FACTORS INFLUENCING COMPLETION OF IRRIGATION PROJECTS IN KENYA: A CASE OF NATIONAL IRRIGATION BOARD PROJECTS IN MOUNT KENYA REGION

BY

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DECLARATION

This research project report project is my original work and has not been presented for any award in any other university.

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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

I dedicate this research project report to my husband, Francis Kamau Kuria and my daughter, Anastacia F. Wangui Kamau for the dedicated support they have accorded to me during the preparation of this research project report.

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ABBREVIATIONS AND ACRONYMS

GDP	Gross Domestic Product
KV 2030	Kenya Vision 2030
MTP	Medium Term Plan
NACOSTI	National Commission of Science Technology & Innovation
NIB	National Irrigation Board
SMEs	Small and Medium Enterprises
SPSS	Statistical Package of Social Sciences

ABSTRACT

The purpose of the study was to investigate the factors that influence completion of irrigation projects being implemented by National Irrigation Board, Kenya. A case of various irrigation development projects will be studied. These projects are Muringa Banana irrigation development project, Phase I in Tharaka Nithi County; Muringa Banana irrigation development project, Phase II in Tharaka Nithi County; Kagaari Kyeni Gaturi irrigation development project in Embu County; Mitunguu irrigation scheme development project Phase I in Meru County; Mitunguu irrigation scheme development project Phase II in Meru County, Iraru Irrigation project in Meru county and Rapsu Irrigation development project in Isiolo County. The project intends to analyze how the contractor related factors, cost related factors and the supervision related factors influence completion of irrigation projects. The study used descriptive survey research design and adopted both qualitative and quantitative techniques of data collection and analysis. The study adopted the stratified sampling procedure and census sampling technique to identify the sample size for the study established as 105 respondents. The researcher was able to administer 94 fully completed questionnaires. The researcher was able to conduct 7 key informant interviews construction managers from the 7 irrigation projects. The researcher used descriptive and inferential statistics to analyse the data collected. Measures of central tendency and correlation analysis were used to establish an interaction between the independent and dependent variables. The researcher used tables and interpretations to present the data. The study concludes that cost-related factors are the determinant factors influencing completion of irrigation projects, project supervision was the second most significant factor influencing the completion of irrigation projects and contractor-related factors were the least significant factors influencing completion of irrigation projects. The study recommends that the National Irrigation Board should seek to make the selection criteria for the bidding of irrigation projects to firms that have the technical and human capacity and resources to undertake irrigation projects. This selection should also be based on experience rather than the promotion of local firms, that the National Irrigation Board should adopt stringent measures which would arrest the cost related factors. This also should include less bureaucratic procedures and processes in disbursement of both material and financial resources required by contractors to implement irrigation projects and the National Irrigation Board should strengthen the capacity of supervisory staff involved in irrigation projects. Supervision was found to have the least influence on completion of projects in the study. However, supervision would enhance the identification of trouble areas through spot checks of project implementation activities in order to reduce massive loss of resources and project non-completion.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The construction industry accounts for a significant portion of the world's gross domestic product. In the developing world, the construction sector provides a substantial source of employment to the majority of poor citizens of those countries (Basheka & Tumutegyereize, 2011). Globally, the annual value of the construction industry is of the order of 1.5 trillion dollars constituting about 8% of GDP and about 60% of fixed capital formation. It is one of the most relevant forces of the world economy representing 7% of its total employment. The problem of completion of projects in the construction industry is a global issue that needs to be analyzed so as the implementers can deliver projects to the beneficiaries in good time.

According to Flyvbjerg (2009) completion and cost overrun are inherent part of most projects despite the much acquired knowledge in project management. Although some may argue that this is negligible. To the dislike of owners, contractors and consultants, many government projects experience extensive delays and thereby exceed the initial time and cost estimates (Ramanathan, 2012). Any construction project comprises two distinct phases: the preconstruction phase (the period between the initial conceptions of the project, through the engineering design stage to awarding of construction contract) and the construction phase (period from awarding construction contract to when the actual construction is completed).

Delays and cost overruns occur in both preconstruction and construction phases. However the major instances of project overruns usually take place in the construction phase (Frimpong & Oluwoye, 2003). Delays in project construction means overrun, loss of capital and revenue, increases market risk, delay in production, increasing material cost as well as lack of efficiency. While completing project at right time leads profit, market growth, increasing

customer's trust and increasing self as well as team's confidence (Yvas, 2013). In this case, irrigation construction projects in the country are commonly undertaken by government agencies and are of national interest.

Studies (Kapulula, 2008; Ngoma, 2006; Ofori, 2009) indicate that the construction industry has been dogged by a myriad of challenges which include mismanagement, skills shortage, corruption, lack of technology, inflexible credit terms, late payments to contractors and difficulties in accessing finance. According to Chilipunde (2010) Projects have largely not been delivered on time, budget and expected quality standards. In short, construction too often fails to meet the needs of modern businesses and impacts on their competitiveness in international markets and rarely provides best value.

Ramanathan, Narayanan and Idrus (2012) observe that the vast majority of project delays occur during the 'construction' phase, where many unforeseen factors are always involved. In construction, delay could be defined as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for the delivery of a project. Assaf and Al-Hejji (2006) found that in Saudi Arabia only 30% of construction projects were completed within the scheduled completion dates and that the average time overrun was between 10% and 30%. In Nigeria, Sambasivan and Soon (2007) observed that the performance of the construction industry in terms of time was poor.

According to Sambasivan and Soon (2007), seven out of ten projects surveyed in Nigeria suffered delays in their execution. Studies in the USA, Scandinavia and UK suggest that up to 30% of construction is rework, labour is used at only 40 to 60% of potential efficiency, accidents can account for 3% to 6% of total project costs, and at least 10% material waste. In developing countries (Tanzania, Zambia, Zimbabwe and Botswana) 40% of construction is

rework; 30 to 40% labour potential is used; 8% of total project costs account for accidents and 20 to 25% of materials are wasted (Datta, 2005).

In regard to irrigation construction projects Frimpong and Oluwoye (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%.

The Kenya Vision 2030 (KV 2030) formulated in 2008 and adopted by government as the roadmap for delivering change to our nation and its people has scaled up investments in irrigation and provided for its development at a rate of 32,000 hectares per year. The Jubilee government through its manifesto, has adopted an accelerated approach to irrigation expansion from KV 2030 on irrigation and have been mainstreamed into the Medium Term Plan of 2013-2017 (MTP 2013-2017). 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). NIB is currently pursuing projects to realize the 1 million acres at an estimated cost of Kshs 250 billion whose value of produce is estimated at Kshs. 340 billion per year after full development (NIB Progress Report 2013).

1.2 Statement of the Problem

The level of development of irrigation in Kenya is low compared to its potential. Kenya's irrigation potential in 2006 was estimated at 539,000 hectares, but only 105,800 hectares have been exploited for agricultural production (GoK, 2012). In this effort the government through

the National Irrigation Board identifies, designs and constructs irrigation infrastructure to improve water availability for agricultural productivity and in turn improve the food security in the country.

Despite the efforts to deliver these projects to the communities certain factors mitigate the completion of these projects especially in the construction phase where the projects do not meet the schedule leading to cost overruns and stalling of irrigation projects (NIB Progress report 2013). Stalled projects are not only symptoms of corruption; they are depriving farmers of life-saving water for crops, weakening food security and pushing them to the brink of poverty.

There are 33 projects in Mt. Kenya region in different stages of construction. Out of these, ten (10) are on-going, twelve (12) are on design stage, four (4) have stalled and seven (7) are completed. This study intends to focus on the on-going, stalled and completed projects. There is a growing concern of financial budget bursting out due to various factors. Therefore, the researcher chose to sample projects from the Mt. Kenya region to determine if/how contractor related factors, cost related factors and supervision related factors influence the completion of irrigation projects being implemented by National Irrigation Board.

To achieve the 1,000,000acres targeted in the Jubilee manifesto, there is need to see as many projects as possible reach completion within the contract period to avoid the cost overruns and improve in food security through use of the irrigation infrastructure installed.

1.3 Purpose of the Study

The purpose of the study was to investigate factors influencing completion of irrigation projects in National Irrigation Board.

1.4 Objectives of the Study

The study is be guided by the following objectives;

i. To determine the influence of contractor-related factors on completion of irrigation projects being implemented by NIB in Mt. Kenya region.
ii. To establish the influence of cost-related factors to completion of irrigation projects being implemented by NIB in Mt. Kenya region.
iii. To assess the influence of project supervision on irrigation projects being implemented by NIB in Mt. Kenya region.

1.5 Research Questions

The study sought to answer the following research questions;

i. To what extent do contractor-related factors influence completion of irrigation projects being implemented by NIB in Mt. Kenya region?
ii. To what extent do costs-related factors influence completion of irrigation projects being implemented by NIB in Mt. Kenya region?
iii. To what extent does project supervision influence completion of irrigation projects being implemented by NIB in Mt. Kenya region?

1.6 Significance of the Study

The study hopes to be of significance to policy and decision makers in the agricultural sector in identifying measures to improve successful implementation of irrigation projects. In addition, the study hopes to assist project managers by providing insight into what factors may affect completion of projects that will guide in future planning. The study also hopes to be of significance to farmers and communities who are the intended beneficiaries of irrigation as it will provide information on mitigation of project completion which will improve irrigation projects service delivery. The study also hopes to be of significance to researchers

and academicians on the factors affecting completion of irrigation projects in Kenya and to hopefully aid in bridging the gap in the scarce information on the study.

1.7 Delimitation of the Study

The study limited its investigation to irrigation projects initiated and implemented by the National Irrigation Board. The researcher has limited the investigation to the personnel involved in the construction phase of irrigation projects as the study participants for the study.

1.8 Limitations of the Study

The major limitation for the study is the availability of information on factors contributing to completion of irrigation projects in Kenya. There is evidence of research in other developing countries in Asia but there is scarce material in Sub-Saharan Africa. The researcher conducted a thorough literature review process to collect adequate information for the study.

1.9 Assumptions of the Study

The study assumes that the respondents identified for the study will be willing to participate in the data collection exercises. The researcher also assumes that the information provided by the study participants is a true representation of the facts.

1.10 Definition of Significant Terms used in the study

Completion of irrigation projects - Refers to the delivery of irrigation projects within the period specified in a contract or as per agreement between parties.

Construction - Actual implementation of irrigation projects on the ground

Contractor - This is a firm/person in agreement with NIB to build/install an irrigation infrastructure for a given irrigation project.

Cost - This is the total spent in the installation of the irrigation infrastructure in the construction phase of an irrigation project

Employer - This is the owner of the project who has hired a contractor to construct the irrigation infrastructure and pays her in phases or upon completion or delivery of the project.

Irrigation projects - These refer to construction of irrigation infrastructure in projects being implemented by the National Irrigation Board.

National Irrigation Board Projects - These are irrigation projects being implemented by the Government of Kenya (including donor-funded projects) through National Irrigation Board in order to enhance food security in the country.

Project management - Specific knowledge and techniques of project management adopted in the implementation of irrigation projects

Supervision - This is the act of overseeing the implementation/installation of an irrigation infrastructure designed by the supervisor.

1.11 Organization of the study

The study is comprised of five chapters. Chapter Two comprises of the literature review, theoretical framework, conceptual framework, knowledge gaps and summary of literature reviewed. Chapter Three consists of the research methodology adopted by the researcher in the course of the study. Chapter Four comprises of the data analysis and presentation Chapter Five presents a summary of the findings, conclusions and recommendations of the researcher.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature on the factors contributing to completion of irrigation projects. The chapter is divided in four sections: completion of irrigation projects; factors influencing completion of projects; theoretical framework and the conceptual framework.

2.2 Concept of Completion of Irrigation Projects

The concept of completion indicates the successful implementation of irrigation projects in due time. This means that the project team delivers the irrigation project time before an elapse of the expected completion date. Time is one of the major constraints in project management alongside other critical factors as costs (budget), scope and quality. Time is generally acknowledged as the most common, costly, complex and risky problem encountered in construction projects. Because of the overriding importance of time for both the owner and the contractor, it is the source of frequent disputes and claims leading to lawsuits (Ahmed, Azher, Castillo and Kappagantula, 2003). Completion of a construction project is frequently seen as a major criterion of project success by clients, contractors and consultants' alike (Bowen, Hall, Edwards, Pearl & Cattell, 2010).

Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it rarely happens that a project is completed within the specified time (Hussin & Omran, 2011).

There are several factors perceived to influence completion of construction projects. The study focuses its investigation in construction of irrigation projects. Therefore the next

section presents the literature review on the factors influencing completion of irrigation projects as conceptualized by the researcher.

2.3 Contractor-Related Factors and Completion of Irrigation Projects

The type of contractor has been found to be an influencing factor in the completion of construction projects these include such factors as the attitude of the contractor, size of the contracted firm and the experience of the contracted firm (Acharya, Lee, Kim & Lee, 2006). For instance, in developing countries, there is an emphasis to involve start-up firms and Small and Medium Enterprises (SMEs) in bidding for construction projects in an attempt to create competitiveness among local firms in public construction projects (Chilipunde, 2010). Rebelo (2005) stated that the construction industry and SME contractors play a significant and critically important socio- economic role in developing countries. It is therefore important that SME contractors be well equipped to effectively manage their construction enterprises from the perspective of the environment, health and safety, as well as from business sustainability, which contributes to the socio-economic development of local communities and society at large. However, this has not always been the case in their performance in infrastructural projects (Chilipunde, 2010).

In a study of the relationship between contractors and subcontractors in Saudi Arabia, it was found that a number of factors significantly affected these relationships. These factors included delay in contract progress payment, lack of construction quality, errors and delays in design drawings and approval of sample materials were ranked highest as contractor-subcontractor interface problems. Ranking lowest among these factors were legal disputes, scheduling conflicts among subcontractors, geological problems and weather conditions (Bowen *et al.*, 2010). Inadequate construction capacity to execute projects is another cause that hinders completion of projects. The issues relating to management, laws and regulation should be the responsibility of project management (Government of India, 2009).

Completion of projects requires adequate and effective project management techniques and skills of the contractor. Weak management of contractors has often affected the completion of construction projects. In Lebanon, contractual relations and project management from viewpoints of contractors and consultants have been found to affect completion of infrastructural projects (Khalafizadeh, Mirhosseini & Tayari, 2014). Similar associated contractor factors include weakness of rush in selection of contractor. The right level of knowledge, experience, methods and management skills are needed to ensure a greater chance for projects to be completed on or before the deadlines (Hussin & Omran, 2011).

Choge and Muturi (2014) also associate the completion of infrastructural projects on the experience of the contractor. Contractors are selected on the basis of price, experience in undertaking particular types of construction project and their reputation or track record in producing high quality work within budget and on time. In most cases there is a trade-off between price, experience and track record but the desire to accept the lowest tender does not always lead to a project that is completed within time. The inherent contractors experience during preparation, planning, authorization and evaluation procedures for large infrastructure projects creates obstacles to the implementation of such projects (Commission of the European Union, 2008).

Phaladi and Thwala (2009) also found management-related issues as major causes of poor project performance for the small and medium sized contractors in South Africa. Lack of effective management in the early stages of the projects, coupled with inadequate finance, lack of credit facilities from suppliers, inadequate skilled manpower, poor pricing and tendering, inadequate contract documentation skills, and generally lack of proper management training were the major factors contributing to contractors' failure to execute projects successfully. In order to forestall the challenge of project delivery, Samuel (2008)

recommends that project time management be a key priority for the contractors and that the appointment of a registered project manager for each contract should be a mandatory condition of tender.

2.4 Cost-Related Factors and Completion of Irrigation Projects

Cost is one of the primary measures of a project's success. This is true, especially for Construction projects in developing countries, because public construction projects in these countries are executed with scarce financial resources (Choge & Muturi, 2014). Although the government of Kenya sets aside huge sums of money to be spent in construction sector, the industry is facing a lot of challenges. Most construction projects in Kenya are exposed to extreme cost escalation menace to the extent that it calls not only for extra funding but also specialized expertise hence leading to technical and project managerial conflicts between project's parties. Adherence to cost estimates has been a major challenge and considered to be the biggest problem which hinders project's progress since it decreases the contractors' profit margin hence influencing time completion (Choge & Muturi, 2014).

Although project delivery process does not have a stage called funding, budgetary constraints affect each stage of the process (Sullivan & Mayer, 2010). The Right of Way to a project is not identified by a project that only fulfils the environmental process, only for the policy makers to disagree with the chosen source of funding. Mansfield, Ugwu and Doran (1994) reviewed the correlation between cost overruns and project delays and realized that a good agreement exists between the two factors. This implies that the availability of cash to cater for project costs influences the completion of a project. Kariungi (2014) study revealed a strong positive correlation between budgetary constraints and procurement delays. Most of the sampled projects experienced budgetary constraints; a situation which compromised projects delivery.

According to Koushki, Al-Rashid and Kartam, (2005) cash flow analysis problems in infrastructural projects are among the most common phenomena - from simple to complex projects. Most failures of construction projects are as a result of cost escalations (Gkritza & Labi, 2008). A study conducted in energy sector on cost overruns in Kenya, problems associated with pioneer power projects and process plants revealed that 74 % of cost escalations was caused by poor coordination of projects activities and lack of change management control thus affecting adherence to cost estimates (Kagiri & Wainaina, 2009). The increasing complexity of infrastructure and the environment within which projects are constructed places greater demand on construction managers to deliver projects on time, within the planned budget and with high quality (Enshasi, Mohamed & Abushaban, 2009).

A study of clients' performance in construction projects in Uganda (Alinatwe, 2008) found that failure to pay advance payment to contractors as provided for in the contract led to poor contractor cash flow leading to poor completion of projects. Kaliba, Muya and Mumba (2009) reported delayed payments, unduly protracted financial processes, financial difficulties, contract modification and economic problems as affecting completion of projects. Adolwa (2002) evaluated an advance loan scheme put in place by the Botswana government to assist small building contractors with project mobilization. The study found that the scheme was not as successful as intended due to misuse of the loans.

2.5 Project Supervision and Completion of Irrigation Projects

In every project, there are different stakeholders and participants. The case is even more complex in construction and engineering projects. Irrigation projects often involve a lot of engineering and construction processes. This means that there are critical decisions that are involved and hence the decision making process becomes a significant factor influencing completion of projects. According to Olatunji (2010) supervision is required to push workers

to meet scheduled targets. Owolabi Amusan, Oloke, Olusanya, Tunji- Olayeni, Owolabi and Omuh (2014) agrees that supervision in infrastructural projects is a significant determinant to completion of the project. Austin, Baldwin and Waskett, (2000) found out that when there is inadequate supervision/inspection of work it might result in rework, increased project cost, poor time completion and abandonment.

According to Chirwa, Samwinga and Shakantu, (2013) the performance of the contractors, in terms of completion, has often been mediocre. However, the failure by the client and their advisors (consultants) to enforce the conditions of contract also seems to be perpetuating the problem. The role of the supervising agent is to guide the process of project management. However, in the public sector of developing countries, project management has been eroded mostly due to bureaucratic processes. For instance, in Pakistan, Ahmed and Mohamad (2014) found that project management has become enmeshed with the normal bureaucracy in the public sector of Pakistan due to control of resources and incentives of allowances that are hindering quality and completion of the projects.

Supervision during construction is critical to ensure quality products and delivery of project. On the part of the consultants the assessment of the following will determine the speed of construction and ensure quality of the product: inspection procedure; adequate quality management inspection resources; quality management information processing requirements; materials or work rejection rate, and clean/dry working environment requirements (Olatunji, 2010). Proverbs and Holt (2000) argue that the number of supervisor in a project also has a positive influence on the completion of an irrigation project. Wambugu (2013) found that majority of the respondents indicated that effective management affected the completion of rural electrification projects in Kenya and that inadequate supervision/inspection of work resulted in rework.

According to Fortune and White (2005), support from senior management is a factor that positively influences the success of a project. This category of staff provides direction, guidelines and control in a project. The majority of the skilled operatives need to be told what to do, either daily or weekly. The lower management staffs supervise the work of the skilled workers while the top management oversees the entire system in terms of time, quantity of materials, workmanship and cost. Inadequate supervision / inspection of work it might result in rework, increased project cost, delay and abandonment (Ng *et al.,* 2003). Olatunji (2010) found that the quality of management during construction such as the level of supervision, activity sequencing and ineffective coordination of resources negatively affects completion time of projects.

In their study of performance of build-operate-transfer projects, Lekan et al. (2013) established in their work that there is linear relationship between an effective project supervision and completing projects on scheduled time. The study found that Relationship between project supervision versus project completion time was analyzed on one hand and supply of material versus scheduled project time on the other it was validated through results that they all linearly correlated. Ameh and Osegbo (2011) also found that the incompetency of the supervision staff has a negative effect on completion of the project. This means that there is a need for qualified professionals to supervise irrigation projects. Lekan, Opeyemi and Olayinka, (2013) similarly argue that the availability of qualified supervision professionals has a positive effect on completion of projects.

According to Jacobides (2007), successful completion of projects need to have adequate number of supervising engineering staff, its teams should use work schedules and plans to monitor project implementation and project teams should concentrate on key functions of project supervision. Sambrook (2010) study on the association between planning, financing,

institutional supervision and completion of projects. The study found that in amongst all the independent variables, supervision capacity statistically was seen to have the most significant relationship with completion of projects. Chirwa et al. (2013) recommend that other areas that will deliver some gains include training and professional development for both contractors' personnel as well as consultants responsible for the supervision and implementation of these projects. Ejaz, Ali and Tahir (2008) agree that there is a short fall of technical supervisory staff in developing world.

Ondari and Gekara (2013) study on factors affecting completion of construction projects in the road industry found that supervision was the second most significant factor influencing completion of projects. The other factors were management support, design specifications and contractor's capacity. The study showed that the principle of organizational structure demands that the number of sub-ordinates under a given supervisor should be limited to a maximum of eight and that the total number of relationships between an executive and his immediate sub-ordinate becomes excessive when the span of control reaches about seven (Ondari & Gekara, 2013). However, there is evidence to show that the presence of supervisors has often not had a positive impact on completion of projects. The difference in cost increase for projects with a supervising engineer, and those without, was not statistically significant at the 95% significance level (Koushki, 2005).

2.6 Theoretical Framework

The study adopted the knowledge based theory of project management and the theory of constraints (TOC) which are presented in this section.

2.6.1 Knowledge Based Theory of Project Management

Knowledge-based Theory of Project Management states that there is no explicit theory of project management and as a result there is a general theory to underpin the discipline and is

found in theories of management, planning, control and projects (Koskela & Howell, 2002). Knowledge-based project management is the systematic and optimal arrangement and coordination of knowledge and knowledge configurations over a period of time to achieve specific objectives within certain constraints. This includes but not limited to project cost management, project risk management, and project integration management (Onions, 2007).

The theory is appropriate for the study as the researcher is interested with project related factors that affect or influence completion of irrigation projects. As other projects, irrigation projects have different phases which can be distinguished as design, planning, implementation and closing of the project and are constrained by time, scope, budget and quality. Theses phases and project activities requires that the management has to have adequate project management skills and apply techniques that the project meets its objectives and is delivered in time. The knowledge of project management skills and techniques is an important determinant of how irrigation projects are implemented. The staff involved in the implementation of the irrigation project should have requisite knowledge and experience in applying project management techniques for completion of projects.

2.6.2 Theory of Constraints (TOC)

The study adopted the Theory of Constraints (TOC) (Goldratt, 1984) started the Theory of Constraints (TOC), and based this management theory that every system has at least one constraint limiting it from getting more of what it strives for. If this were not true, then the system would produce infinite output. The TOC has been applied to production planning, production control, project management, supply chain management, accounting and performance measurement, and other areas of business as well as such not-for-profit facilities as hospitals and military depots.

The TOC is both descriptive and prescriptive in nature; it not only describes the cause of system constraints, but also provides guidance on how to resolve them. This theory refers to systems in organizations as chains. A system is a collection of interrelated, independent processes that work together to turn inputs into outputs in the pursuit of some goal. The weakest link is the constraint that prevents the system from doing any better at achieving its goal. This theory can be applied to factors that contribute to the delay in completion of irrigation construction projects. The presence of any one factor in the project will cause delays in its completion. Therefore it is the responsibility of the project teams to identify such factors and seek ways to avoid or minimize them for effective completion of projects.

2.7 Conceptual Framework

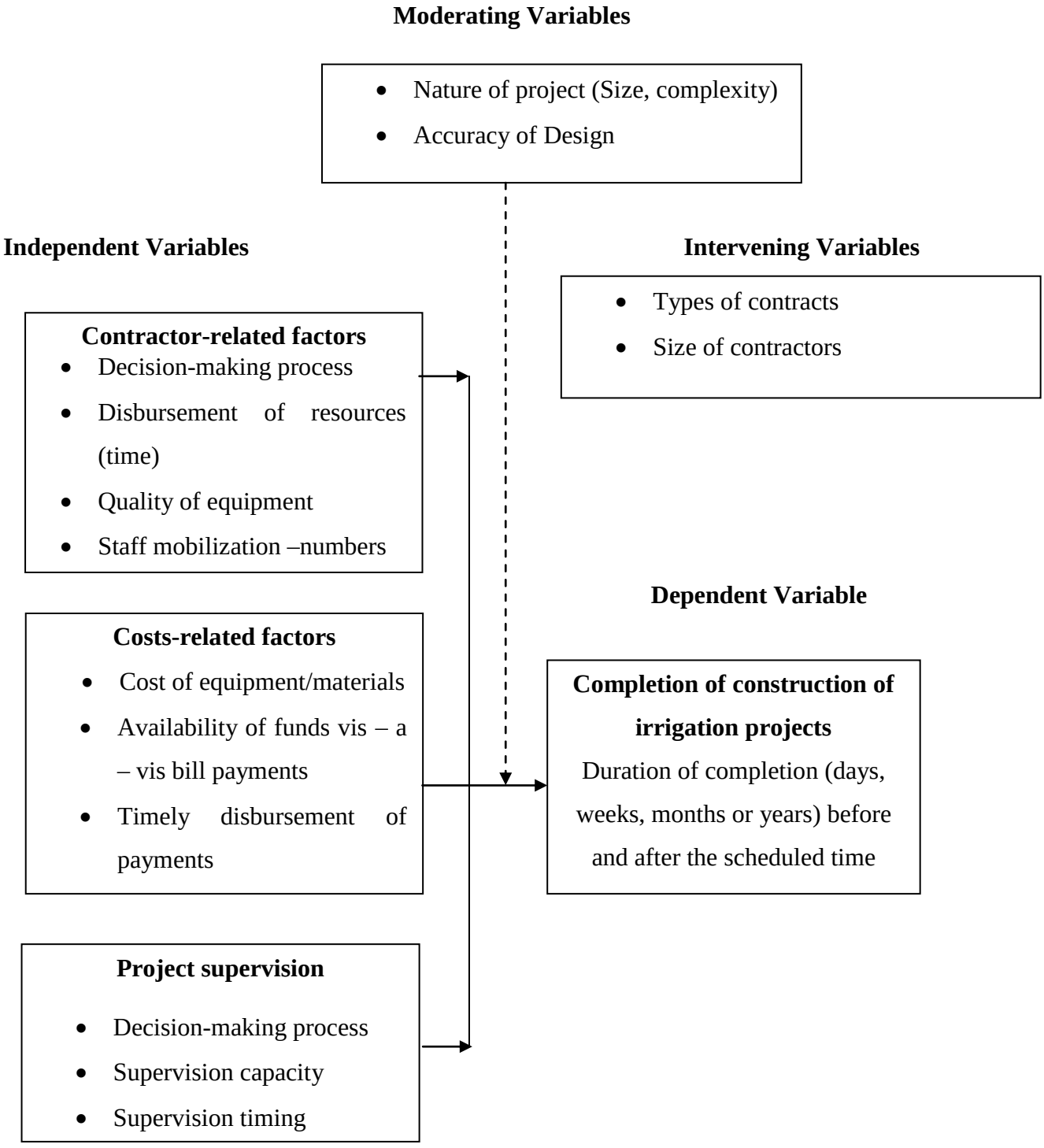

Figure 1: Conceptual Framework

Figure 1 illustrates graphical presentation of the relationship between the independent and dependent variables. The independent variables are contractor related factors, costs-related factors and supervision of irrigation projects and their influence on completion of irrigation

projects. The moderating factors are nature of the project and the accuracy of design. Contractor related factors refer to the contractors' experience, qualifications and capacity to undertake the irrigation project requirements and these are assumed to affect the completion of irrigation projects. The cost related factors refer to the availability of funds, the appropriate use of funds, disbursement of funds and the appropriate use of allocated funds for project activities and equipment.

The use of project funds is also assumed to influence the completion of projects. Supervision of irrigation projects is also perceived to influence completion of projects. These includes the availability of supervisors, the adequate number of supervisors, and timing of supervision activities are all aspects influencing completion of projects.

2.8 Knowledge Gap

The literature reviewed shows that there is a plethora of studies on the factors assumed to affect the completion of irrigation projects. However, there was less emphasis on factors influencing completion of irrigation projects. The literature of construction projects is available and is associated with that of irrigation projects as they undergo similar stages of project implementation.

The study will however limit its investigation towards irrigation projects and the factors influencing completion of these projects in Kenya. The study also focuses on internal factors influencing completion overlooking such factors as environmental factors effects on completion of projects which has been a popular subject of research.

2.9 Summary of Literature Review

This chapter reviewed existing literature on the factors contributing to completion of irrigation projects. The chapter was divided in four sections: completion of irrigation projects; factors influencing completion of projects; theoretical framework and the conceptual framework. Majority of the studies cited in the literature review focused on the construction sector. There is evidence to suggest that contractor-related factors, cost-related factors and project supervision have an influence on project success. However, there is a weak assessment of these factors in relation to project completion. There is also lack of evidence on the influence of these factors on completion of irrigation projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research procedure and technique employed by the study. This included research design, target population, sampling procedures and sample size, data collection methods, data collection procedures, validity, reliability and methods of data analysis.

3.2 Research Design

A research design refers to the approach that a researcher adopt in an attempt to achieve the study's objectives. The research design for this study is descriptive in nature as it involves the accurate description of the features of the population for the study in relation to the variables of the study. The descriptive survey research design is also chosen as it allows the researcher to adopt both quantitative and qualitative data as a means to construct the "what is" of the objectives of the study.

Descriptive survey research designs can be distinguished between cross-sectional and longitudinal studies. The longitudinal study involves administering the research instruments to respondent over a repeated duration of time whereas the cross-sectional descriptive research design involves collecting information at one specific time. The study adopted the cross-sectional research design as it seeks to collect information at a specified period of time. A descriptive study is concerned with establishing the what, where and how of a phenomenon (Cooper & Schindler, 2009).

3.3 Target Population

The target population for the study were contractors, consultants, project managers, and technical staff, construction managers and respective project committees of the Seven (7)

National Irrigation Board projects in Mount Kenya Region. In each project there is a consultant, contractor, sub-contractor, project manager, construction manager, technical staff and a project committee. This means that the target population for the study was 105 respondents (see Table 3.1).

3.4 Sample Size and Sampling Procedures

The researcher adopted the stratified sampling procedure to sample the projects. The procedure involves disaggregating the target population to different strata based on a certain criteria. The strata for this study were based on the National Irrigation Board irrigation projects in Mount Kenya region. The researcher adopted the census sampling technique to identify the study's sample size. The census sampling technique involves including all the members of population in the sample size. This technique was most appropriate as the researcher has the adequate resources to sample all members of the population.

Table 3.1: Target Population and Sample

Project	Population	Percent	Sample
Muringa Banana irrigation Phase I	15	100	15
Muringa Banana irrigation Phase II	15	100	15
Iraru Irrigation project	15	100	15
Rapsu Irrigation Scheme project	15	100	15
Kagaari Kyeni Gaturi irrigation	15	100	15
Mitunguu irrigation scheme Phase I	15	100	15
Mitunguu irrigation scheme Phase II	15	100	15
Total	**105**		**105**

Source: National Irrigation Board (2014)

3.5 Data Collection Procedures

The researcher developed an introduction letter to the respondents on the objectives and purposes of the study and also guaranteeing the respondents of the anonymous, confidential and the voluntary participation of the research. The researcher sought a letter of data collection authorization from the University of Nairobi, Department of Extra-Mural Studies

and research permit from National Commission of Science Technology & Innovation (NACOSTI). The data collection process begun with the administration of the questionnaires to the sampled respondents.

The questionnaires were self-administered in order to motivate the respondents to participate in the data collection activities. This was done through the project coordinators. The project coordinators have some form of influence on the respondents to participate in the research due to their familiarity with the project environment. The researcher conducted interviews with the project managers of the irrigation projects under the study after the analysis of the questionnaires. The advantage of this approach is that the researcher was able to follow-up on the observed trends from the questionnaires. The interviews were conducted in the respondents' own environment which enhances the comfort of the respondents and therefore motivates their participation in the interview.

3.6 Data Collection Methods

There are two distinct approaches to data collection. These are qualitative techniques and quantitative techniques. Quantitative techniques were adopted to gather information from a larger sample of respondents whereas qualitative techniques were adopted to acquire in-depth information of the phenomenon under investigation from a relatively smaller sample. The study adopted the questionnaire as the quantitative data collection technique and the key informant interview as the qualitative technique.

3.6.1 Questionnaire

The questionnaire contained four sections. The first section included the background information of the respondents. The second to fourth sections comprised of questions related to the research objectives. These include the influence of contractor-related factors, cost-related factors and supervision on completion of the project. The questionnaire had a section

on the variable of completion of projects. The questionnaire was based on the Likert scale items. The Likert scale is used in research to investigate the attitudes and beliefs of respondents on the phenomenon under study. The questionnaire were administered to the contractors, consultants and technical staff of irrigation projects as adopted in past studies (Khalafizadeh *et al.,* 2014). In order to enhance the reliability and validity of the research instruments, the researcher has developed the questionnaire items based on past studies instruments whose validity and reliability has been established. These include supervision (Ondari, & Gekara, 2013); contractor-related factors (Ondari, & Gekara, 2013; Chilipunde, 2010) cost-related factors (Lekan *et al.,* 2013; Koushki *et al.,* 2005).

3.6.2 Key Informant Interview

The key informants of the study are project managers of the sampled National Irrigation Board projects in Mount Kenya region. A key informant interview guide was developed according to the research objectives. An interview guide can either be structured or semi-structured. Structured interviews follow a predetermined sequence of the questions whereas semi-structured interviews are more flexible and do not require the interviewer to "stick" to the sequence of questions. In view of this, the researcher adopted the semi-structured interview. The advantage of using this technique is that the interviewer can engage in a discussion with the interviewee on the subject under study. Such discussions allow the researcher to gather information that may not have been anticipated during the development of the proposal but may be significant to the study.

3.7 Validity of the Instrument

Validity refers to the extent to which the research instruments measure what was intended. In order to ensure validity of the research instruments, the researcher developed a questionnaire which used items that have been used in previous studies and their validity has been established. The researcher involved the university supervisor in the construction of the

questionnaire and also look forward to guidance from the proposal defense committee. This form of establishing validity has been referred to as peer review of instruments (Creswell, 2003).

3.7.1 Pilot Study

The researcher conducted a pilot test which was carried out among National Irrigation Board staff at the Head Office in Nairobi who have in the past been involved in irrigation projects. This pilot study allowed the researcher to identify the concepts, statements and terms that may be problematic to the respondents which were modified before administration of the final instrument.

3.8 Reliability of the instrument

Reliability refers to the extent to which a research instrument produces similar results if administered to respondents in similar circumstances. This implies the replicability of findings using a research instrument. In order to establish the reliability of the questionnaire, the researcher used the split-half method.

3.8.1 Split - Half Method

Split-half reliability assumes that the items in an instrument can be split into two matched halves in terms of contents and cumulative degree of difficulty. This is often achieved by assigning all the odd numbered items to one group and all even numbered items into another. Essentially, a testees's marks on one half is expected to match his or her marks on the other half. The calculation follows by correlating the marks in the odd items with the marks in the even items using Pearson's statistics and corrected for the whole items. The correlation coefficient for the instrument was found to be 0.83. According to Whiston (2005), a reliable correlation coefficient is accepted at 0.80 or higher.

3.9 Data Analysis and Presentation

Data analysis refers to the process of making sense of collected data for the reader whereas data presentation refers to the graphical illustration of research findings. The first step of data analysis was to check for completeness, accuracy and consistency in the administered questionnaires. This was done in the field after administration of the questionnaires at the end of each day of data collection. The next process included the coding and entering of data into the Statistical Package for Social Sciences (SPSS). The researcher used descriptive and inferential statistics. Measures of central tendency, correlation and linear regression analysis was used to measure relationships between the independent and dependent variables. The data was presented in tables and compared to the reviewed literature and accompanied by the researchers own interpretation. The qualitative data was presented in verbatim in order to complement the quantitative data.

Table 3.2: Operationalization Table

Objectives	Variables	Indicators	Measurements	Measurement scales	Tools of analysis
To determine influence of contractor-related factors on completion of project	**Independent variable** Contractor-related factors	Decision-making process Disbursement of resources (time) Quality of equipment	Duration of time taken Duration of time taken Efficiency of equipment Quality of equipment	Interval Interval	Correlation Analysis Regression Analysis
	Dependent variable Completion of irrigation projects	Time, scope, budget and Quality	Project completed within time, scope, budget and quality	Interval	
To establish the influence of costs-related factors on completion of project	**Independent variable** Cost-related factors	Cost of equipment/materials Quality of equipment Level of mobilization Availability of funds disbursements of funds	Cost fluctuations of equipment	Interval Interval	Correlation Analysis Regression Analysis
	Dependent variable completion of irrigation projects	Time, scope, budget and Quality	Project completed within time, scope, budget and quality	interval	
To identify the influence of project supervision on completion of project	**Independent variable** Project supervision	Decision-making process Supervision capacity-expertise Adequate supervision staff Supervision timing Availability of supervision staff		Interval Interval	Correlation Analysis Regression Analysis
	Dependent variable completion of irrigation projects	Time, scope, budget and Quality	Project completed within time, scope, budget and quality	Interval	

Source: Researcher (2015)

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents the results from the data collection which is presented in terms of the study objectives. The data is presented in tables and also by the researchers own interpretation. The researcher adopted the census sampling technique as the target population was not relatively large. A target population of 105 was within the limits of the researchers' resources and performing further sampling procedures would have reduced the sample size for the study which would be inadequate for generalisations.

4.2 Response Rate

The study was able to collect 94 complete questionnaires which were used in the data analysis from the sample size of 105 respondents. This means that the study had a response rate of 89 % which is acceptable in research as recommended by Nulty (2008) that a response rate of above 50 % is acceptable.

4.3 Background Information

This section intends to gather information of the respondents in reference to the various projects.

4.3.1 Distribution of Respondents by Gender

Table 4.1 Gender of Respondents

Gender	Frequency	Percent
Male	68	72.3
Female	32	27.7
Total	**94**	**100.0**

Table 4.1 shows that the majority of respondents were male and represented 72.3 % of the sample while the female population represented 27.7 %. The findings show that the majority

of the respondents were male. This finding could be attributed to the fact that engineering is a male dominated field.

4.3.2 Distribution of Respondents by Education

Table 4.2: Education Level of Respondents

Education level	Frequency	Percent
Primary education	23	24.5
Secondary education	17	18.1
Tertiary Education	54	57.4
Total	**94**	**100.0**

In terms of the education level, the study found that 24.5 % had a primary level of education, 18.1 % had secondary education and 57.4 % had a tertiary level of education as shown in Table 4.2. Majority of the respondents had a tertiary level of education and is attributed to the professional nature of irrigation construction projects which requires tertiary level of education.

4.3.4 Distribution of respondents by Experience in the project

Table 4.3: Experience of the respondent in the Project

Project experience	Frequency	Percent
Months	14	14.9
Years	73	77.7
Weeks	7	7.5
Total	**94**	**100.0**

The results show that majority of the respondents were involved in the projects for years, 77.7 % were years, 14.9 % were months and 7.5 % were weeks as shown in Table 4.3. The results show that majority of the stakeholders in the project had years of experience. In any undertaking, experience is an important component of the success rate. Vast experience

means that one is more likely to expect variations and prepare to mitigate them thereby enhancing chances of success. Lim and Ling (2002) given in summary as the clients' understanding of the project constraints; ability to effectively brief the design team; ability to contribute ideas to the design and construction processes; and finally, ability to make authoritative decisions quickly, and the stability of these decisions. This means that there was positive influence of respondent experience to the project.

4.3.5 Distribution of respondents by Capacity in the project

Table 4.4: Capacity of Respondent in Project

Capacity	Frequency	percent
Contractor	50	53.2
Consultant	29	30.9
Technical staff	15	15.9
Total	**94**	**100.0**

The researcher sought to get response from respondents holding different capacities in the project. In terms of their role in the sampled projects, 53.2 % were contractors, 30.9 % were consultants and 15.9 % were technical staff

4.4 Influence of Contractor-Related Factors on Completion of Irrigation Projects

Table 4.5: Contractor-Related Factors Influence on Project Completion

Response	Frequency	Percent
Yes	63	67.0
No	31	33.0
Total	**94**	**100.0**

In regard as to whether contractor-related factors affected completion of irrigation projects, the results show that 67.0 % were yes and 31.0 % indicated no as presented in Table 4.5. Ibironke, Oladinrin, Adeniyi and Eboreime (2013) found that there are several contractor-

related factors which include: inadequate contractor experience; inappropriate construction methods; inaccurate time estimates; inaccurate cost estimates; poor site management and supervision; improper project planning and scheduling; incompetent project teams; unreliable subcontractors and obsolete technology.

4.4.1 Contractor Experience and Technical Capacity

Table 4.6: Experienced and Sufficient Technical Manpower in Projects

Response	Frequency	Percent
Disagree	22	24.5
Undecided	6	6.4
Agree	38	40.4
Strongly Disagree	27	28.7
Total	**94**	**100.0**

The findings show that in regard to the influence of contractor experience and technical capacity on irrigation projects, 24.5 % were disagree, 6.4 % were undecided, 40.4 % were agree and 28.7 % were strongly disagree as shown in Table 4.6. The findings support the perception that the experience of the contractor affects completion of projects. This finding agree with Choge and Muturi (2014) that completion of infrastructural projects on the experience of the contractor. Contractors are selected on the basis of price, experience in undertaking particular types of construction project and their reputation or track record in producing high quality work within budget and on time.

4.4.2 Modern Equipment Use

Table 4.7 Use of Modern Construction Equipment in Projects

Response	Frequency	Percent
Disagree	2	2.1
Undecided	31	33.0
Agree	37	39.4
Strongly Disagree	24	25.5
Total	**94**	**100.0**

The use of modern construction equipment was identified as an influencing factors among 39.4 % of the sampled respondents, 2.1 % were disagree, 25.5 % were strongly disagree and 33.0 % were undecided as presented in Table 4.7. This finding supports Ondari and Gekara (2013) study findings which concluded that the adequacy with which equipment was utilized in projects had a significant influence on project completion.

4.4.3 Size of Contractor

Table 4.8: Size of Contracting Firm influence on Project Completion

Response	Frequency	Percent
Strongly Agree	20	21.3
Undecided	13	13.8
Agree	34	36.2
Strongly Disagree	27	28.7
Total	**94**	**100.0**

In terms of the size of contract firm influence on completion of irrigation projects, the results show that 21.3 % were strongly agree, 13.8 % were undecided, 36.2 % were agree and 28.7 % were strongly disagree as depicted in Table 4.8. The size of the contractor has to be commensurate to the size of the project. SME contractors may be overwhelmed in undertaking huge projects. Olowabi (2014) agrees that despite the important role that SME

contractors they are unable to meet project completion targets especially in low-income countries.

4.4.4 Contractors' Experience

Table 4.9: Experience of the Contractor on Project Completion

Response	Frequency	Percent
Strongly Disagree	25	26.6
Disagree	10	10.6
Undecided	9	9.6
Agree	37	39.4
Strongly Agree	13	13.8
Total	**94**	**100.0**

The results show that contractor experience was a significant factor influencing the completion of irrigation projects as indicated by 39.4 % agree responses, 13.8 % were strongly agree, 9.6 % were undecided, 10.6 % were disagree and 26.6 % were strongly disagree as presented in Table 4.9. Liu, Bannerman, Elliot, Ewart and Atkinson (2014) found that contractor experience of a particular project was the most significant contractor related factor followed by number of competitors and the work load of the project.

4.4.5 Procurement Processes

Table 4.10: Planning in Procurement of Material and Workers

Response	Frequency	Percent
Strongly Disagree	26	30.9
Disagree	2	2.1
Undecided	9	9.6
Agree	46	48.9
Strongly Agree	11	11.7
Total	**94**	**100.0**

Table 4.10 shows responses on the extent to which procurement of material and workers influencing completion of irrigation projects. the results show that 48.9 % were agree, 11.7 % were strongly disagree, 9.6 % were undecided, 2.1 % were disagree and 30.9 % were strongly disagree. There is need for procurement planning in order to undertake adequate financial planning for the contractor to avoid inflation which may affect the cost of both physical and human resources for the project. According to Sloaman (2008), when there is inflation we need to be careful in assessing by how much national output, consumption and wages are increasing. This means an increase in inflation value will result in the necessity to review wages and prices of items to arrest the inflation.

4.4.6 Site Management

Table 4.11: Site Management influence on Project Completion

Response	Frequency	Percent
Strongly Disagree	19	20.2
Disagree	12	12.8
Undecided	7	7.4
Agree	41	43.6
Strongly Agree	15	16.0
Total	**94**	**100.0**

In terms of the influence of site management and completion of irrigation projects, the findings revealed that 20.2 % were strongly disagree, 12.8 % were disagree, 7.4 % were undecided, 43.6 % were agree and 16.0 % were strongly agree as shown in Table 4.11. The findings suggest that there was a strong influence of site management on project delivery. These findings corroborate Walker and Shen (2002) suggestion that contractor-related factors such as poor site management and supervision are major causes of delays in project delivery.

4.4.7 Contractor's Work Experience

Table 4.12: Engagement of Contractors with Requisite Work Experience

Response	Frequency	Percent
Strongly Disagree	29	30.9
Disagree	7	7.4
Undecided	4	4.3
Agree	41	43.6
Strongly Agree	14	14.9
Total	**94**	**100.0**

In regard to the engagement of contractors with requisite experience of irrigation projects, the results show that 43.6 % were agree, 14.9 % were strongly agree, 4.3 % were undecided, 7.4 % were disagree and 30.9 % were strongly disagree as shown in Table 4.12. This finding suggest that the site management processes of an irrigation construction project affect the completion of the project. According to Acharya et al. (2006), the type of contractor has been found to be an influencing factor in the timely completion of construction projects these include such factors as the attitude of the contractor, size of the contracted firm and the experience of the contracted firm.

4.4.8 Key Informant Findings

According to the key informant findings, there were several contractor–related factors that influence project completion. These factors were specific to the projects included in the study. These factors included;

- Good mobilization when way leave was available (Muringa Banana Phase 1)
- Availing of resources Muringa Banana Phase 2 –
- Poor work plan because it was expected that the contractor would have started works elsewhere where it was accessible (Kagaari)
- Good work plan, cash flow (Iraru)
- Poor cash flow, poor contractor (Rapsu)

4.5 Influence of Cost-Related Factors on Completion of Irrigation Projects

Table 4.13: Cost related factors influence on completion of irrigation projects

Response	Frequency	Percent
Yes	72	76.6
No	22	23.4
Total	**94**	**100.0**

Cost is one of the primary measures of a project's success. This is true, especially for Construction projects in developing countries, because public construction projects in these countries are executed with scarce financial resources (Choge & Muturi, 2014). In terms of whether cost related factors affected the completion of irrigation projects, the study findings show that 76.6 % were yes compared to 23.4 % no responses as shown in Table 4.13.

4.5.1 Bill Payments by Employer

Table 4.14: Influence of Bill Payments Employer on Project Completion

Response	Frequency	Percent
Strongly Disagree	9	9.6
Disagree	21	22.3
Undecided	3	3.2
Agree	44	46.8
Strongly Disagree	17	18.1
Total	94	100.0

Table 4.14 shows that 46.8 % were agree, 18.1 % were strongly agree, 3.2 % were undecided, 22.3 % were disagree and 9.6 % were strongly disagree in regard as to whether bill payments employer affected completion of irrigation projects. This finding suggests that late payments have a negative effect on completion of projects. In Uganda (Alinatwe, 2008) found that failure to pay advance payment to contractors as provided for in the contract led to poor contractor cash flow leading to poor timely completion of projects. Kaliba et al. (2009)

reported delayed payments, unduly protracted financial processes, financial difficulties contract modification and economic problems as affecting timely completion of projects.

4.5.2 Bidding Processes and Procedures

Table 4.15: Influence of Bidding Processes and Procedures on Project Completion

Response	Frequency	Percent
Strongly Disagree	1	1.1
Disagree	4	4.3
Undecided	2	2.1
Agree	58	61.7
Strongly Disagree	29	30.9
Total	**94**	**100.0**

Table 4.15 shows the study results in terms of the influence of contractor bidding processes and procedures where 1.1 % were strongly disagree, 4.3 % were disagree, 2.1 % were undecided, 61.7 % were agree and 30.9 % were strongly agree. This finding corroborate that of Acharya et al. (2006) who found that low bidding of contractors was a factor that contributed to the completion of construction projects in India. According to Chilipunde (2010), there is an emphasis to involve start-up firms and Small and Medium Enterprises (SMEs) in bidding for construction projects in an attempt to create competitiveness among local firms in public construction projects. It is therefore important that SMME contractors be well equipped to effectively manage their construction enterprises from the perspective of the environment, health and safety, as well as from business sustainability.

4.5.3 Utilisation of Mobilisation Advance

Table 4.16: Use of Mobilization Advance on Project Completion

Response	Frequency	Percent
Strongly Disagree	8	8.5
Disagree	24	25.5
Undecided	8	8.5
Agree	40	42.6
Strongly Agree	14	14.9
Total	**94**	**100.0**

In regard to use of mobilization advance influence on irrigation projects, Table 4.16 shows that 8.5 % were strongly disagree, 25.5 % were disagree, 8.5 % were undecided, 42.6 % were agree and 14.9 % were strongly agree. This implies that the use of mobilization allowance for other purposes other than the project will contribute to its non-completion. According to Acharya et al. (2006) these are factors associated with project participants (contractors). They found that poor utilization of mobilization advance has a negative effect on construction projects' completion.

4.5.4 Cost of Materials

Table 4.17: Fluctuation in Prices of Building Materials

Response	Frequency	Percent
Strongly Disagree	2	2.1
Disagree	12	12.8
Undecided	10	10.6
Agree	58	61.7
Strongly Disagree	12	12.8
Total	**94**	**100.0**

Table 4.17 shows that 2.1 % were strongly disagree, 12.8 % were disagree, 10.6 % were undecided, 61.7 % were agree and 12.8 % were strongly agree in terms of the influence of

price fluctuation of materials on completion of irrigation projects. This findings suggests that changes in the pricing of commodities affects the completion of projects. According to Sloaman (2008) argues that when there is inflation we need to be careful in assessing by how much national output, consumption and wages are increasing. This means an increase in inflation value will result in the necessity to review wages and prices of items to arrest the inflation.

4.5.5 Availability and Failure of the Equipment

Table 4.18: Equipment Availability and Failure

Response	Frequency	Percent
Strongly Disagree	6	6.4
Disagree	8	8.5
Undecided	2	2.1
Agree	53	56.4
Strongly Agree	25	26.6
Total	**94**	**100.0**

The availability and failure of equipment was found to influence completion of irrigation projects as 56.4 % cited agree, 26.6 % were strongly agree, 2.1 % were undecided, 8.5 % were disagree and 6.4 % were strongly disagree as presented in Table 4.18. This finding support Haseeb (2011) study on problems of projects and effects of delays in the construction industry of Pakistan which concludes that shortage and inadequacy of the equipment used by the contractor had a negative effect on the completion of the project.

4.6 Influence of Project Supervision on completion of Irrigation Projects

Table 4.19: Project Supervision Influence on Completion of Projects

Response	Frequency	Percent
Yes	60	63.8
No	34	36.2
Total	**94**	**100.0**

The results show that 63.8 % agreed that project supervision influenced the completion of irrigation projects compared to 36.2 % who did not agree as shown in Table 4.19. This findings imply that there is need for quality management during the life cycle of the project. this findings support Olatunji (2010) conclusions that the quality of management during construction does significantly influence project delivery time. Owolabi et al. (2014) agree that supervision in infrastructural projects is a significant determinant to timely completion of the project. Austin et al (2000) found out that when there is inadequate supervision/inspection of work it might result in rework, increased project cost, poor time completion and abandonment.

4.6.1 Capacity for Project Management

Table 4.20: Project Management Capacity

Response	Frequency	Percent
Strongly Disagree	5	5.3
Disagree	25	26.6
Undecided	6	6.4
Agree	39	41.5
Strongly Agree	19	20.2
Total	**94**	**100.0**

Table 4.20 shows the findings in terms of the influence of project management capacity where 5.3 % were strongly disagree, 26.6 % were disagree, 6.4 % were undecided, 41.5 %

were agree and 20.2 % were strongly disagree. As in any organisation, irrigation construction projects need an effective management and supervision for completion. There is need for the management of the project to have capacity to deliver. Ondari and Gekara (2013) found that in terms of management, supervision capacity was the most significant factor followed by contractor's capacity.

4.6.2 Timing of Inspection

Table 4.21: Timing of Inspection

Response	Frequency	Percent
Strongly Disagree	16	17.0
Disagree	41	43.6
Undecided	10	10.6
Agree	21	22.3
Strongly Agree	6	6.4
Total	**94**	**100.0**

The inspection timing factor was found to have no influence on completion of irrigation projects as 17.0 % were strongly disagree, 43.6 % were disagree, 10.6 % were undecided, 22.4 % were agree and 6.4 % were strongly disagree as depicted in Table 4.21. This findings suggest that inspection timing in projects is not a significant variable influencing completion of irrigation projects. this finding disagrees with Jacobides (2007) who concluded that successful completion of projects need to have adequate number of supervising engineering staff, its teams should use work schedules and plans to monitor project implementation and project teams should concentrate on key functions of project supervision.

4.6.3 Availability of Supervisory Staff

Table 4.22: Availability of Supervising Staff

Response	Frequency	Percent
Strongly Disagree	5	5.3
Disagree	17	18.1
Undecided	4	4.3
Agree	47	50.0
Strongly Agree	21	22.3
Total	**94**	**100.0**

In terms of availability of supervising staff on completion on irrigation projects, Table 4.22 shows that 5.3 % were strongly disagree, 18.1 % were disagree, 4.3 % were undecided, 50.0 % were agree and 22.3 % were strongly agree. Supervision during construction is critical to ensure quality products and delivery of project. Supervision is required to push workers to meet scheduled targets (Griffith & Watson, 2004). Wambugu (2013) study on determinant of successful completion of rural electrification projects in Kenya found that majority of the respondents indicated that effective management affected the timely completion of rural electrification projects in Kenya and that inadequate supervision/inspection of work resulted in rework.

4.6.4 Project Team Focus

Table 4.23: Project Teams Focus on Key Functions of Project Supervision

Response	Frequency	Percent
Strongly Disagree	3	3.2
Disagree	8	8.5
Undecided	16	17.0
Agree	60	63.8
Strongly Agree	7	7.4
Total	**94**	**100.0**

Majority of the respondents (63.8 %) agree that project team focus on project supervision influence completion of projects. Further, 7.4 % were strongly agree, 17.0% were undecided, 8.5 % were disagree and 3.2 % were strongly disagree as shown in Table 4.23. This finding validates the importance of project team in the successful completion of a project. Project teams should coordinate to identify any causes of delay in the life of the project. This finding also agrees with the arguments of the Theory of Constraints (ToC) that the presence of any one factor in the project will cause delays in its completion. Therefore it is the responsibility of the project teams to identify such factors and seek ways to avoid or minimize them for effective completion of projects.

4.6.5 Supervising Professionals

Table 4.24: Supervision Professionals

Response	Frequency	Percent
Strongly Disagree	17	18.1
Disagree	24	25.5
Undecided	9	9.6
Agree	36	38.3
Strongly Agree	8	8.5
Total	**94**	**100.0**

The results show that in terms of supervision professionals on completion of irrigation projects, 18.1 % were strongly disagree, 25.5 % were disagree, 9.6 % were undecided, 38.3 % were agree and 8.5 % were strongly agree as presented in Table 4.24. This finding implies that there is need for supervision staff during the life cycle of the project. According to Walker and Shen (2002) suggest that contractor-related factors such as poor supervision are major causes of delays in project delivery.

4.6.6 Number of Supervisory Staff

Table 4.25: Number of Supervising Engineering Staff

Response	Frequency	Percent
Strongly Disagree	2	2.1
Disagree	57	60.6
Undecided	7	7.4
Agree	16	17.0
Strongly Disagree	12	12.8
Total	**94**	**100.0**

The number of supervising technical staff was found not to have an influence on the completion of irrigation projects. Table 4.25 shows that 2.1 % were strongly disagree, 60.6 % were disagree, 7.4 % were undecided, 17.0 % were agree and 12.8 % were strongly disagree.

4.6.7 Use of Work Schedules and Plans

Table 4.26: Use of work schedules to monitor project implementation

Response	Frequency	Percent
Strongly Disagree	13	13.8
Disagree	17	18.1
Undecided	6	6.4
Agree	10	10.6
Strongly Agree	48	51.1
Total	**94**	**100.0**

The study results show that in terms of using work schedules and plans affected the completion of projects found that 51.1 % were strongly agree, 10.6 % were agree, 6.4 % were undecided, 18.1 % were disagree and 13.8 were strongly disagree as shown in Table 4.26. This finding support Olatunji (2010) study on influences on construction project delivery

time in South Africa which found that lack of adherence to the work schedules and plans during the project life cycle affects implementation of construction projects.

4.6.8 Findings from the key informants on influence of project supervision factors to completion of irrigation projects

According to key informant responses, there were several project supervision factors affecting the completion of irrigation projects. These factors included;

- did not assist in acquiring way leave (Muringa Banana Phase 1)
- has been pushing the contractor to complete the works and assisting in request for payment from client on behalf of contractor (Muringa Banana Phase 2)
- did not assist in acquiring way leave, poor site location after change in scope of the work thus affecting functionality of the system and delayed approvals for variations (Mitunguu Phase 1)
- was not active in pushing the contractor to complete and delayed approvals for variations (Kagaari)
- the consultant was ahead of the contractor, approved variations in ggod time, assisted in acquiring way leave, prepared payment cerificates in good time and assitesd in pusing the client to pay the contractor (Iraru)
- was not active in pushing the contractor to complete (Rapsu)

4.7 Successful Completion of Irrigation Projects

The successful completion of a project is often measured through the basic project indicators of time, scope, budget and quality. This section of the study presents the findings of the study in terms of the sampled project completion.

4.7.1 Time

Table 4.27: Project Was Completed in Time

Response	Frequency	Percent
No extent at all	5	5.3
A little extent	20	21.3
Moderate extent	8	8.5
A small extent	45	47.9
A great extent	16	17.0
Total	**94**	**100.0**

In regards as to whether the project was completed in time, the results show that 5.3 % were no extent at all, 21.3 % were a little extent, 8.5 % were moderate extent, 47.9 % were a small extent and 17.0 % were a great extent as presented in Table 4.27.

4.7.2 Scope

Table 4.28: Project Was Completed Within Scope

Response	Frequency	Percent
No extent at all	12	12.8
A little extent	24	25.5
Moderate extent	4	4.3
A small extent	38	40.4
A great extent	16	17.0
Total	**94**	**100.0**

In terms of the projects' completion within scope, the results show that 12.8 % were no extent at all, 25.5 % were a little extent, 4.3 % were moderate extent, 40.4 % were a small extent and 17.0 % were a great extent as presented in Table 4.28.

4.7.3 Budget

Table 4.29: Project Was Completed Within Budget

Response	Frequency	Percent
No extent at all	12	12.8
A little extent	36	38.3
Moderate extent	9	9.6
A small extent	30	31.9
A great extent	7	7.4
Total	**94**	**100.0**

Table 4.29 shows the responses in terms of the projects' completion within the budget was found to be poor. The results show that 12.8 % were no extent at all, 38.3 % were a little extent, 9.6 % were a moderate extent, 31.9 % were a small extent and 7.4 % were a great extent.

4.7.4 Quality

Table 4.30: Project Met Expected Quality

Response	Frequency	Percent
No extent at all	4	4.3
A little extent	15	16.0
Moderate extent	3	3.2
A small extent	51	54.3
A great extent	21	22.3
Total	**94**	**100.0**

The study results show that 4.3 % were no extent at all, 16.0 % were a little extent, and 3.2 % were moderate extent, 54.3 % a small extent and 22.3 % a great extent as shown in Table 4.30.

4.8 Inferential Statistics

4.8.1 Influence of Contractor-Related Factors on Completion of Irrigation Projects

Table 4.31: Correlation between Contractor-Related Factors and Project Completion

		Project success factors	Contractor-related factors
Project success factors	Pearson Correlation	1	.032
	Sig. (2-tailed)		.761
	N	94	94
Contractor-related factors	Pearson Correlation	.032	1
	Sig. (2-tailed)	.761	
	N	94	94

Table 4.31 shows the correlation between contractor-related factors and project completion factors. The results show that there is a correlation coefficient of 0.32.

4.8.2 Influence of Cost-Related Factors on Completion of Irrigation Projects

Table 4.32: Correlation between Cost-Related Factors and Project Completion

		Project success factors	Cost-related factors
Project success factors	Pearson Correlation	1	.373(**)
	Sig. (2-tailed)		.000
	N	94	94
Cost-related factors	Pearson Correlation	.373(**)	1
	Sig. (2-tailed)	.000	
	N	94	94

The correlation coefficient between cost-related factors and project completion was found to be 0.373 as presented in Table 4.32.

4.8.3 Influence of Project Supervision on Completion Irrigation Projects

Table 4.33: Correlation between Project Supervision Factors and Project Completion

		Project success factors	**Project supervision factors**
Project success factors	Pearson Correlation	1	.079
	Sig. (2-tailed)		.450
	N	94	94
Project supervision factors	Pearson Correlation	.079	1
	Sig. (2-tailed)	.450	
	N	94	94

Table 4.33 shows that the correlation coefficient between project supervision and project completion was found to be 0.79.

4.8.4 Regression

4.8.4.1 Influence of Contractor-Related Factors On Completion Of Irrigation Projects

Table 4.34: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.032(a)	.001	-.010	2.86146

a Predictors: (Constant), Contractorrelatedfactors1

Table 4.35: ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.761	1	.761	.093	.761(a)
	Residual	753.292	92	8.188		
	Total	754.053	93			

a Predictors: (Constant), Contractorrelatedfactors1

b Dependent Variable: Project success factors

Table 4.35: Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	12.595	2.360		5.338	.000
	Contractor-related factors	.027	.089	.032	.305	.761

a Dependent Variable: Project success factors

Table 4.34, Table 4.35 and Table 4.36 show the linear regression results between contractor-related factors. Table 4.34 (model summary) indicates that the model explains 10 % of variations in completion of irrigation projects. Table 4.35 shows the ANOVA results which indicate that the significance level is more than 0.05 which implies that the model is not significant in explaining the influence of contractor-related factors on completion of irrigation projects.

4.8.4.2 Influence of Cost-Related Factors on Completion of Irrigation Projects

Table 4.36: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.373(a)	.139	.130	2.65630

a Predictors: (Constant), Cost related factors

Table 4.37: ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	104.909	1	104.909	14.868	.000(a)
	Residual	649.144	92	7.056		
	Total	754.053	93			

a Predictors: (Constant), Cost related factors

b Dependent Variable: Project success factors

Table 4.38: Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	8.384	1.306		6.418	.000
	Cost-related factors	.267	.069	.373	3.856	.000

a Dependent Variable: Project success factors

Table 4.37, Table 4.38 and Table 4.39 show the linear regression results between cost-related factors. Table 4.37 (model summary) indicates that the model explains 38 % of variations in completion of irrigation projects. Table 4.38 shows the ANOVA results which indicate that the significance level is less than 0.05 which implies that the model is significant in explaining the influence of contractor-related factors on completion of irrigation projects. Table 4.39 (coefficients) shows that cost-related factors influence 67 % change in completion of irrigation projects.

4.8.4.3 Influence of Project Supervision on Completion Irrigation Projects

Table 4.39: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.079(a)	.006	-.005	2.85398

a Predictors: (Constant), Project supervision factors

Table 4.40: ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.693	1	4.693	.576	.450(a)
	Residual	749.360	92	8.145		
	Total	754.053	93			

a Predictors: (Constant), Project supervision factors
b Dependent Variable: Project success factors

Table 4.41: Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	11.794	2.017		5.847	.000
	Project supervision factors	.067	.088	.079	.759	.450

a Dependent Variable: Project success factors

Table 4.40, Table 4.41 and Table 4.42 show the linear regression results between the project supervision and project completion factors. The model summary (Table 4.40) shows that project supervision factors influence 6 % of project completion of irrigation projects. Table 4.41 shows the ANOVA results which indicate that the linear model is not significant in explaining the effect of project supervision on project completion of irrigation projects.

4.9 Discussion of Findings

4.9.1 To determine the influence of contractor-related factors on completion of irrigation projects

The study found that among the contractor-related factors size of contracting firms, use of modern construction equipment were the most significant factors influencing completion projects. In terms of size of contracting firms, the study findings agree with Acharya et al. (2006) contracted firm and the experience of the contracted firm. For instance, in developing countries, there is an emphasis to involve start-up firms and Small and Medium Enterprises (SMEs) in bidding for construction projects in an attempt to create competitiveness among local firms in public construction projects (Chilipunde, 2010). Phaladi and Thwala (2009) also found management-related issues as major causes of poor project performance for the small and medium sized contractors in South Africa.

The study found that use of modern construction equipment influenced completion of irrigation projects. This finding agrees with Ibironke et al. (2013), who found that inadequate modern equipment was ranked seventh and frequent equipment breakdown ranked thirteenth. This finding is particularly true for older model equipment, which is related to low production and frequent equipment breakdowns.

The study findings agree with Hussin & Omran (2011), that The right level of knowledge, experience, methods and management skills are needed to ensure a greater chance for projects to be completed on or before the deadlines (Hussin & Omran, 2011). Similarly, Choge and Muturi (2014) also associate the completion of infrastructural projects on the experience of the contractor. Contractors are selected on the basis of price, experience in undertaking particular types of construction project and their reputation or track record in producing high quality work within budget and on time.

4.9.2 To Establish the Influence of Cost-Related Factors to Completion of Irrigation Projects

The study findings showed that cost-related factors were the most significant factors influencing the completion of irrigation projects. Cost is one of the primary measures of a project's success. This is true, especially for Construction projects in developing countries, because public construction projects in these countries are executed with scarce financial resources (Choge & Muturi, 2014).

Among the factors listed, contractor bidding processes and procedures, equipment availability and failure and fluctuation in prices of building materials. In terms of contractor bidding processes and procedures, these factors included delay in contract progress payment, lack of construction quality, errors and delays in design drawings and approval of sample materials were ranked highest as contractor-subcontractor interface problems (Bowen *et al.,* 2010).

The study also found that equipment availability and failure also influenced completion of irrigation projects. Many of the contractors do not own equipment that are required for the construction work. They lease the equipment when required. During the season when there are many construction projects, the equipment are in short supply and are poorly maintained. This leads to failure of the equipment causing the progress to be hampered (Sambasivan & Soon, 2007).

In terms of the fluctuation in prices of building materials, the findings agree with most construction projects in Kenya are exposed to extreme cost escalation menace to the extent that it calls not only for extra funding but also specialized expertise hence leading to technical and project managerial conflicts between project's parties (Choge & Muturi, 2014). Koushki et al. (2005) cash flow analysis problems in infrastructural projects are among the most

common phenomena - from simple to complex projects. Most failures of construction projects are as a result of cost escalations (Gkritza & Labi, 2008).

4.9.3 To Assess the Influence of Project Supervision on Completion of Irrigation Projects

The study also found that the availability of supervising staff influenced completion of irrigation projects. Chirwa eta l. (2013), the role of the supervising agent is to guide the process of project management. However, in the public sector of developing countries, project management has been eroded mostly due to bureaucratic processes. For instance, in Pakistan, Ahmed and Mohamad (2014) found that project management has become enmeshed with the normal bureaucracy in the public sector of Pakistan due to control of resources and incentives of allowances that are hindering quality and completion of the projects.

The number of supervising staff is also a significant factor influencing completion of irrigation project. Proverbs and Holt (2000) argue that the number of supervisor in a project also has a positive influence on the completion of an irrigation project. Wambugu (2013) found that majority of the respondents indicated that effective management affected the completion of rural electrification projects in Kenya and that inadequate supervision/inspection of work resulted in rework. Ondari and Gekara (2013), found that in terms of supervising capacity in road projects, the organizations' projects had adequate number of supervising engineering staff and had an influence on completion on road projects.

CHAPTER FIVE

SUMMARY OF FINDINGS, 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

The study sought to investigate the factors influencing completion of irrigation projects taking a case of national irrigation board projects in the Mount Kenya region. The study was guided by three specific objectives which were, to determine the influence of contractor-related factors on completion of irrigation projects; establish the influence of cost-related factors to completion of irrigation projects and to assess the influence of project supervision on irrigation projects being implemented by NIB in Mount Kenya region. In chapter two, the study presented the reviewed literature which was presented in section which were in tandem with the research objectives. The theoretical framework and conceptual framework for the study was also presented in chapter two of the study. The researcher adopted the knowledge based theory of project management and the theory of constraints (TOC) to guide the study. The study adopted the descriptive research design as it involved the accurate description of the features of the population for the study in relation to the variables of the study. The target population for the study were contractors, consultants, project managers, and technical staff, construction managers and respective project committees of the Seven (7) National Irrigation Board projects in Mount Kenya Region. The researcher adopted the census sampling technique to identify the study's sample size which involved selection of all members of population. The study adopted the questionnaire as the quantitative data collection technique and the key informant interview as the qualitative technique. The data was analysed using both descriptive and inferential statistics. Descriptive statistics were used to show the

frequencies and percentages of the questionnaire items based on the Likert scale. Inferential statistics were used to show the strength of association between variables and to show the direction of the relationship between independent and dependent variable.

5.3 Conclusion

The study concludes that cost-related factors are the determinant factors influencing completion of irrigation projects. These costs are associated with price escalations which affect the project budget and may cause poor implementation of projects which may lead to incompletion. The study also concludes that the bidding processes and procedures also influence completion of irrigation projects. These was due to delays in payments which delayed the implementation of projects.

The study concludes that project supervision was the second most significant factor influencing the completion of irrigation projects. The study findings agreed with past studies that the capacity of supervision was an important factor in construction projects in the road industry and in other construction related sectors. Further, the study also concludes that the number of supervising staff and their deployment to the irrigation projects was a factor that influenced completion of irrigation projects.

The study concludes that the contractor-related factors were the least significant factors influencing completion of irrigation projects. The study concludes that there are other factors which are independent of the contractor are the most influencing factors. This means that the contractor has no direct influence in the completion of the project but rather their influence is determined by costs and supervision among other factors that were not investigated in this study.

5.4 Recommendations

Based on the study findings the researcher makes the following recommendations.

1. The study recommends that the National Irrigation Board should seek to make the selection criteria for the bidding of irrigation projects to firms that have the technical and human capacity and resources to undertake irrigation projects. This selection should also be based on experience rather than the promotion of local firms.
2. The study recommends that the National Irrigation Board should adopt stringent measures which would arrest the cost related factors. This also should include less bureaucratic procedures and processes in disbursement of both material and financial resources required by contractors to implement irrigation projects.
3. The study recommends that the National Irrigation Board should strengthen the capacity of supervisory staff involved in irrigation projects. Supervision was found to have the least influence on completion of projects in the study. However, supervision would enhance the identification of trouble areas through spot checks of project implementation activities in order to reduce massive loss of resources and project non-completion.

REFERENCES

Acharya, N. K., Lee, Y. D., Kim, S. Y. & Lee, J. C. (2006). Analysis of Construction Delay Factor: *A Korean Perspective, Proceedings of the 7th Asia Pacific Industrial Engineering and Management Systems Conference*, 17 – 20, December, Bangkok, Thailand.

Adolwa, M. (2002). *Development of small building contractors in Botswana; a critical evaluation.* Thesis project submitted in fulfilment of the requirements for the degree; Master of Science (Project Management), in the faculty of Engineering, Built Environment & Information Technology, University of Pretoria

Ahmed, S., Azher, S., Castillo, M., & Kappagantula, P. (2002). *Construction delays in Florida: An empirical study.* Proceedings: ASC Proceedings of the 39th Annual Conference. Florida.

Ahmed, R. & Mohamad, N. A. (2014). Performance of Projects in Public Sector of Pakistan: Developing a Framework for Future Challenges. *Serbian Project Management Journal*, 4 (1), 3-12

Alinatwe, H. M. (2008). An assessment of client's performance in having an efficient building process in Uganda, *Journal of Civil Engineering and Management, 14* (2), 73-78

Ameh, O. J., & Osegbo, E. E. (2011). Study of relationship between time overrun and productivity on construction sites. *International Journal of Construction Supply Chain Management, 1* (1). 56-67.

Assaf, S. A. & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International Journal of Project Management*. *24* (4):349–57.

Austin, S., Baldwin, A., Li, B. & Waskett, P. (2000) Analytical Design Planning Technique (ADePT): A Dependency Structure Matrix Tool to Schedule the Building Design Process. *Construction Management and Economics, 18,* 173- 182.

Basheka, B. C. & Tumutegyereize, M (2011). Measuring the performance of contractors in government construction projects in developing countries: Uganda's context. *African Journal of Business Management, 6* (32), 9210-9217

Bowen, P. A., Hall, K. A., Edwards, P. J., Pearl, R. G. & Cattell, K. S. (2010). Perceptions of Time, Cost and Quality Management on Building Projects. The Australian journal of construction economics and building, 2 (2), 48-56

Chilipunde, L. R. (2010). *Constraints and Challenges Faced By Small, Medium and Micro Enterprise Contractors in Malawi.* Faculty of Engineering, the Built Environment and Information Technology, Nelson Mandela Metropolitan University

Chirwa, D., Samwinga, V. & Shakantu, W. (2013). *Project delivery: a case study of Malawian educational projects.* School of the Built Environment, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa.

Choge, J. K. & Muturi, W. M. (2014). Factors affecting adherence to cost estimates: A survey of construction projects of Kenya National Highways Authority. *International Journal of Social Sciences and Entrepreneurship, 1* (11), 689-705.

Commission of the European Union. (1993). *Growth, Competitiveness, and Employment: The Challenges and Ways Forward Into the 21st Century*. White Paper. Brussels: Commission of the EU.

Cooper. R. & Schindler, P. (2009). *Research design: qualitative and quantitative approaches*. Thousand Oaks, CA: Sage

Creswell, J. W. (2003). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (2nd Ed.). Thousand Oaks, London, UK: Sage publications

Datta, M. (2008). *Challenges Facing the Construction Industry in Developing Countries.* Department of Architecture and Building Services, Gaborone, Botswana

Ejaz, N., Ali, I. & Tahir, M. F. (2008). *Assessment of delays and cost overruns during construction projects in Pakistan.* University of Engineering & Technology, Taxila – Pakistan

Enshassi, A., Mohamed, S., & Abushaban, S. (2009). Factors affecting the performance of construction projects in the Gaza strip. *Journal of Civil Engineering and Management, 15* (3), 269-280.

Flyvbjerg, B. (2009). *Excerpt from the book: mega projects and risk.* Available from: www.flyubjerg.plan.aau.dk

Fortune, J. & White, D. (2005) Framing of Project Critical Success Factors by a Systems Model. *International Journal of Project Management, 24* (1), 53-65.

Frimpong, Y. & Oluwoye, J. (2003). Significant factors causing delay and cost overruns in construction of groundwater projects in Ghana. *J. Construct. Res,1* (2): 175-187.

Gkritza, K., & Labi, S. (2008). Estimating Cost Discrepancies in Highway Contracts: Multistep Econometric Approach. *Journal of Construction Engineering and Management, 134* (12), 953-962.

Goldratt, E. M. (1984). *Essays on the Theory of Constraints*. Great Barrington, MA: North River Press.

Government of India (2009). *Report of the Task Force on Irrigation.* Planning Commission. India

Griffith, A. & Watson, P. (2004). *Construction Management Principles and Practice*. (1st Ed.) New York, NY: Palgrave Macmillan.

Hussin, A. A. & Omran, A. (2011). *Implication of Non-Completion Projects in Malaysia*. ACTA Technica Corviniensis - Bulletin of Engineering, pp. 29-38

Ibironke, O. T., Oladinrin, T. O., Adeniyi, O. & Eboreime, I. V. (2013). Analysis of Non-Excusable Delay Factors Influencing Contractors' Performance in Lagos State, Nigeria. *Journal of Construction in Developing Countries, 18* (1), 53–72

Ibironke, O. T., Oladinrin, T. O., Adeniyi, O., & Eboreime, I. V. (2013). Analysis of Non-Excusable Delay Factors Influencing Contractors' Performance in Lagos State, Nigeria, *Journal of Construction in Developing Countries, 18* (1), 53–72

Jacobides, M. G. (2007). The inherent limits of organizational structure and the unfulfilled role of hierarchy: Lessons from a near war. *Organization Science, 18* (3), 455-477

Kagiri, D., & Wainaina, G. (2009). Time and Cost Overruns in Power Projects in Kenya: *A Case Study of Kenya Electricity Generating Company Limited,* Nairobi

Kaliba, C., Muya, M. & Mumba, K. (2009). Cost escalation and schedule delays in road construction projects in Zambia, *International Journal of Project Management,* 27, 522-531.

Kapulula, A. (2008). Problems, solutions in construction industry. *The Public Procurer*, 2 (1), 26-27.

Kariungi, S. M. (2014). Determinants of Completion of Projects in Kenya: A Case of Kenya Power and Lighting Company, Thika. *ABC Journal of Advanced Research, 3,* 9-19.

Khalafizadeh, H., Mirhosseini, R. T., & Tayari, O. (2014). Investigating causes of delay in construction projects and presenting a solution (Case study of northwest projects of Iran). *New York Science Journal,* 7 (10), 43-47

Koskela, L., & Howell, G. (2002). The Underlying Theory of Project Management is Obsolete: Proceedings of the PMI Research Conference 2002: *Project Management Institute,* pp 293-302

Koushki, P. A., Al-Rashid, K. & Kartam, N. (2005). Delays and cost increases in the construction of private residential projects in Kuwait. *Construction Management and Economics, 23,* 285–294

Lekan, A., Opeyemi, J. & Olayinka, O. C. (2013). Performance of Build-Operate-Transfer Projects: Risks' Cost Implications from Professionals and Concessionaires Perspective. *European International Journal of Science and Technology, 2* (3), 239-250

Lim, H. & Ling, F. Y. Y. (2002) Model for predicting Clients Contribution to Project Success. *Journal of Engineering Construction and Architectural Management, 9* (5-6), 388-395.

Liu, L., Bannerman, P., Elliot, E., Ewart, G., Atkinson, S. (2014). *Underpricing for Construction Projects - A Double-Edged Sword: A Survey of Australian Construction Contractors.* PMI Research and Education Conference 2014, Portland, Oregon, USA: Project Management Institute (PMI).

Mansfield, N, Ugwu, O., & Doran, T. (1994) Causes of delay and cost overruns in Nigerian construction projects. *International Journal of Project Management, 12* (4), 254-260.

Medium Term Plan (2013-2017). Government printer. Nairobi

National irrigation board (2008). Strategic Plan 2008-2012. National Irrigation Board. Nairobi

Ng, S. T., Skitmore, R. M., Lam, K. C., & Poon, A. W. C. (2004). Demotivating Factors Influencing the Productivity of Civil Engineering Projects. *International Journal of Project Management*, *22* (2), *139-146.*

Ngoma, I. (2006). *Lessons in effecting transportation skills transfer to meet set target; in proceedings of 2006 Third Africa Technology Transfer,* Mangochi, Malawi, 10-15 May 2006, pp. 10-13.

Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: what can be done? *Assessment & Evaluation in Higher Education, 33* (3), 301–314

Ofori, G. (2009). Challenges of Construction Industries in Developing countries: Lessons from various countries. Available at: http://buildnet.csir.co.za/cdcproc/docs/2nd/ofori_g.pdf

Olatunji, A. A. (2010). *Influences on Construction Project Delivery Time*. Unpublished thesis. Philosophiae Doctor in Construction Management in the Faculty of Engineering, the Built Environment and Information Technology at the Nelson Mandela Metropolitan University

Ondari, P. O. & Gekara, J. M. (2013). Factors influencing successful completion of roads projects in Kenya. *International Journal of Social Sciences and Entrepreneurship, 1* (6), 26-48.

Onions, W. (2007). *A Knowledge Based Theory of Project Management.* New York, NY: McGraw-Hill

Owolabi, J. D., Amusan, L. M., Oloke, C. O., Olusanya, O., Tunji- Olayeni, P., Owolabi, D., Peter, Joy. & Omuh, I. (2014).Causes and Effect of Delay on Project Construction Delivery Time. *International Journal of Education and Research, 2* (4), 197-208

Proverbs, D. C. & Holt, G. D. (2000). A Theoretical Model for Optimum Project (Time) Performance Based on European Best Practice. *Construction Management and Economics, 17,* 652-665.

Ramanathan, C., Narayanan, S. P. & Idrus, A. B. (2012) 'Construction delays causing risks on time and cost – a critical review', *Australasian Journal of Construction Economics and Building, 12* (1) 37-57

Rebelo, E. (2005). Small business, SA's biggest test. *Creamer Media's Engineering News, 25* (1), 16-17.

Sambasivan, M. & Soon, Y. W. (2007). Causes and Effects of Delays in Malaysian Construction Industry, *International Journal of Project Management, 25* (5), 517-526.

Sambrook, U. (2010) Constructability Implementation: A Survey in the Malaysian Construction Industry. *Construction Management and Economics, 19,* 819-829.

Samuel, R. (2008). *Effective and Efficient Project Management on Government Projects',* Available on: www.cib2007.com/papers.CIDB2008%2520F retrieved 19th January 2015.

Sloman, S. P. (2008). *Economic and the Business Environment.* (2nd Ed). London, UK: Prentice Hall.

Walker, D. H. T. & Shen, Y. J. (2002). Project Understanding, Planning, Flexibility of Management Action and Construction Time Performance: Two Australian Case Studies. *Construction Management and Economics, 20*, 31-44

Wambugu, D. M. (2013), Determinant of successful completion of rural electrification projects in Kenya: A case study of Rural Electrification Authority, *International Journal of Social Sciences and Entrepreneurship, 1* (2), 549-560

Whiston, S. C. (2005). *Principles and applications of assessment in counselling.* 2nd ed. London, UK: Thomson Brooks/Cole

Yvas, S. (2013). Causes of Delay in Project Construction in Developing Countries. *International journal of commerce and management studies, 2* (1), 24-29

APPENDICES

APPENDIX I: LETTER OF INTRODUCTION

Loise Wanjiku Kahiga

Mobile no: 0724824879

Email: loiselle2005@gmail.com

Date:

To:

Respondent

Re: Request to Participate in Data Collection

I am a student at the University of Nairobi pursuing a Master of Arts Degree in Project Planning and Management. As a requirement for my studies, I am undertaking a study on "***FACTORS INFLUENCING COMPLETION OF IRRIGATION PROJECTS. A CASE OF NATIONAL IRRIGATION BOARD PROJECTS IN MT. KENYA REGION***". As a participant in these projects, you have been selected to participate in the study by answering the attached questionnaire. The study is purely for academic purposes and is voluntary. The information provided will be held in confidentiality by the researcher and will only be used for analysis. The information should also be provided anonymously and does not require your identification. The final report can be shared with you through the contact information of the researcher provided. Thank you in advance.

Yours Sincerely

Losie Wanjiku Kahiga

APPENDIX II: QUESTIONNAIRE

(This questionnaire is to be filled by the respondents involved in the project. The responses will assist the researcher in finding out how the factors in question influence the completion of irrigation projects. From the responses, the analysis and recommendations will assist in project management of irrigation projects being carried out by National Irrigation Board.)

Section A: Background Information

Please tick (√) where appropriate

1. What is your gender

   Male ( ) Female ( )

2. What is your highest level of education

   None ( ) Primary education ( )

   Secondary education ( ) Tertiary education ( )

3. How long have you been involved in this project (*include the time*)

   Weeks ( ) Months ( )

   Years ( )

4. What is your Capacity in the project

   Contractor ( ) Consultant ( )

   Technical staff ( ) Project manager ( )

   Project committee member ( )

Section B: Contractor related factors on completion of irrigation projects

5. Do contractor related factors affect the completion of projects?

   Yes ( )

   No ( )

   Not sure ( )

6. The following statements refer to the influence of contractor related factors on completion of irrigation projects. Please indicate to what extent you agree or disagree

Statements	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Use of experienced and sufficient technical manpower					
Use of modern technologies and construction equipment					
Size of contracting firm					
Work Experience of the contractor					

Proper planning in procurement of material & workers					
Proper use of the work schedule					
Adequate site management					

7. What other contractor related factors observed has influenced the completion of project?

……

……

……

8. How do you deal with contractor related factors affecting completion of projects?

……

……

……

Section C: Costs related factors influence on completion of irrigation projects

9. Do cost related factors affect the completion of projects?

Yes ( )

No ( )

Not sure ( )

10. The following statements refer to the influence of cost related factors on completion of irrigation projects. Please indicate to what extent you agree or disagree

Statements	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Late bill payments by employer					
Poor contractor Bidding processes and procedures					
Misappropriated use of mobilization advance					
Price fluctuations of building materials					
Appropriate equipment availability through project life					

11. What other cost related factors has influenced completion of the project?

……

……

……

12. How do you deal with cost-related factors influencing completion of projects?

……

……

……

Section D: Project supervision influence on completion of irrigation projects

13. Does project supervision influence the completion of project?

Yes ( )

No ( )

Not sure ( )

14. The following statements refer to the influence of project related factors on completion of irrigation projects. Please indicate to what extent you agree or disagree

Statements	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
Project management capacity of the project team					
Timing of inspections during the project life cycle					
Availability of supervising staff during project implementation					
Project teams' focus on key functions of project supervision					
Availability of supervising professionals					
Number of supervising engineering staff during project					
Use of work schedules/plans to monitor project implementation					

15. What other supervision related factors influence the completion of projects?

……

……

……

16. How do you deal with supervision related factors affecting completion of projects?

……

……

……

Section E: Completion

17. The following table shows the indicators of project success. Please indicate to what extent the project was successfully completed according to these factors?

Project Factors	**No extent at all**	**A little extent**	**Moderate extent**	**A small extent**	**A Great Extent**
Time					
Scope					
Budget					
Quality					

APPENDIX III: KEY INFORMANT INTERVIEW GUIDE

1. When was the project completed?
2. Was the completion of the project in time?
3. What factors influenced the completion of the project?
4. What are the contractor related factors that influenced completion of the project?
5. What are the costs related factors that influenced completion of the project?
6. What is the influence of supervising agent on completion of the project?
7. What do you think should be done to improve completion of irrigation projects?

APPENDIX IV: LETTER FROM THE UNIVERSITY OF NAIROBI

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA-MURAL STUDIES
NAIROBI EXTRA-MURAL CENTRE

Your Ref:

Our Ref:

Telephone: 318262 Ext. 120

Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
NAIROBI

19th June, 2015

REF: UON/CEES//NEMC/22/27

TO WHOM IT MAY CONCERN

RE: LOISE WANJIKU KAHIGA - L50/62921/2013

This is to confirm that the above named is a student at the University of Nairobi, College of Education and External Studies, School of Continuing and Distance Education, Department of Extra- Mural Studies pursuing Master of Arts in Project Planning and Management.

She is proceeding for research entitled **"factors influencing completion of irrigation projects". A** case of national irrigation board projects in Mount Kenya Region.

Any assistance given to her will be appreciated.

UNIVERSITY OF NAIROBI C.E.E.S. P O Box 30197 19 JUN 2015 NAIROBI NAIROBI EXTRA MURAL CENTRE

CAREN AWILLY
CENTRE ORGANIZER
NAIROBI EXTRA MURAL CENTRE

APPENDIX V: LETTER FROM THE UNIVERSITY OF NAIROBI

THIS IS TO CERTIFY THAT:
MS. LOISE WANJIKU KAHIGA
of UNIVERSITY OF NAIROBI, 1017-520
NAIROBI,has been permitted to conduct
research in *Embu , Isiolo , Meru ,*
Tharaka-Nithi Counties

on the topic: *FACTORS INFLUENCING COMPLETION OF IRRIGATION PROJECTS: A CASE OF NATIONAL IRRIGATION BOARD PROJECTS IN MOUNT KENYA REGION*

for the period ending:
4th December,2015

.....
Applicant's
Signature

Permit No : NACOSTI/P/15/9477/6848
Date Of Issue : 5th August,2015
Fee Recieved :Ksh 1,000

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

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice

REPUBLIC OF KENYA

NACOSTI

National Commission for Science,
Technology and Innovation

RESEARCH CLEARANCE
PERMIT

Serial No. A 6056

CONDITIONS: see back page

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349,310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:
5th August, 2015

NACOSTI/P/15/9477/6848

Loise Wanjiku Kahiga
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Factors influencing completion of irrigation projects: A case of National Irrigation Board Projects in Mount Kenya Region,"*** I am pleased to inform you that you have been authorized to undertake research in **selected Counties** for a period ending **4th December, 2015.**

You are advised to report to **the Chief Executive Officer, National Irrigation Board, the County Commissioners and the County Directors of Education of the selected Counties** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The Chief Executive Officer
National Irrigation Board.

The County Commissioners
Selected Counties.

The County Directors of Education
Selected Counties.