organization's objectives and mission. Contractors and consultant rarely employ their staff on permanent jobs. In many cases contractor and consultant staff pay is better than government pay the staff never feel satisfied.

Quantitative analysis results are in agreement with qualitative results in that poor motivation of staff is the most significant factor of project staff that influences construction of irrigation projects.

4.8 Construction of Irrigation Projects

The researcher sought to establish the extent to which the irrigation projects were completed in time, budget, scope, expectation of beneficiaries and that the projects were of good quality.

Completion of irrigation projects	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Standard Deviation
The projects are completed in time	13.2	35.2	34.1	15.4	2.2	2.58	0.978
The projects are completed on budget	15.4	29.7	34.1	14.3	6.6	2.67	1.106
Project was completed according to the scope	16.5	31.9	20.9	23.1	7.7	2.74	1.210
Project met the beneficiaries expectations	22.0	41.8	9.9	17.6	8.8	2.49	1.259
Project was of good quality	17.6	36.3	29.7	12.1	4.4	2.49	1.058

Table 4.10: Construction of Irrigation Projects

Table 4.10 shows that projects met the criteria of scope (M=2.74; SD=1.210), followed by budget (M=2.67; SD=1.312), time (M=2.58; SD=0.978), project quality (M=2.49; SD=1.259), and meeting beneficiaries' expectations (M=2.49; SD=1.058). From analysis, all observations results were concentrated around the mean.

According to key informants;

> Most projects were constructed as planned and within the budgetary levels. However there were considerable delays in completion which contributed to low farmers expectations. Additionally, beneficiaries in many projects are not aware that changing scope affected the project costs. These make it very difficult to satisfy the beneficiaries.

The quantitative analysis agrees with the qualitative analysis that projects were constructed as the scope and most projects did not meet the beneficiaries' expectations.

4.9 Inferential Statistics

Inferential statistics addresses the relationship between the sample and its corresponding population which the sample has been drawn from. A correlation was performed to measure the association between the independent and dependent variables while regression analysis was performed to measure the influence of the independent variables on the dependent variable.

4.9.1 Correlation

The correlation results (Table 4.11) show that the highest correlation was observed between the independent variables (Managerial planning, financial resources, equipment factors and project staff factors) and the dependent variable (Project completion) was project staff (r = 0.072), followed by equipment factors (r = 0.067), financial resources (r = 0.054) and the least correlation observed was managerial planning (r = 0.024).

	Managerial planning	Financial resources	Equipment factors	Project staff	Project completion
Managerial planning	1				
Financial	.013	1			
Equipment factors	.019	.092	1		
Project staff	.019	.123	.967	1	
Project completion	.024	.054	.067	.072	1

Table 4.11: Correlation** Correlation is significant at the 0.01 level (2-tailed).

4.9.2 Regression Analysis

The researcher performed a multiple regression analysis between the independent (managerial planning, financial resources, equipment factors and project staff factors) and dependent variables (construction of irrigation projects). Table 4.12 shows the, model summary where the model is shown to influence 68 % of variations in construction of irrigation projects. This means that there is need for further studies to identify factors affecting completion of construction of irrigation projects that account for the 32 % of variations.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.090(a)	.068	-.046	96.76490

Table 4.12: Model Summary

a Predictors: (Constant), Project staff, Managerial planning, Financial resources, Equipment factors

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5621.385	4	1405.346	.150	.0261(a)
	Residual	692895.046	74	9363.447		
	Total	698516.430	78			

Table 4.13: ANOVA

a Predictors: (Constant), Project staff, Managerial planning, Financial resources, Equipment factors

b Dependent Variable: Project completion

Table 4.13 shows the ANOVA results where the significance level is 0.026 which is less than 0.05 which means that the model is significant in explaining the influence of managerial planning, financial resources, equipment factors and project staff factors on construction of irrigation projects.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	68.591	56.192		1.221	.226
	Managerial planning	0.087	.609	-.026	-.226	.022
	Financial resources	0.138	2.808	-.045	-.387	.000
	Equipment factors	0.043	.661	.030	.065	.048
	Project staff	0.139	.667	-.096	-.208	.035

Table 4.14: Coefficients a Dependent Variable: Project completion

Table 4.14 shows the coefficients of the multiple regressions. The model is expressed by the equation $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$ where; β_0 is the equation constant, β_1 is coefficient for managerial planning factor, β_2 is coefficient for financial factor, β_3 is coefficient for equipment factor and β_4 is coefficient for project staff factor and ε is the error. From the analysis $Y = 68.591 + 0.087 + 0.138 + 0.043 + 0.139 + \varepsilon$). The regression equation established that taking all factors into account (managerial planning, financial resources, equipment factors and project staff) constant at zero, construction of irrigation projects will be 68.591.

The findings presented also shows that taking all other independent variables at zero, a unit increase in project staff will lead to a 0.139 increase in the construction of irrigation projects, a unit increase in managerial planning will lead to a 0.138 increase in the construction of irrigation projects, a unit increase in financial resources will lead to a 0.087 increase in the construction of irrigation projects and a unit increase in equipment factors will lead to a 0.043 increase in the construction of irrigation projects. The findings show that financial resources ($p = 0.000$) are the most significant factor, followed by managerial planning ($p = 0.002$), project staff ($p = 0.035$) and the least was equipment factors ($p = 0.048$).

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the discussion, conclusion and recommendations of the study based on the study findings.

5.2 Summary of Findings

This section of the study presents a summary of study findings. The section is presented according to the study research objectives.

5.2.1 Influence of Managerial Planning on Construction of Irrigation Project

The following are the factors of managerial planning that influence construction of irrigation project in order of significance. Change orders from designers, Low speed of decisions making, Change in the scope of the project and lastly poor project planning and scheduling. The multiple interests from the stakeholders were found to be the main causes of change orders from the designers.

5.2.2 Influence of Financial Resources on Construction of Irrigation Project

The most determinant financial resource factor that influence construction of irrigation project was inadequate funds allocated to the project. This was followed by payment delays to the contractors, unavailability of finances as planned in project cash flows, misappropriation of project funds and lastly inflation of budget allocation According to the key informants.

The inadequate funds allocated to projects which were the dominant factors were attributed to frequent changes in budget to National irrigation Board. The delay in paying the contractors was due to the bureaucratic procedures of treasury passing project money through NIB parent ministry.

5.2.3 Influence of Equipment on Construction of Irrigation Project

Quantitative analysis showed that the most significant factor was use of proper equipment. This factor was followed by poor operation of equipment, poor condition and frequent breakdown of equipment, inadequate number of equipment and the least contributing factor was poor management of equipment. Qualitative analysis showed to level of mobilized equipment was the most significant factor influencing construction of irrigation projects.

5.2.4 The influence of Project Staff on Construction of Irrigation Project

Poor motivation of staff emerged the most significant factor of project staff. This was followed by shortage of site workers, Staff has relevant training of staff, recruitment & competence development, lack of staff experience while the least contributing factors was availability of competent staff .

5.3 Discussions of findings

This section of the study presents a discussion of study findings. The discussion involves comparing and contrasting the findings of the study with the literature reviewed in chapter of the study. The section is presented according to the study research objectives.

5.3.1 Influence of Managerial Planning on Construction of Irrigation Projects

Among the managerial planning factors, the study found that the most significant factors to affect construction of irrigation projects were change orders from designers. These findings disagree with past studies, Aljeshi and Almarzouq (2008) and Zawawi (2010) which found that changing the plans by the owners is the main source of change orders. However in this study we have not analysed why designs were changed.

According to Al-Dubaisi (2000) there are many reasons for issuing construction change orders in large building construction contracts. It might be a result of further development of the owner’s requirements. It can be a result of non-availability, slow delivery of required materials or correction of contract document errors and omissions. The causes of change orders, and their effects on project cost and schedule are complex and influenced by numerous interrelated factors. In irrigation projects, there are several stakeholders

(beneficiaries, government, politicians) and change orders may also come from these parties and thus affecting the construction of irrigation projects.

Alaryan, Beltagi, Elshahat and Dawood (2014) argue that the most common effect of change orders include increase in project cost and duration were found as the main two effects of change orders. Alaryan et al. study found that the top five effects of change orders were delay in completion schedule, increase induration (of individual activities), increase in cost of the project, additional money for contractor, and disputes between owners and contractor.

Construction of irrigation projects is different from construction of private projects in that there are many stakeholders in irrigation projects who are considered as owners and influences the design changes.

5.3.2 Influence of Financial Resources on Construction of Irrigation Projects

The study results indicated that inadequate funds allocated to the project were the most common factor to affect construction of irrigation projects. This finding agrees with Olusegun and Olumuyiwa (2011) that a major cause of abandonment of construction projects is inadequate funding or finance. This is in consonance with the assertion of Odenyinka and Yusuf (2007) that owner's cash flow problem is a major factor responsible for abandonment of project.

Similarly, Ameh and Osegboh (2011) found that inadequate funding was the most significant factor among a total of 18 factors which were found to lead to cost overruns in construction projects. However, it is also significant to note that payment delays was the second most ranked significant factor influencing construction of irrigation projects in this study. This finding is a reflection of the construction of irrigation projects in Kenya. Although at times adequate funds are allocated to the project the disbursement and payments to consultants and contractors often lead to delay in construction of irrigation projects.

Inadequate funds influences the construction of irrigation project and delay in payments will have the same effect as inadequate funds if it is prolonged.

5.3.3 Influence of Equipment Factors on Construction of Irrigation Projects

The study found that use of proper equipment for the job was the most likely factors to influence construction of irrigation projects among the equipment variable. This finding agrees with past studies which have shown that contractors in most developing countries do not have adequate equipment (Adnan et al., 2011; Frimpong & Oluwoye, 2003) which are likely to affect the construction of irrigation projects.

According to Aziz and Aboel-Magd (2015), equipment selection is the critical factor in construction projects. Rational selection of suitable equipment leads to profits for contractors. At the same time, miscalculating the proper size and number of required equipment for the project may result in suffering from overhead costs or losing the contract. Therefore, contractors consider selection of earthmoving equipment a vital factor for any construction project to be successful (Marzouk & Moselhi, 2004).

In this study, proper use of the equipment emerged the most significant equipment factor influencing construction of irrigation projects it should be noted that improper use of equipment is brought about by low level of equipment mobilization whereby contractors use one machine for many jobs.

5.3.4 Influence of Project Staff on Construction of Irrigation Project

The study findings showed that among the project staff factors the most significant factor to influence construction of irrigation projects was poor motivation among the staff. Barg, Ruparathna, Mendis, and Hewage (2014) agree that motivation of workers has been suggested as one of the major factors that can stimulate the productivity in the construction industry.

The interesting nature of the construction work has to be properly utilized by the organisation along with providing achievable goals to improve the motivation level. Similarly the organisation has to address the poor administrative policies and the poor work conditions to reduce de-motivation (Venkatesan, Varghese & Ananthanarayanan, 2009).

Lewis (2003) pointed that a project manager needs to understand the individual desires of each team member. To achieve a project environment where the majority of the members involved are motivated about the project, project managers have to be sensitive to the needs and wants of the team members. Githenya and Ngugi (2014) study on the assessment of the determinants of implementation of housing projectsin Kenya found that motivation was a significant factor to successful implementation of construction projects. Permanent staff in this case NIB staffs are comfortable and assured of a meager salary irrespective of how hard they work.

5.4 Conclusion

Among the managerial factors, the study concludes that change orders from the designer are significant factors influencing completion of construction of irrigation projects. The study concludes that change orders from designers affect the completion schedule, increase in duration (of individual activities), increase in cost of the project, additional money for contractor, and disputes between owners and contractor.

The study concludes that financial resources are the most significant factors influencing construction of irrigation projects. The study concludes that although the sampled projects were adequately funded, other factors such as the delay in payments were a significant factor influencing the construction of irrigation projects

Among the equipment factors, the study concludes that inadequate use of proper equipment to undertake some work in construction of irrigation projects affected their completion. Irrigation projects require heavy machinery to move ground works and the lack of the proper equipment for this work may result in cost overruns, breakdown of equipment and otherwise cause delay in the implementation of the projects.

In regard to the staff related factors, motivation of construction staff is the most significant staff related factor influencing construction of irrigation projects. The study concludes that the lack of or poor motivation of staff leads to poor performance which advertently leads to cost overruns and time overruns in construction of irrigation projects. The study further

concludes that supervisory staff may not be competent in project implementation and this also affects the motivation of staff in the projects.

5.4 Recommendations

Based on the study findings the researcher makes the following recommendation**s**;

1. The study recommends that management of the construction project should increase involvement of stakeholders especially at early stages of project development to reduce change orders from designers.
2. Project managers should start the construction works when project funds are available in full and a clear disbursement procedure is in place.
3. That contractor should adhere to strict equipment mobilization requirements. These requirements should be clear in works contract and project managers should adhere to the contract.
4. That project managers of the irrigation projects should motivate staff by providing sufficient working terms and working environment.

5.5 Areas of Further Study

The study suggests for further study on the following areas.

1. Complete irrigation project cycle from planning to project commissioning phase.
2. Capacities of implementing irrigation projects in Kenya.

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APPENDICES

Appendix II: Questionnaire for Beneficiaries, Nib, Contractors and Consultants

Part A: Background Information

1. Gender

Male	( )
Female	( )

2. Age

18 – 24	( )
25 – 34	( )
35 – 44	( )
45 – 54	( )
55 – 64	( )
64 and above	( )

3. Educational qualification

Certificate	( )
Diploma	( )
Degree	( )
Postgraduate	( )

4. Respondents' category

NIB staff	( )
Consultant	( )
Contractors	( )
Beneficiaries	( )

5. Job-related experience

Less than 10 years	( )
More than 10 years	( )

Part B: Management Planning

6. The following statements refer to the planning aspect of construction projects and its influence on Construction the project. Please indicate to what extent you agree or disagree by indicating with a (√) in the appropriate box.

Planning factors	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Poor project planning & scheduling					
Poor design					
Change in the scope of the project					
Low speed of decisions making					
Frequent design changes					
Change orders form designer					
Other (*specify*)					

Part C: Financial Resources

7. The following statements refer to the financial resources of construction projects and its influence on Construction the project. Please indicate to what extent you agree or disagree by indicating with a (√) in the appropriate box.

Financial Resources	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Inadequate funds allocated to the project					
Inflation of budget allocation					
Unavailability of finances as planned					
Payment delays					
Bureaucratic procedures					
Misappropriation of project funds					
Other (*specify*)					

Part D: Equipment Factors

8. The following statements refer to the equipment factors of construction projects and its influence on Construction the project. Please indicate to what extent you agree or disagree by indicating with a (√) in the appropriate box.

Equipment Factors	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Inadequate number of equipment					
Use of proper equipment					
Poor management of equipment					
Poor condition and frequent breakdown of equipment					
Poor operation of equipment					
Delay in mobilization of equipment					
Other (*specify*)					

Part E: Staff-Related Factors

9. The following statements refer to staff-related factors of construction projects and its influence on Construction the project. Please indicate to what extent you agree or disagree by indicating with a (√) in the appropriate box.

Staff-Related Factors	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Staff has relevant training					
There is availability of competent staff					
Shortage of site workers					
Poor motivation of staff					
Lack of staff experience					
Recruitment and competence development					
Other (*specify*)					

Part F: Construction of Irrigation Projects

10. The following statements refer to indicators of successful Construction of irrigation projects of construction projects and its influence on Construction the project. Please indicate to what extent you agree or disagree by indicating with a (√) in the appropriate box.

Construction of irrigation Projects	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
The projects are completed in time					
The projects are completed on budget					
The project was completed according to the scope					
The project met the beneficiaries expectations					
The project was of good quality					

Appendix II: Key Informant Interview Guide

1. What are the major challenges facing construction of irrigation projects?
2. What are the factors contributing to these challenges in construction of irrigation projects
3. Which are the most dominant factors influencing construction of irrigation projects?
4. What role do the stakeholder (owner/client, consultant and contractor) have to play to mitigate the influence of these factors?
5. What are the strategies adopted to minimize construction challenges in irrigation development
6. What else would you like to contribute that we may not have discussed?

Appendix III: Project Observation Checklist

S/No	Project Name	LOCATION (COUNTY)	COMPLETION STATUS (%)	DATE OF VISIT
1	Muringa Phase 1	Tharaka Nithi	100	16th Sep 2015
2	Muringa Phase II	Tharaka Nithi	72	16th Sep 2015
3	Kagaari Gaturi	Embu	95	15th Sep 2015
4	Lower Kuja	Migori	78	2nd Sept 2015
5	Lower Sio	Busia	85	1st Sep 2015
6	Ihindu	Nakuru	100	18th Aug 2016
7	Kibwezi drip	Kibwezi	100	4th Aug 2015
8	Riamukurwe	Nyeri	93	8th Jul 2015
9	Rapsu	Isiolo	100	10th Jul 2015
10	Mitunguu	Meru	95	17th Sep 2015