INFLUENCE OF PROJECT PARTICIPANTS RELATED FACTORS ON THE PERFORMANCE OF RAILWAY INFRASTRUCTURE PROJECTS: A CASE OF NAIROBI COMMUTER RAIL PROJECTS

BY

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A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN PROJECT PLANNING AND MANAGEMENT,UNIVERSITY OF NAIROBI

2014

DECLARATION

This is my original work and has not been presented for any degree or any other award in any university or institution of higher learning for examination

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This research project report has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

This research project report is dedicated to my parents John and Eunice Aoko for giving me a strong foundation in life.

ACKNOWLEDGEMENT

My sincere thanks to my Supervisor Dr. Dismus Bulinda for his guidance through the entire process, the Lecturers for their contribution, the university for providing enabling environment for studies and to my colleagues Susan, Cyrus, Mercy and Njenga for their support too. I also give my unreserved gratitude to my Wife Margaret for her support and my children Geno, Loch and Mich for their unique interest during my studies. Finally I am grateful to God Almighty for His divine enablement.

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ABBREVIATIONS AND ACRONYMS

CPM – Critical Path Analysis

CSF – Critical Success factors

EAC- East African Community

EPSRC – Engineering and Physical Sciences Research Council

ERS – Economic Recovery Strategy

GDP – Gross Domestic Product

GERT – Graphical Evaluation and Review Techniques

GOK – Government of Kenya

KPI – Key Performance Indicators

KRC – Kenya Railways Corporation

MOT – Ministry of Transport

MTP – Medium Term Plan

NCR – Nairobi Commuter Rail

PERT – Program Evaluation and Review Techniques

PMBOK – Project Management Book of Knowledge

PSC – Project Success Criteria

PSRI – Project Success Rating Index

RAP – Relocation Action Plan

RVR – Rift Valley Railways

ABSTRACT

While delivering successful projects continues to remain a challenge in many parts of the world and more so among the developing countries such as Kenya, one cannot underscore the influence of project participants on the overall performance of such projects. This study examined the influence of project participants related factors with respect to the Critical Success Factors (CSF) namely: project manager related factors, design and supervision team related factors, contractor related factors, and client related factors in project performance with particular reference to the Nairobi Commuter Rail infrastructure projects (Syokimau, Imara Daima and Makadara railway stations) implemented by the Kenya Railways Corporation. Quantitative research method was used and descriptive survey as the research design. The sampling procedure was majorly purposeful with a sample size, N of 52 from a target population of 60. The data collection was through structured questionnaire with a response rate of 92.3% and the analysis done using SPSS. The exploratory factor analysis indicated that Client related factors had the greatest influence on the projects performance with a mean criticality index of 3.714, followed by Contractor related factors(3.375), Project manager related factors(3.125), Design/supervision team related factors(3.000). From the ANOVA, with the significant F is 0.009 and from the t-test with all values less than 0.05, it was concluded that the null hypothesis be rejected and that all the project participants' related factors have a significant influence on the performance of railway infrastructure projects. The regression analysis showed that there was statistically moderate and positive correlation of average 0.5 between the four project participants and project performance and that 54.5 % of the project performance was attributed to the factors under the study with a further 45.5% attributed to other factors not investigated in this study. Similar study should be conducted in a different railway infrastructure project to act as a control project while measuring the similar variables and more to ascertain the objectivity of the findings in this study. This may also provide a large sample size of the target population to be able to come up with more collaborative findings.

CHAPTER ONE

INTRODUCTION

Background of Study

Development projects are among the primary approaches by which significant economic strides are made in many developing countries through their creation and implementation, leading to improvement in the quality of life of societies the world over. The success or failure of the projects therefore has a direct relationship to the rate of development. However for this to be realized, the performance and overall success of the said projects is paramount. The concept of project performance and success continues to remain a subject of study since the advent of project management in the 1950's that marked the era of modern project management. From the example of John F. Kennedy's speech to the Congress on 1961, dissatisfaction with project results and performance dates back to the 1950's (Ika, Dialllo and Thuillier, 2011).

Kilby, 2000 while making reference to the 2000 Meltzer Commission, established that project failure rate at the World Bank was over 50% in Africa until 2000. The World Bank undertakes international development projects in most developing countries but does not implement projects itself instead it relies on partners on the respective recipient countries. The World Bank's private arm, the International Finance Corporation has discovered that only half of its African projects succeed. In an independent rating, the Independence Evaluation Group (IEG) claimed that 39% of World Bank projects were unsuccessful in 2010 (Chauvet et al., 2010).

World Bank projects all too frequently fail to achieve their goals due to a number of problems that could be termed “managerial” and “organizational” (Kwak, 2002): imperfect project designs, poor stakeholder management, delay between project identification and start-up, delays during project implementation, cost overruns, coordination failure among others (Gunawan, 2010).

In Africa for example, Transnet Freight Rail in South Africa has faced project delays in its multi-project environment (Nethathe, Waveren, Chan, 2011). According to Nethathe et. Al., (2011), in a multiple project environment , individuals can be responsible for work on various different life cycle phases of different projects on a part time basis and not allocated full time to a particular project. Recent literature has also indicated that most organizations experience late deliveries on their projects due to technical staff being overloaded by working on several projects at the same time (Steyn et at., 2007).

In Kenya for example where project management is considered as an emerging discipline, only about ten years old, the question of project success continues to gain importance due to the myriad challenges in the delivery of successful projects and for continuous improvement of project delivery. This partly explains the slow pace of development both in Kenya and the region. Kenya’s Economic Recovery Strategy for Wealth and Employment Creation (ERS) 2003 - 2007, the precursor of Vision 2030 was anchored on four main pillars, one of them being rehabilitation and expansion of infrastructure. Poor infrastructure was identified as a major constraint to doing business and an obstacle in the country’s economic recovery programs hence

the need for an efficient and modern infrastructure. According to the Kenya's Vision 2030 blue print, despite the development registered under the ERS, the country continued to face constraints in the area of poor and inadequate infrastructure. This is attributed partly to the slow pace of the implementation of the identified projects with some going beyond their initial timelines. This happens when Infrastructure still remains one of the six key foundations for the Kenya Vision 2030, whose vision is to "provide cost effective, world class infrastructure facilities and services in support of vision 2030". It for example envisages a City of Nairobi and entire country firmly interconnected through a network of roads, railways, ports, airports, waterways, and telecommunication. The Vision 2030 First Medium Term Plan (MTP) 2008-2012, the foundation for the first phase of implementing Kenya Vision 2030 and first in a series of successive 5 year medium term plans, identified the key policy actions and reforms as well as programmes and projects to be implemented in the period 2008-2012.

Railway transport is considered the second most important mode of transport in Kenya, after road transport, for both freight and passenger services. The Vision 2030 MTP1 prioritized the following program and projects under the railway transport sub-sector: Rail transport programme and the development of light rail for Nairobi and its suburbs commonly known as Nairobi Commuter Rail (NCR). Under the Rail Transport Programme a total of USD 390 million was to be spent towards additional capital expenditures over the 25 years of the project with the concessionaire, Rift Valley Railways (RVR) investing at least USD 5 Million per year for the first five

years. In addition, the following was to be undertaken on rail transport: The construction of 17.2 km railway by-pass and implementation of the Relocation Action Plan (RAP) in Kibera and Mukuru areas, creating a 5.2 metre safe zone. Similarly under the development of light rail for Nairobi and its suburbs: The area expected to be served by the light rail was to stretch from Nairobi Railway Station, situated in the Central Business District, to Embakasi/Jomo Kenyatta International Airport, a distance of 15.6 kilometres and serving about 150,000 daily passengers - about 5 per cent of daily passengers in Nairobi Metropolis (Vision 2030 MTP1).

Kenya Railways Corporation (KRC) was established in 1978 through an Act of Parliament KRC Act (CAP 397) and the State Corporation Act (CAP 486), following the collapse (in 1977) of the former East African Community (EAC) to provide rail transport services to serve the country and the region. The total railway network in the country currently consists of 2,778 km comprising 1083 km of mainline, 346 km of principle lines, 490 km of minor and branch lines and 859 km of private lines and sidings. Over the last ten years, the railway has not been expanded, with the exception of 38 km of private line and recently in 2012 the 2.1 km branch line to Syokimau station which is part of vision 2030 flagship projects the Nairobi Commuter Rail (NCR) service. The performance of the Kenya Railway Corporation (KRC) had declined over the years and became increasingly manifest in the 1980s due to management challenges, locomotive power and rolling stock capacity constraints caused by inadequate funding. As a result, KRC was unable to meet its traffic demand, losing most of its traffic to road transport. The lopsided modal split between

road and railway traffic is therefore burdensome to the road network and has serious implications on the cost of road maintenance and road safety, among other issues.

This led to the signing of a concession agreement with RVR in 2006, to lease the railways assets to RVR to manage and operate cargo transport services for 25 years and passenger services for 5 years with a view of restructuring KRC to focus on National railway network development. This concession has not produced the desired results in terms of improved performance of rail transport.

The value of output of the transport sector during the review period, continued to be dominated by road transport which accounted for 56.0 per cent of the total. While the output values of road transport, air transport and services incidentals to transport rose by 18.9, 17.7, and 23.3 per cent respectively the railway sub-sector dropped significantly by 46.5 per cent over the same period. (Economic Survey 2012)

Table 1. 1 Transport and Communication - Value of Output, 2007 - 2011 (Ksh Million)

Sub-sector	**2007**	**2008**	**2009**	**2010**	**2011**
Road Transport	233,244	273,044	285,262	326,318	388,013
Railway Transport	4,550	4,449	4,747	5,591	2,992
Water Transport	23,233	21,868	21,039	21,483	22,117
Air Transport	80,254	83,010	81,609	84,257	99,176
Services Incidental to Transport	33,971	38,822	40,019	47,977	59,161
Pipeline Transport	8,736	9,222	11,837	13,906	14,174
Communications	88,691	93,426	100,705	105,951	107,502
TOTAL	**472,657**	**523,841**	**545,218**	**605,483**	**693,135**

Source: Economic Survey 2012

Table 1. 2: Transport Sector percentage (%) value contribution by sub-sector

Sub-sector	2007	2008	2009	2010	2011
Road Transport	67.0	70.0	72.0	72.3	73.7
Railway Transport	1.0	1.0	1.0	1.2	0.6
Water Transport	7.0	6.0	6.0	4.8	4.2
Air Transport	23.0	21.0	22.0	18.7	18.8
Pipeline Transport	2.0	2.0	2.0	3.1	2.7
TOTAL	**100**	**100**	**100**	**100**	**100**

Source: Economic Survey 2012

The railway transport sub sector posted a marginal growth of 1.5 per cent in freight traffic with revenue from passenger and freight traffic streams increasing by 14.5 and 20.2 per cent during the financial year 2011/2012. This increase was attributed to the restructuring of operations in Rift Valley Railways (RVR) undertaken by the governments Kenya and Uganda which saw additional capital injected into the concession to improve service delivery (Economic Survey 2012). Surprisingly within the same period under review, the railway passenger journeys dropped by 1.3 per cent compared to the previous period.

Table 1. 3: Railway Traffic, 2007 - 2011

	Unit	2007	2008	2009	2010	2011
Freight:						
Tonnes	000	2,304	1,628	1,532	1,572	1,596
Tonne-km	Million	5,606	1,109	1,060	1,105	1135
Revenue	Ksh Million	4,448	4,266	4,317	4,353	4,983
Revenue per tonne-Km	Cts	79	3,85	407	394	439
Passenger:						
Journeys	000	4,500	3,226	8,861	3,411	3,366
Passenger-Km	Million	148	105	389	270	365
Revenue	Ksh Million	103	76	251	252	303
Revenue per passenger-Km	Cts	70	72	65	93	83

Source: Economic Survey 2012

It is reported that global construction market in 2008 was worth around US $3,200 billion per year (Sohail and Cavill, 2008). Such large investments in infrastructure projects, have almost assured growth prospects for economic development if the projects are successfully executed with desired performance levels. It is therefore clear that development projects are clearly where concepts are put to the test and results are very publicly achieved - or not achieved" (Watkins, West-Meiers, and Song, 2013).

The success of railway infrastructure project will reflect the sector as an engine of growth but failure, abandonment and collapse a catastrophe to nation building. According to Nwachukwu, et al (2010) the rate at which infrastructure construction projects fail, or are abandoned, some even under construction, is retrogressive in most developing economies. Performance improvement holds great potential for the results of development projects, serving public and private organizations in growing economies (Watkins et al., 2013).

There is an emerging paradigm of project management that is moving from product creation as the prime focus to value creation as the prime focus. The same is in sync with the emerging trend in the monitoring and evaluation that seeks to assess project success against different levels of project results: the project's outputs at the end of the project; the project's outcomes in the months following project completion; and the project's impacts in the years following completion (Turner R.J. et. al. 2009). This approach seeks to concentrate the definition of project success more on the product and the benefits against which projects can be assessed.

1.2 Statement of the Problem

As stated in the introductory chapter, development projects are among the primary approaches by which significant economic strides are made and their performance therefore have a direct relationship to the rate of development. This notwithstanding, the poor performance of projects and the disappointment of project stakeholders and beneficiaries continue to be rampant. These failures and deficiencies are in areas of delays, project variations, increases in contract sums, among others.

The second five year Medium Term Plan (MTP2) of the Vision 2030 that started in July 1, 2013 highlights some of the failure of MTP1 among them delay in project implementation and project performance akin to issues mentioned above.

Railway transport is considered the second most important mode of transport in Kenya, after road transport, for both freight and passenger services. On average, the physical infrastructure sector accounts for 2.6 per cent of the GDP as per the Vision 2030 First Medium Term Plan (MTP) 2008-2012. The success and improved performance of the identified projects in the railway sub-sector holds great potential for improving the results of development projects and hence faster socio-economic development. The need to effectively achieve this has informed the research study on the influence of project participants on the performance of the railway infrastructure projects having been identified as a key driver of the economy by Vision 2030, Medium Term Plan (MTP) 2012 and the KRC Strategic Plan (2007 – 2012).

1.3 Objectives of the Study

The research has the following specific objectives:-

1. To establish how project manager related factors influence the performance of the NCR Projects.
2. To assess how the consultant (design and supervision team) related factors influence the performance of NCR projects.
3. To determine the contribution of contractor related factors in influencing the performance of the NCR projects.
4. To examine how client related factors influence the performance of the NCR projects

1.4 Research Questions

To effectively carry out the research, the following research questions were posed:-

1. What was the role of project manager related factors in influencing the performance of the NCR Projects?
2. How did the consultant (design and supervision team) related factors influence the performance of NCR projects?
3. What was the contribution of contractor related factors in influencing the performance of the NCR projects?
4. How did client related factors influence the performance of the NCR projects?

1.5 Hypothesis of the study

To evaluate the influence of the project participants' related factors on the performance of the railway infrastructure projects, a research hypothesis is postulated. The hypothesis is as follows:

Project participants' (Client, Consultant, Contractor and Project manager) related factors have no significant correlation on the performance of railway infrastructure projects.

Null Hypothesis: Project participants related factors do not influence the performance of railway infrastructure projects

Alternate Hypothesis: Project participants' related factors influence the performance of railway infrastructure projects

1.6 Purpose of the Study

The study endeavors to provide an overall assessment of the performance of the Nairobi Commuter Rail (NCR) infrastructure projects implemented by KRC. It seeks to establish the extent to which the various categories of the project participants influenced the said overall performance of the projects.

1.7 Significance of the Study

The research findings will contribute to the current knowledge on the best practice to implement and improve success and performance of the railway infrastructure project in order to realize the aspiration of country of transport for prosperity. It will provide good understanding of how to plan, implement and operate railway infrastructure project.

1.8 Limitations of the Study

Due to sensitivity of some of the projects, free sharing of useful information may hinder full disclosure of information by some of the respondents. However this was mitigated by seeking clearance from the relevant authorities.

1.9 Delimitations of the Study

The focus of the study is on the project performance and its application in measurement of project success. This is in relation to the railway transport sub sector infrastructure projects, with the Nairobi Commuter Rail (NCR) projects as the main projects under study.

1.10 Basic Assumptions

The following assumptions have been made: The respondents to be interviewed are conversant with the needs and requirement for successful railway project; they are willing to freely share the information they have regarding the projects and that honest responses will be obtained from the participants in the study.

1.11 Definition of Significant Terms

Project participants – refers to persons or group of persons involved in the implementation of a project by assuming responsibility on functions and duties assigned to them.

Project manager – refers to person appointed by the client to coordinate the day to day implementation of project and that the other parties work in harmony to realize the set objectives of the project.

Client – refers to person, persons or entity that assumes the role of the owner of a project through stating the project objective, financing, and assuming the final product.

Contractor –refers to a person or entity engaged by the client for the sole purpose of constructing and delivering the final acceptable product as provided by the plans.

Consultant (design and supervision team) – refers to person or entity engaged by the client to deliver designs based on the client's objectives

Project performance – refers to measure by which success or failure of a project is measured against its overall objectives

Project success factors – refers to the inputs to the project management systems that lead directly or indirectly to the success of a project.

1.12 Organization of the Study

The research project report has been organized into five chapters. Chapter one covers introduction of the study, objectives and purpose of the study, research questions, limitations and delimitation of the study. The second chapter deals with the literature review. It highlights existing literatures on the subject obtained from published books, journals, annual reports and academic publications used as secondary sources of data. Chapter three is on the study methodology and deals with the research design, population, sample and sampling techniques, instruments and measurement techniques, data collection procedure and data processing techniques. Chapter four covers the data analysis, presentation and interpretation and finally chapter five gives the summary of study findings, discussions, conclusions and study recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter deals with the literature review. It highlights existing literatures on the subject of study obtained from published books, journals, annual reports and academic publications used as secondary sources of data.

2.2 Project and Project Management

A project is defined as a temporary endeavor undertaken to create a unique product, service or result (PMBOK, 2004). From this definition certain Key characteristics are evident; Temporary means every project has a definite beginning and definite end, when the project objectives have been achieved and unique. Munns & Bjeirmi (1996) consider a project as the achievement of a specified objective, which involves a series of activities and tasks that consume resources. Traditionally a project has been known predominantly by its four phased life cycle namely; project conceptualization, planning, execution and termination.

In 2003, the UK's Engineering and Physical Sciences Research Council (EPSRC) agreed to fund a research network – Rethinking Project Management – to define a research agenda aimed at enriching and extending the subject of project management beyond its current conceptual foundation. The main argument for the proposed Network highlighted the growing critiques of project management theory and the need for new research in relation to the developing practice. The network's main finding encompasses a framework of five directions aimed at developing the field

intellectually in the following areas: project complexity, social process, value creation, project conceptualization, and practitioner development. These, the research findings say are not meant to be the agenda for future research, but to inform and stimulate current and future research activity in developing the field of project management.

2.2.1 Project Performance

According to (Watkins et. al. 2013), "…performance improvement holds great potential for improving the result of international development projects, serving public and private organizations in growing economies…"

While different writers my use different terminologies such as Leading performance indicators or Key performance indicators, the question of performance indicators is important in measuring project performance. The purpose of key performance indicators (KPI's) is to enable measurement of projects and organizational performance throughout the construction industry (KPI Working Group, 2000) Collins (2000) advocates that only a limited, manageable number of KPIs should be maintained for regular use as having too many or too complex can be time and resource consuming. Tuner et. al. (2009) suggests that leading performance may include both success criteria and success factors which can be measured by the projects teams during project delivery and post delivery.

Chan (2001) provides a range of KPIs to measure the performance of a construction projects developed both objectively and subjectively. These key performance indicators for project success are:

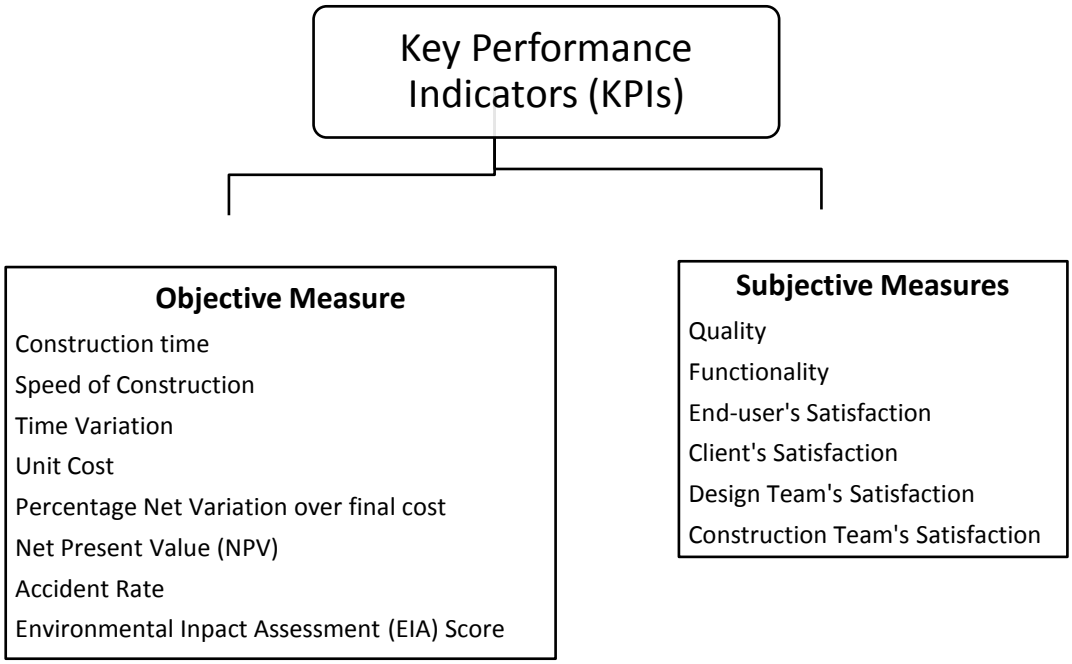

Figure 1: Source: Framework for Measuring Success of Construction Projects, Dr. Albert Chan, 2001

2.2.2 Project Success

Most of the projects the world over and Kenya specifically are usually characterized by either late delivery, over budget or are simply not good enough in terms of expectations. With all these shortcomings still different groups of people usually emerge claiming that those projects have been successful while some opposing.

Prakash (2008) argues that neither the practitioners nor the academicians seem to agree on what constitutes project success making it a rather an elusive concept. There is wide divergence of opinions in this field; the only agreement seems to be the disagreement on what constitutes 'project success'. (Murphy, Baker and Fisher, 1974; Pinto and Slevin 1988; Gemuenden and Lechler, 1997 and Shenhar, Levy, and Dvir 1997). Crawford (2002) describes success in the following way: "…a

perception…" and that "…the project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcomes…"

Tunner and Muller (2005) reviewed current thinking on project success by surveying the literature into project success criteria and success factors over the last 30 years. In their findings, early writing in project management in 1970's and earlier was about tools and techniques. In the 1980's writers began to try and identify success factors, elements of the project that project managers and project teams could influence to increase their chances of success. Then in the 1990's to lately authors started writing about success criteria, the measures (quantitative and qualitative) by which a project can be judged to be successful. Cleland (1986) suggested that "project success is meaningful only if considered from two vantage points: the degree to which the project's technical performance objective are attained on time and within budget; and, the contribution that the project makes to the strategic mission of an enterprise." De Wit (1988) and other writers distinguished between project success (measured against the overall objectives of the project) and project management success (measured against the widespread and traditional measures of performance against cost, time and quality). The second distinction is also important – it is the difference between success criteria (the measures by which success or failure of a project or business will be judged) and success factors (those inputs to the management system that lead directly or indirectly to the success of the project or business) (Prabhakar, 2008). Quite often project management literature confusingly intertwines these two separate

components of project success and presents them as a single homogenous group. In order to properly define and assess project success, a distinction should be made between product success and project management success, as the two are not the same.

Pinto and Slevin (1988) after sampling over 650 project managers, concluded that "project success" is something much more complex than simply meeting cost, schedule, and performance specifications. According to them client satisfaction with the final result has a great deal to do with the perceived success or failure of projects. Further, Baker, Murphy and Fisher (1983, 1988) conclude that "...In the long run, what really matters is whether the parties associated with, and affected by, a project are satisfied. Good schedule and cost performance means very little in the face of a poor performing end product..." According to Baker et al. (1983) "…instead of using time, cost and performance as measures for project success, perceived performance should be the measure…" Baccarini (1999) identified two distinct components of project success to be: (i) Project management success - this focuses upon the project process and, in particular, the successful accomplishment of cost, time, and quality objectives. It also considers the manner in which the project management process was conducted and (ii) Product success - this deals with the effects of the project's final product. Shenhar, Levy and Dvir, (1997) proposed that project success is divided into four dimensions that are inter-dependent: Project efficiency, Impact to customer, Business Success and Preparing for the future. Atkinson (1999) defines project success in three stages: the delivery stage - the process, doing it right, the post

delivery stage – the system, getting it right and the post delivery stage – the benefit, getting them right. Lim and Mohammed (1999) present project success from the different perspective of the individual owner, developer, contractor, user, and the general public. They propose two categories: the micro viewpoint (time, cost, quality, performance, safety) and the macro viewpoint (time, satisfaction, utility, operation). Sadeh, Dvir, and Shenhar (2000) also in their further research divided project success into four separate dimensions as presented in Table 2-1.

Table 2. 1: Success Dimensions and Measures (Sadeh, et. al. 2000)

Success Dimension	**Success Measures**
Meeting design goals	• Functional specification • Technical specification • Schedule goals • Budget Goals
Benefit to the end user	• Meeting acquisition goals • Answering the operation needs • Reached the user on time • Product has a substantial time for use • Meaningful improvement of user operational level • User is satisfied with product
Benefit to the developing organization	• Had relatively high profits • Opened a new market • Created a new product line • Developed a new technological capability • Increased positive reputation
Benefit to the national technological infrastructure	• Contribute to critical subjects • Maintained a flow of updated generations • Decreased dependence on outside sources • Contributed to other projects
Overall Success	• **A combined measure of project success**

2.3 Global and Regional Trends on Project Performance

According to (Ika et. al., 2011) while projects remain the instruments of choice for policy makers in international development, their poor performance and

disappointment of project stakeholders and beneficiaries seem to become the rule and not the conception in contemporary reality. The World Bank though it does not implement projects itself, undertakes a number of large scale international development projects in most development countries along with other development partners. Yet in the process, the project failure rate at the World Bank was over 50% in Africa until 2000. The World Bank's private arm the International Finance Corporation discovered that only half of its African projects succeed. In an independent rating, the Independent Evaluation Group (IEG) claimed that 39% of the World bank projects were unsuccessful in 2010 (Chauvet et. al., 2010). This failure rate is to a number of problems that could be termed "managerial" and "organizational" (Kwak, 2002): imperfect project design, poor stakeholder management, delay between project identification and start-up, delays during project implementation, cost overruns, coordination failure among others. (Youker, 1999; Kilby, 2000; Ahsan and Gunawan, 2010).

Alexandrova et. al., 2012, in their research done on projects supported by the European Union(EU) programmes in Bulgaria established that project managers need focused efforts to gain expanded comprehension of the potential critical success factors which in turn could assist their work on current and future project management hence enhancing their chances for achieving project goals. The study established five critical success factors: competence of project manager, compliance with the rules and procedures, competence of project team, quality of service provided by contractors, and support of the top management.

In South Africa for example as a representative of developing countries, Transnet Freight Rail has faced projects delay in its multi-project environment. Nethate et. al. 2011, in their study established that the greatest number of success factors are people-related, with the focus on team selection and team commitment. The study further states that two demographic characteristics are of importance when managing multiple projects ; the size of the business unit and the employees' project experience. Multiple projects are unique: several projects are "accomplished side by side while drawing resources from a common resource pool" – that is, " the projects are integrated into the management control and reporting system of some common resource pool owner" (Engwall and Jerbrant, 2003). Steyn et. al. (2007) state that most organizations experience late delivery on their projects due to overloaded staff working on several projects at the same time.

2.4 Project Success Factors

Murphy, Baker and Fisher (1974) used a sample of 650 completed aerospace, construction, and other projects with data provided primarily by project managers on the factors contributing to project success. Theirs have been the most cited works in the 1970's, used, extensive and the most authoritative research in the area of project success factors. They found ten factors that were found to be strongly linearly related to both perceived success and perceived failure of projects, while some twenty-three project management characteristics were identified as being necessary but not sufficient conditions for perceived success Baker, Murphy, and Fisher (1988).

The most widely quoted list of success factors are those by Pinto and Slevin (1987) in the 1980's. Pinto and Slevin (1987, 1988) and Morris and Hough (1986, 1987) also did an important work on project success factors in the 1980s. While Morris and Hough (1986, 1987) drew primarily on literature and case study analysis of major projects, Pinto and Slevin (1987, 1988) based their findings on the opinions of a usable sample of 418 PMI members responding to questions asking them to rate the relevance to project implementation success of ten critical success factors and four additional external factors (Slevin and Pinto 1986).

Therefore, one can conclude that there are a number of factors that may have a bearing on project success. These may differ from one project to another.

To come up with all possible critical factors that might affect outcome is close to impossible because of the diversity of projects. But to identify the groups to which the critical factors belong would be sufficient for better evaluation of projects. Belassi and Tukel (1996) grouped the success factors listed in the literature and described the impact of these factors on project performance. They grouped the factors into four areas: Factors related to the project, Factors related to the project managers and the team members, Factors related to the organization, and Factors related to the external environment. Cooke-Davies (2002) eludes that the question of which factors are critical to project success depends on answering three separate questions: (i) What factors lead to project management success? (ii) What factors lead to a successful project? (iii) What factors lead to consistently successful projects?

According to Saqib, Farooqui and Lodi (2008) the study of project success and the critical success factors (CSFs) are considered to be a means to improve the effectiveness of project. Certain factors are more critical to project success than others. These factors are called critical success factors (CSFs). The term "critical success factors," in the context of projects and the management of projects, was first used by Rockart (1982) and is defined as those factors predicting success on projects (Sanvido et al. 1992).

A number of variables influencing the success of project implementation were also identified following a thorough literature review by Saqib et. al. (2008). According to them a careful study of previous literature suggested that CSFs can be grouped under seven main categories. These include: (1) Project Management Factors; (2) Procurement-related Factors; (3) Client-related Factors; (4) Design team-related Factors; (5) Contractor-related factors; (6) Project Manager-related Factors; and (7) Business and Work Environment-related Factors.

Soqib et. al. (2008) advices that further study on the key performance indicators (KPIs) is needed to identify the causal relationships between CSFs and KPIs. The causal relationships, once identified, will be a useful guide to implement a project successfully.

2.5 Consultants (Design and Supervision Team) Related Factors

Consultants in the context of this study refer to an individual or a group of individuals who work as a team appointed to take responsibility for the design and construction supervision of a development project from its inception to operation. According to

Gyadu-Asiedu (2009), several developing countries at various levels of socio-economic development have recognized the need and importance of taking measures to improve the performance of their construction industries with ensuring the efficiency in the role of consultant's performance in project execution being identified as one key factor.

The consultant is the client (owners) agent engaged to ensure that the project is completed to the right quality against the design standards, technical specifications, on time and within budget to the satisfaction of the employer. According to FIDIC IV, some of the main duties of the consultant during the life of the project include: reviewing and updating design details; reviewing contractor's programme; monitoring contractor's operations, carrying out quality control tests; reviewing contractor's monthly invoices and certifying for payment; evaluating all claims for additional payments and applications for extension of time and preparing progress reports. The consultants are therefore supposed to complement the effort of the contractor to ensure successful completion of projects.

The designer and eventually supervision team therefore play a pivotal role in the delivery of construction infrastructure projects. These teams are involved right from the inception during project feasibility studies through to project completion. Chan and Kumaraswamy (1997) considered consultant related factors consist of consultants experience, project design complexity, and mistakes and delays in producing design documents (Saqib et al. 2008). Other consultant related factors that can influence the

performance of projects include; team organization, team composition, and nature of engagement.

2.6 Contractor Related Factors

A Contractor is an independent businessperson or business entity who agrees to enter into a contract to do work for another party at an agreed contract price with the party hiring the contractor defining the desired results and the duration for execution. The contractor can be engaged either as a main contractor or as a sub contractor. The contractor in any project usually start their duties when the project reaches the construction stage. Selection of the contractor to execute a project is therefore a recipe for overall project performance. The contractor related factors in this case include contractors experience, qualification of the management, qualification of key field staff, site management, supervision, involvement of subcontractors, contractor's cash flow, speed of information flow (Chan and Kumaraswamy 1997; Dissanaya and Kumaraswamy 1999).

2.7 Client Related Factors

Clients create the market for the construction industry and so should be placed at the center of the construction process (Latham, 1994). Their classification can be based on knowledge ability, organizational type and size and purpose of ownership. Walker (1995) considered the influence of the client and client's representative as a significant factor for construction project performance. The client related factors include client characteristics and culture, client type and experience, knowledge of project organization, project financing, client confidence in the construction team,

client's construction sophistication, well defined scope, owner's risk aversion, client project management (Chan and Kumaraswamy, 1997; Soger and Molenaar, 1997; Dissanayaka and Kumaraswamy, 1999). The traditional form of organization is not suitable for project work as it lack means of integrating different departments and facilitating effective communication (Chandra 2010). As such other forms of project organization are where an individual or group of individuals are entrusted with the responsibilities of organizing the projects. Three forms of project organization arise depending on how the authority of the project manager is exercised namely: Functional organization, Divisional organization, and Matrix organization.

a) Functional (Line and Staff) Organization – In this form of housing projects, projects are made part of one of the functional divisions of the organization. Someone is appointed mainly in a staff position to coordinate the work of other people in the functional departments. Usually the Project manager in this form does not have authority and direct responsibility over the line management.

b) Divisional (Pure Project) Organization – under this form of project organization, a separate division headed by a project manager with its complement of staff is set up to implement the projects. This implies the creation of a separate goal-oriented division of an organization with its own functional departments (Chandra 2010).

c) Matrix Organization – In an attempt to achieve the twin objective deficient in the functional organization and divisional organization of effective use of

resources and effective realization of project objectives, the matrix form is an alternative. In a matrix organization the personnel working on the project have a responsibility to both the functional superior and the project manager and that the authority is shared between the functional manager and the project manager.

2.8 Project Manager Related Factors

The project manager is the fulcrum of the entire project implementation process and performance level. To achieve desired results the project manager must excel in the three areas namely technical, human and conceptual skills.

The qualification, competence of the project manager is a critical factor that may influence the project planning, controlling, scheduling and communication (Belassi and Tukel 1996). The variables under this factor consist of the skills and characteristics of the project manager, their commitment, competence, experience and authority (Chua et al. 1999)

The management and leadership style of the project manager is key is driving the project delivery process and enhancing project performance and ultimate success.

Knowledge of project management tools are fundamental to the project manager in the delivery of projects. They include Project planning and control tools as well as analysis tools. Planning is key as it provides a basis for organizing project activities, allocating resources and monitoring and control.

a) Tools for planning – These include Gantt (bar) chart and Network techniques. The Gantt chart developed by an American Engineer and pioneer in scientific

management Henry L. Gantt (1861 – 1919) is a pictorial representation of project activities listed in the vertical direction with horizontal bars on the time axis. Network Techniques are somewhat more sophisticated than the bar charts and include the CPM (Critical Path Analysis), PERT (Program Evaluation and Review Techniques and GERT (Graphical Evaluation and Review Technique). Others include work breakdown structures and status reports.

b) Project control – Control is key as soon as the project is launched. Two approached can be used in project control: Variance analysis approach and the Performance analysis approach. Variance analysis involves comparison of the actual coat with the budgeted cost to determine the variance as opposed to performance analysis that tries to answer three fundamental question about projects: Is the project as whole (and its individual parts) on schedule, ahead of schedule or behind schedule?; Has the cost of the project as a whole (and its individual parts) been as per budget, less than the budget or more than the budget estimates? ; What is the trend of performance? (Chandra 2010).

2.9 Project Success Criteria

To effectively measure success, there must be established a criteria by which the same can be measured. According to Crawford (2002) project success is an important project management issue, and one of the most frequently discussed topics. Inspite of this there is a lack of agreement concerning the criteria by which success is judged (Pinto and Slevin 1988; Freeman and Beale 1992; Shenhar, Levy, and Dvir 1997; Baccarini 1999).

A review of the literature further reveals that there is, in fact, a high level of agreement with the definition provided by Baker, Murphy, and Fisher (1988), that project success is a matter of perception and that a project will be most likely to be perceived to be an overall success if "…the project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome and impacts among key people on the project team, and key users or clientele of the project effort…"

There is also a general agreement that although schedule and budget performance alone are considered inadequate as measures of project success, they are still considered important components of the overall construct. Quality is intertwined with issues of technical performance, specifications, and achievement of functional objectives and it is achievement against these criteria that will be most subject to variation in perception by multiple project stakeholders.

Freeman and Beale (1992) reviewed the project management literature, and identified seven main criteria for measuring the success of projects namely: Technical performance, Efficiency of execution, Managerial and organizational implications (mainly customer satisfaction), Personal growth, and Manufacturability and business performance.

Saqib, Farooqui and Lodi (2008) also grouped Project Success Criteria into two broad and distinct criteria namely: Common Criteria and Unique Criteria. Wateridge (1996) argues that the identification of success criteria should be the starting point and that it

is responsibility of the project team. Appropriate success factors can then be identified from the success criteria and the right tools chosen to achieve the factors.

2.10 Measuring Project Success

The question of whether project success can be measured and the purpose for measuring is yet to be fully determined. De Wit (1999) says that in "...any discussion on success, it is essential that a distinction is made between project success and the success of the project management effort..." He argues that the most appropriate criteria for success are the project objectives and that the degree to which these objectives have been met determines the success or failure of a project.

The assessment of success of complex projects can be made by a range of stakeholders over different time scales, against different levels of project success: the project's outputs at the end of the project; the project's outcomes in the months following project completion; and the project's impacts in the years following completion (Turner et.al., 2009).

Turner et. al., (2009) opines that there are well known cases of projects that were substantially late and overspent which were later perceived to be very successful like the Sydney Opera House and the Thames Barrier (Morris and Hough, 1987). Meanwhile other projects have been completed on time and cost, but have left their investors dissatisfied because they have failed to deliver the desired benefits. The Sydney Cross-City Tunnel for road traffic being an example.

Turner et. al., (2009) argues that what this illustrate is that the wretched golden triangle of project success (time, cost and quality) is an inadequate indicator of

project success, but also that success is not just related to completion of the project's scope of work, but also to the delivery of the project's outputs, outcomes and impacts, and that different stakeholders assess these different levels of project success, and they do so over different timeframes.

2.11 Success Measurement Models for Construction Infrastructure Projects

There is still a disagreement between project management researchers as to what constitute project success and how it is to be measured (Klagegg O.J et.al. 2005). De Wit (1988) and Pinto and Slevin (1988) mentioned that it is still not clear how to measure project success since project stakeholders perceive success or failure factors differently. Lim and Mohamed (1999) believed that project success should be viewed from different perspectives of the individual owner, developer, contractor, user, and the general public and so on.

Kerzner (1998) discusses definitions of Project success, and provides a list of critical success factors that can affect project performance at different stages of a project life cycle. As earlier mentioned, the definition of project success has changed over the years. In the 1960s, project success was measured entirely in technical terms: either the product worked or it did not. In the 1980s, the following definition for project success was offered Kerzner (1998): project success is stated in terms of meeting three objectives: 1) completed on time, 2) completed within budget, and 3) completed at the desired level of quality. The quality of a project was commonly defined as meeting technical specifications. Note that all three of these measures are internal to a project, and do not necessarily indicate the preferences of the end user or the

customer. In the late 1980s, after the introduction of TQM, a project was considered to be a success by not only meeting the internal performance measures of time, cost and technical specifications but also making sure that the project is accepted by the customer; and resulted in customers allowing the contractor to use them as a reference.

Models

Based on the literature review there are some different project success models developed so far which are briefly explored here.

Khosravi and Afshari (2011) developed a model that provide a basis for measurement of construction project success in Mapna Special Projects Construction and Development Co (MD-3). It developed a success measurement model for construction projects to fulfill two main objectives: to provide a project success index for every finished projects in order to compare them with each other and to establish a benchmark for future improvement in success of construction project execution. This model uses five project success criteria for measuring success of construction projects with Project Success Index (PSI) taken as a measure of project success. The model proposes that project success index will be calculated by using the following equation:

PSI = 0.209PTP + 0.233PCP + 0.199PQP + 0.173PHP + 0.186PCS (4)

Where: PSI: Project Success Index

PTP: Project time performance

PCP: Project cost performance

PQP: Project quality performance

PHP: Project HSE performance

PCS: Project Client's Satisfaction

Atkinson (1999) separates success criteria into delivery and post-delivery stages and provides a "square route" to understanding success criteria: iron triangle, information system, benefit (organizational) and benefit (stakeholder community). The 'iron triangle', has cost, time and quality as its criteria (for the delivery stage). The post delivery stages comprise: (i) the information system, with such criteria as maintainability, reliability, validity, information quality use; (ii) benefit (organizational): improved efficiency, improved effectiveness, increased profits, strategic goals, organizational learning and reduced waste; (iii) benefit (stakeholder community): satisfied users, social and environmental impact, personal development, professional learning, contractors profits, capital suppliers, content project team and economic impact to surrounding community. This model takes into consideration the entire project life cycle and even beyond. It thus lends itself for continuous assessment.

Lim and Mohamed (1999), as reviewed by Chan and Chan (2004), modelled project success measurement into 'micro viewpoint: completion time, completion cost, completion quality, completion performance, completion safety; and macro-view points: completion time, completion satisfaction, completion utility, completion operation. A key feature of this model is that it proposes only lagging indicators and gives no room for continuous assessment and monitoring.

Patanakul and Milosevic (2009) grouped their measurement criteria into three: (i) criteria from "organizational perspective": resource productivity, organizational

learning (ii) criteria from “project perspective”: time-to-market, customer satisfaction and (iii) criteria from “personal perspective”: personal growth, personal satisfaction.

Chua, Kog, and Loh (1999) proposed a hierarchal model for construction project success. In this model the objectives of budget, schedule, and quality are key measures that contribute to the goal of "construction project success".

Sadeh, Dvir, and Shenhar. (2000) divided project success into four dimensions: 1) meeting design goals, which applies to contract that is signed by the customer, 2) the benefit to the end user, which refers to the benefit to the customers from the end products, 3) benefit to the developing organization, which refers to the benefit gained by the developing organization as a result of executing the project, and 4) the benefit to the technological infrastructure of the country and of firms involved in the development process.

The project Excellence Model, according to Westerweld and Gaya-Walters, (2002) combines success factors and success criteria into a single model.

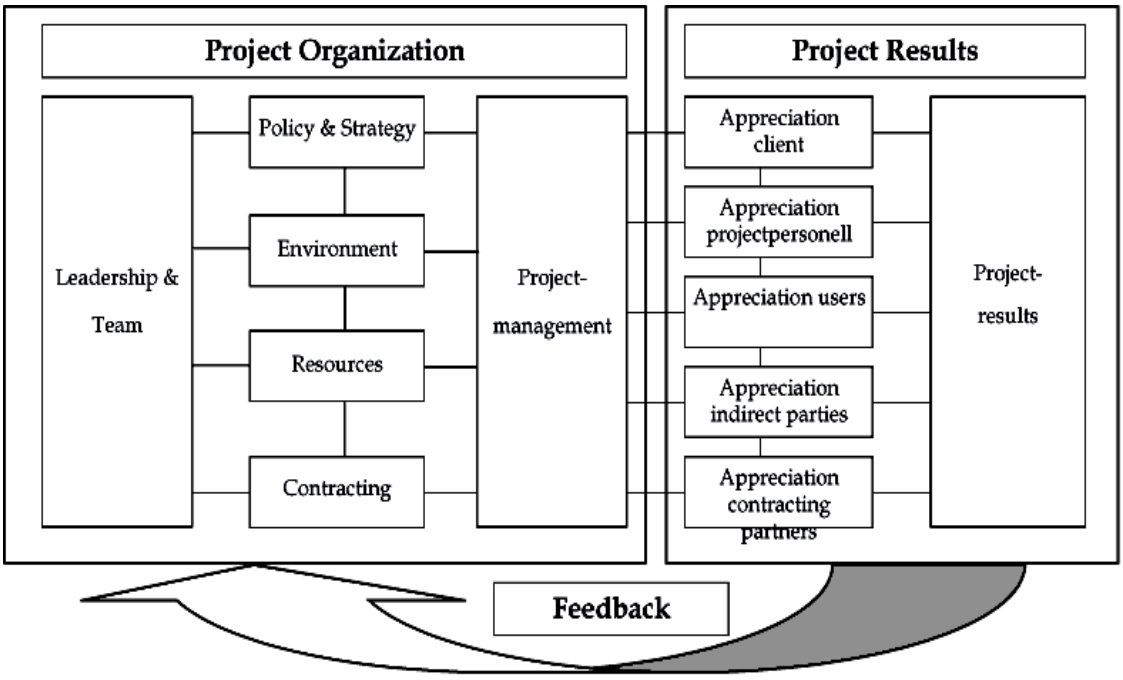

Figure 2: The project excellence model (Westerweld and Gaya-Walters, 2002)

Tunner's (2009) Model: In his model, Tunner identifies that success is judged by the perceptions of different stakeholders, against different criteria, over different timescales. The stakeholders comprise the shareholders, board, sponsors, owner, consumer, users, project teams and contractors. On the timescale, the timelines according to Tunner, (2009) range from immediate end to plus months after completion to plus years after completion.

Shenhar and Dvir (2007) Model – five categories of project success: They identified five categories of project success; efficiency, impact on the team, impact on the customer, business success and preparing for the future.

Asian Development Bank (ADB) Model (Xue, 2009) - The ADB developed a result-based monitoring and evaluation system for projects it's sponsoring in China (Xue,

2009). The system based on the W. K. Kellogg Foundation Logic Model Development Guide (2004), identifies three levels of results assessed over different time frames namely; project output, project outcomes, and project impact. The same is summarized in Figure 2 below.

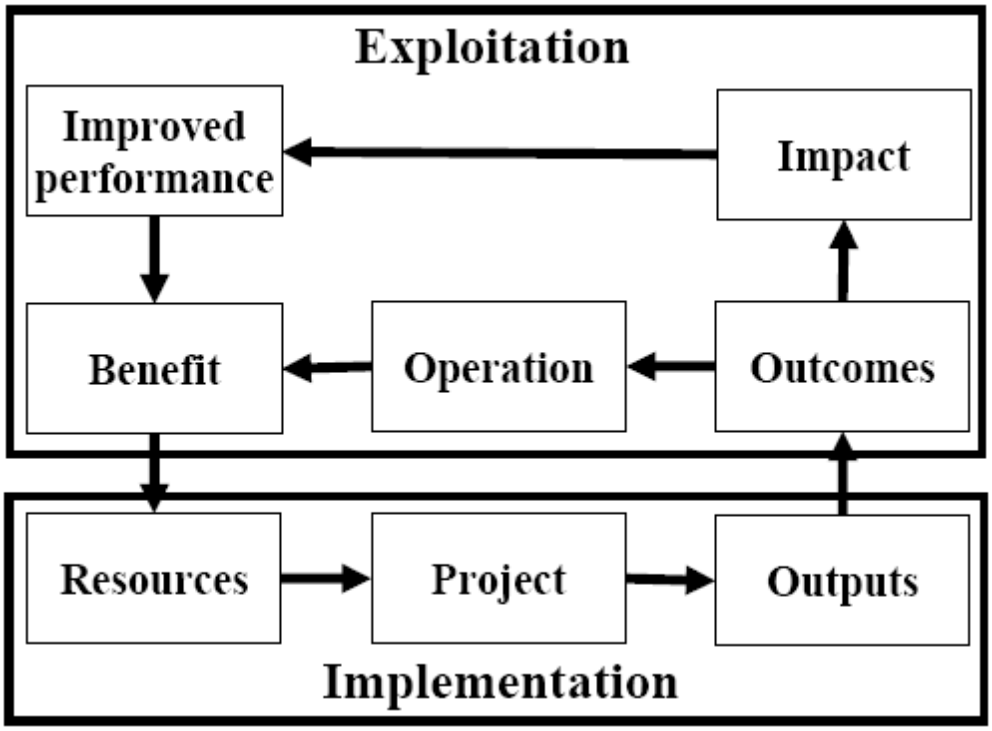

Figure 3: Asian Development Bank (ADB) Model (Xue, 2009)

The new model by Turner R. and Zolin R., (2009): This so called new model combines the last three models into a new hybrid model of project success and combines the different levels of results, the different timescales over which the different types of results are judged. It marches the project output to the immediate end of project, project outcomes to plus months of the project's completion and project impact to plus years of project completion.

2.12 Conceptual Framework

Independent Variables

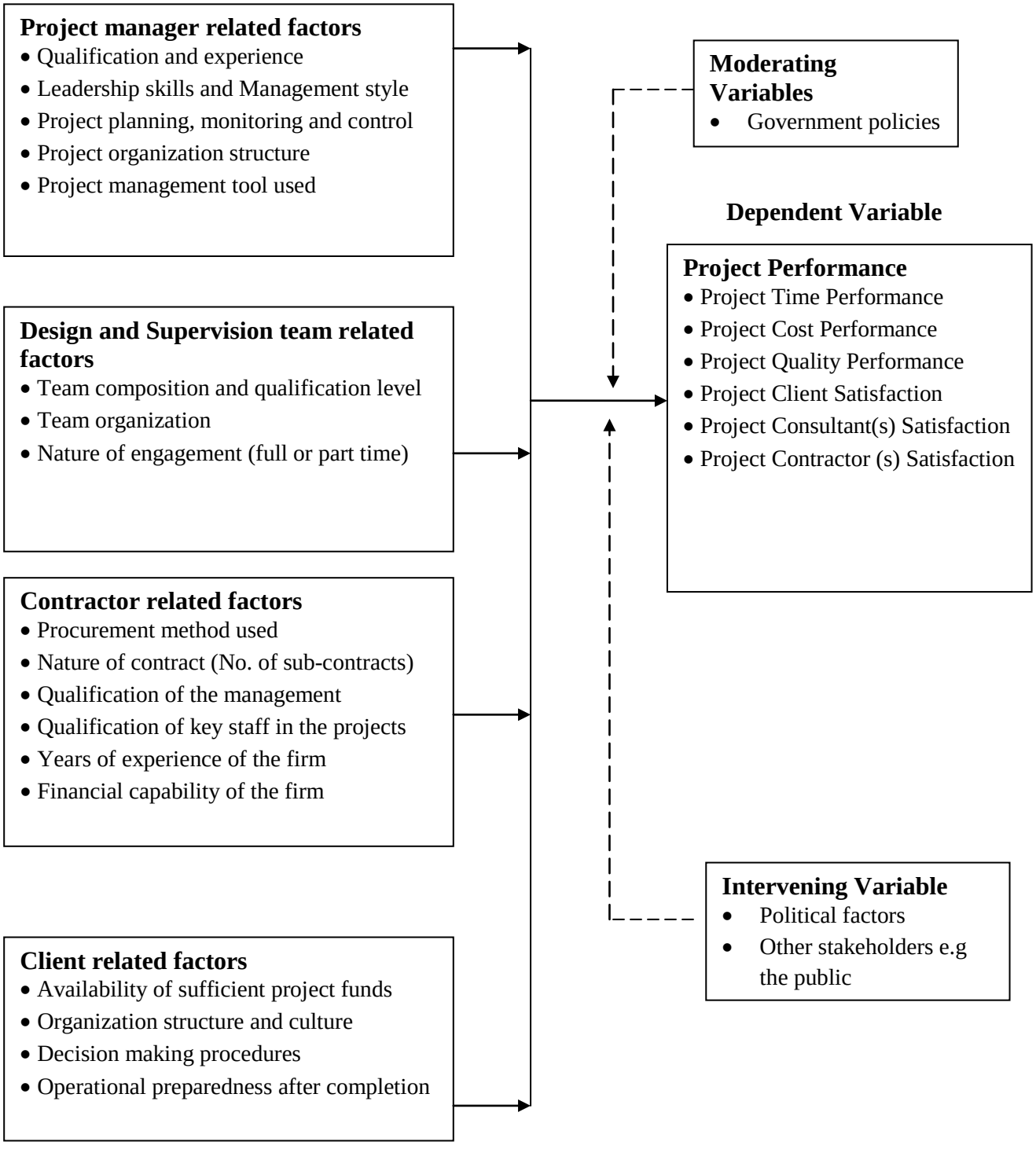

Figure 4: Conceptual framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research design, target population, sample and sampling technique, research instruments and measurement techniques, data collection procedure, data processing and analysis, ethical issues and operationalization of variables.

3.2 Research Design

A research design is said to be the arrangement of conditions for collection in a manner that aims to combine relevance of the research purpose with the economy in procedure (Seltltiz et. al. 1962). According to Yin (2003) research strategy is not distinguished mainly by its appropriateness but by the type of research questions, extent of control and the degree of focus on contemporary issues.

The study adopts the quantitative research method and descriptive survey as the research design (Eastrby-Smith, Thorpe and Jackson, 2008:11) which is both descriptive and cross-sectional in nature.

3.3Target Population

The study area is the railway transport sub sector, in Nairobi with the Kenya Railways Corporation being the key agency. The target projects are the railway infrastructure projects that were identified for implementation by the First Medium Term Plan (MTP1) of the Vision 2030 and the Kenya Railways strategic plan 2007 – 2012. The Vision 2030 MTP1 prioritized the Rail transport programme and the development of light rail for Nairobi and its suburbs commonly known as Nairobi Commuter Rail (NCR). Under the NCR three projects were identified for

implementation by the GOK and KRC: 1. Syokimau Railway Station, 2. Makadara Railway Station, and 3. Imara Daima Railway Station

Table 3. 1: **MTP1 Nairobi Commuter Rail (NCR) Projects**

Study Projects
Syokimau Railway Station
Makadara Railway Station
Imara Daima Railway Station

The target population for the study was those involved in the implementation and management of the projects under consideration mainly made up of the representatives of Client (KRC), Contractors, and Consultants. The KRC establishment is attached in the Appendix 3 of the study.

Table 3. 2: Target Population

Project	**Client (Total establishment 115)**	**Consultant**	**Contractor**
Syokimau	Projects department, Legal department, Procurement department, ICT department,	Architect	Main Contractor
Makadara	Finance department	Engineers	Sub-contractors
Imara Daima	Audit department, Security and CA & PR	Quantity Surveyor	(management and key Staff)
TOTAL	**30**	**15**	**15**

3.4 Sample and Sampling Technique

The determination of sample size was based on accuracy level, margin of error (ME) and confidence level (CI) approach as well as cost and time considerations. As a rule for sample size, n, it should be of an optimum size to achieve the objectives at reasonable costs.

3.4.1 Sample Size

The sample size is determined on the Krejcie and Morgan (1970) table for determination of sample size for research activities attached in Appendices. Because of the conservative nature of the study, a 95% confidence level with 5% accuracy level is adopted. With the value of p = q= 0.5, the sample size n was based on the following formulae:

Table 3. 3: **Sample Frame**

Project	**Client**	**Consultant**	**Contractor**
Syokimau	10	5	5
Makadara	10	5	5
Imara Daima	10	5	5
TOTAL	**30**	**15**	**15**
	Profile of the respondents		
	Project Manager Resident Engineer Clerk of works Internal Auditors Finance & Accounts officers Inspection & acceptance committee	Architect Civil Engineer Electrical Engineer Mechanical Engineer Quantity Surveyor	Main Contractor's Directors Site Agent/manager Sub contractors key staff Site Manager/foreman

With a study population of 60, the sample size used for the study is 52. The samples size was stratified to be drawn from among the various categories of project participants as in Table 3.4.

Table 3. 4 Sample Size

Item	**Client**	**Consultant**	**Contractor**	**Total**
Sample Frame	30	15	15	60
SAMPLE SIZE		**52**		
Stratified % ge of total	50%	16.7%	33.3%	100%
Sampling distribution	26	13	13	52

3.4.2 Sampling Procedure

Selection of participants and/or respondents from whom to gather project related data especially from Client, Consultant and Contractor categories was mainly through purposeful sampling strategies to select "information rich" participants. Some of the strategies employed included: Key informant - selecting individual(s) particularly involved or knowledgeable about the project.

3.5 Research Instruments and Measurement Techniques

According to Kothari (2004) measurement, is a process of mapping aspects of a domain onto other aspects of a range according to some rules of correspondence and that provides that “scaling describes the procedure of assigning numbers to various degrees of opinion, attitude and other concepts”.

To conduct the study, a structured questionnaire was developed and used to collect information on the various critical success factors that influenced the performance of the NCR projects. The research used of both rating scale and 5-rank Likert scales.

3.5.1 Instrument Validity

This was done through content analysis and criterion-related aspects of relevance, freedom from bias, reliability and availability. To ensure validity, data regarding the projects was collected from qualified persons who participated actively in the projects as they are the ones who actively interacted with the projects. According to Cronbach, (1990) good validity coefficient is the best one can get and it is unusual for a validity coefficient to rise above 0.6 though far from a perfect prediction.

3.5.2 Instrument Reliability

To achieve this, the instrument were developed and initially piloted with a small number of respondents to test how easy the questions are understood, relevance to the research topic, level of openness of respondents, how long it may take to administer and cost of administering. Reliability analysis was performed using the internal consistency technique on all identified factors. Cronbach's coefficient, alpha of 0.754 obtained showed an acceptable level of consistency of the set of factors used for the staudy. Cronbach's coefficient, alpha is a general form of the Kender-Richardson (K-R) 20 formula based on the split-half reliabilities of data from all possible halves of the instruments computed as:

$$KR_{20} = \frac{(S - \sum s^2)}{(S^2)(K - 1)}$$

Where: KR_{20} = Reliability coefficient of internal consistency

K = No. of items used to measure the concept

S^2 = Variance of all scores

s^2 = Variance of individual items

3.6 Data Collection Procedure

The Survey as a method of collecting information allows for inputs from various sources as key informants and target population. Data to be used in the study are twofold: primary data and secondary data to the extent practical possible. Secondary data to be used was based on documents reviewed during the research study. The

primary data was collected directly from respondents using tailor made structured questionnaire. The questionnaires shall be administered through drop and pick mode.

3.7 Data Processing and Analysis

The data processing operations at the preliminary stages entailed editing, coding, classification and tabulation of the collected data so that they are amenable to analysis. The editing was necessary to weed out any errors that may have arisen during data collection where possible. Coding facilitated assigning of numerical or any other symbols necessary for efficient analysis. The descriptive characteristics referring to qualitative phenomenon data was classified according to attributes. The processed data was analyzed at preliminary stages by the use of descriptive statistics such as proportions, frequencies and percentages.

The type of data analysis undertaken in this case was empirical analysis. Having identified the critical success factors that influenced the projects performance, their measure of relationship was determined. Mean rank analysis was employed to identify and weight the critical project success factors that influenced project performance. The study also adopted the use of inferential statistics to test on the contribution of the independent variables to the dependent variable which is the project performance; regression analysis will be used where the Karl Pearson model equation will be adopted as below;

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

Where β_0 represent the project performance

X_1 Represent the Manger related factors

X_2 Represents the design and supervion team related factors

X_3 Represents the Contractor related factors

X_4 Represent the clients related factors

Statistical Package for the Social Sciences (SPSS) was used for the analysis.

3.8 Ethical issues

Key to the ethics adherence in the research is confidentiality. This was guaranteed by ensuring that the identity of the respondents is safeguarded. Prior consent of the respondents was sought before engaging them through personal contact. The information collected was for the sole purpose of the research.

3.9 Operationalization of Variables

Operationalization answers the question of how each variable in the study is defined and measured.

Table 3. 5: **Operationalization of Variables**

Objective	Variable	Measurement	Scale
To establish the role of project manager related factors in influencing the performance of the NCR Projects	**Independent** Project Manager and project management Related Factors • Technical capability of project manager • Project manager's competence • Project manager's experience • Leadership skills of project manager • Decision making effectiveness • Project planning, monitoring, & control	Bad, below average, average, good, excellent	Nominal /Ordinal scale
To assess the how the design and supervision team related factors influence the performance of NCR projects.	**Independent** Consultant Related Factors • Technical competence of design team • Design team experience • Project design complexity • Mistakes/delays in producing design Documents • Adequacy of plans and specifications	Bad, below average, average, good, excellent	Nominal /Ordinal scale
To determine the contribution of contractor related factors in influencing the performance of the NCR projects.	**Independent** Contractor Related Factors • Contractor's experience • Nature of contract • Qualification of the management • Qualification of supervision staff • Site management • Contractor's cash flow	Bad, below average, average, good, excellent	Nominal /Ordinal scale
To analyze how client related factors influence the performance of the NCR projects	**Independent** Client Related Factors • Structure and size of client's organization • Clear definition of project scope • Client's ability and decision making process • Client's speed of information flow • Availability of funds, timely payments	Bad, below average, average, good, excellent	Nominal /Ordinal scale
To establish the performance level of the selected NCR projects.	**Dependent** Project performance and success • Project Time Performance • Project Cost Performance • Project Quality Performance • Project Client Satisfaction • Project Consultant Satisfaction • Project Contractor Satisfaction	Bad, below average, average, good, excellent	Nominal /Ordinal scale

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents the data analysis, presentation and interpretation. In addition, the chapter discusses the findings from the research questions that were under investigation. The findings were presented using frequency tables for easy analysis and interpretations. Statistical analysis of the findings was done using frequencies and percentages, means, standards deviations including inferential analysis (correlation and regression analysis).

4.2 Questionnaire response and return rate

Out of the 52 Questionnaires which were issued to the Contractors, clients and consultants, the response rate were as follows 13 (100.00%) Questionnaires of the 13 Questionnaires issued to the contractors were returned, 23(88.46%) Questionnaires of the 26 Questionnaires issued to the clients were returned while 12 (92.31%) Questionnaires were collected from the Consultants out of the 13 Questionnaires issued to the Consultants. This implies that a response rate of 92.30% was realized, this was achieved due to the fact that the researcher closely administered the Questionnaires which led to the significant response rate. The response rate was considered adequate as according to Idrus and Newman (2002) a response rate of 50% is good enough for social studies. The Table 4.1 shows the data collected.

Table 4. 1Questionnaire response rate

Response rate			**Non response rate**	
Population	Frequency	Percentage	Frequency	Percentage
Contractors	13	100.00	0	0
Clients	23	88.46	3	11.54
Consultants	12	92.31	1	7.69

4.3 Demographic characteristics of the respondents

This was basically the information on the population interviewed in this study. It is the demographic characteristics of the sampled population. This section has analyzed the education level, years of work experience, nature of engagement in business, years of incorporation, type of the construction work, annual volume of work and the number of permanent employees.

4.3.1 Distribution of the respondents according to the Category of work

The study sought to establish the distribution of the respondents according to their work category; the data collected were shown in Table 4.2;

Table 4. 2 Category of Work

Category	Frequency	Percentages
Client	31	64.6
Contractor	9	18.8
Consultants	8	16.7
Total	**48**	**100**

From the findings, majority 31 (64.6%) of the respondents were clients, 9 (18.8%) of the respondents were contractors while 8 (16.7%) of the respondents were Consultants. The findings implies that majority of the respondents participants were clients an indication that clients were major participants in the performance of Nairobi commuter railway infrastructure projects.

4.3.2 Distribution of the respondents according to the Education level

This study further sought to establish the education level of the respondents; the data collected from the respondents were presented in the table 4.3;

Table 4. 3 Education level

Education level	frequency	Percentages
Diploma	11	22.9
Graduate	24	50
Post graduate	13	27.1
Total	**48**	**100**

From the findings it was revealed that majority 24 (50.0%) of the respondents were graduates 13 (27.1%) of the respondents were postgraduates, while 11 (22.9%) of the respondents were diploma holders. By implications majority of the participants in the performance of the railways infrastructure projects were graduates who were the project managers, design and supervision team, contractors and the clients who were involved in the performance of these projects.

4.3.3 Distribution of the respondents according to years of work experience

The study sought to establish the distribution of the respondents according to the years of work experience; the data collected were presented in the table 4.4;

Table 4. 4 Years of work experience

Years of work experience	frequency	Percentages
>2-5 years	6	12.5
>5-10years	12	25
>10 years	30	62.5
Total	**48**	**100**

From the findings, it was revealed that majority 30 (62.5%) of the respondents had worked for more than 10 years, 6 (12.5%) of the respondents had worked between 2-5years while 12 (25%) of the respondents had worked between 5-10years. By implications majority of the

participants in the railways infrastructure projects had a working experience of more than 10 years.

4.3.4 Distribution of the respondents according to the nature of engagement in business

The study sought to establish the distribution of the respondents according to the nature of engagement in business, the data collected was presented in the table 4.5;

Table 4. 5 Nature of Business

Nature of business	frequency	Percentages
Sole proprietor	2	4.17
Company	15	31.25
Partnership	0	0
Missing systems	31	64.58
Total	**48**	**100.00**

From the data collected the findings revealed that majority 31(64.58%) of the respondents were not involved in any nature of business mainly because they were drawn from the clients side under the projects of study, while 15 (31.25%) of the respondents were engaged in company form of business, 2 (4.17%) of the respondents were involved in sole proprietorship form of business operations, while none of the respondents were involved in partnership form of business operations. By implication majority of the participants in the railways infrastructure projects under study notably the contractors, clients and the consultants of which most were involved in the company form of business this could have been influenced by the nature of the infrastructure projects being performed which suited the company form of business ownership.

4.3.5 Distribution According to years of incorporation in business

Table 4.6 shows the data collected on the distribution of the respondents according to the years of incorporation in business,

Table 4. 6 Year of incorporation in Business

Years of incorporation	Frequency	Percent
>5-10 years	7	14.6
> 10years	10	20.8
Missing systems	31	64.6
Total	**48**	**100**

The findings revealed that majority 31(64.6%) of the respondents were not involved in the business, this was represented by the missing systems again majorly from clients respondents, while 10 (20.8%) of the respondents have been in business for a period of more than 10 years, 7 (14.6%) of the respondents had been in business for a period between 5-10 years. Those in business were mainly drawn from the contractor and consultants respondents.

4.3.6 Type of the construction work done by the respondents

The study sought to establish the type of construction work done by the respondents; the data collected were shown in the table 4.7;

Table 4. 7 Type of the Construction work

Type of construction work performed	Frequency	Percentage
Building works	4	8.33
Road civil works	3	6.25
Electrical work	4	8.33
ICT	6	12.50
Missing systems	17	35.42
Total	**48**	**100.00**

From the data collected the findings revealed that majority 17 (35.42%) of the respondents were not involved in any of the construction work, 6 (12.50%) of the respondents were involved in ICT, 4 (8.33%) of the respondents were involved in the building works likewise 4 (8.33%) of the respondents were involved in the electrical works while only 3 (6.25%) of the respondents were involved in the road civil works.

4.3.7 Distribution according to Annual turnover

Further the study sought to establish the distribution of the respondents according to the annual turnover, the data collected from the respondents were shown in the table 4.8 which shows the level of annual turnover of the respondents which ranged from <50M to >250-500M.

Table 4. 8 Annual Turnovers

Annual turnover	Frequency	Percentage
<50M	4	8.33
>50-100M	3	6.25
>100-250M	1	2.08
>250-500M	3	6.25
>500M	6	12.50
Missing systems	31	64.58
Total	**48**	**100.00**

From the findings majority of the respondents 6 (12.50%) reported an annual turnovers of >500M, 4 (8.33%) of the respondents reported an annual turnover of <50M, 3 (6.25%) of the respondents reported an annual turnover of >50-100M, concurrently 3 (6.25%) of them reported an annual turnover of >250-500M while only 1 (2.08%) reported an annual turnover of >100-250M.

4.3.8 Analysis of the Number of Permanent Employees

Further the study sought to establish the number of permanent employees, the data collected was shown in the Table 4.9;

Table 4. 9 Number of Permanent Employees

Number of Permanent employees	Frequency	Percentage
<2	4	8.33
>5-10	3	6.25
>10	10	20.83
Missing systems	31	64.58
Total	**48**	**100.00**

From the findings, majority of the respondents 10 (20.83%) reported to have >10 permanent employees, 4 (8.33%) of the employees reported having <2 of the permanent employees, 3 (6.25%) of the employees reported having >5-10 of the permanent employees, even though majority 31 (64.58%) of the respondents did not respond to this question having been drawn from the client. By implication most of the participants of railways infrastructure projects under study had more than 10 permanent employees.

4.3.9 Analysis of the Project being assessed

Further the study sought to establish in each case the project which was being accessed the data collected were presented in Table 4.10;

Table 4. 10 Projects being assessed

Project	Frequency	Percentage
Syokimau station	12	25.00
Makadara station	16	33.33
Imara daima station	20	41.67
Total	**48**	**100.00**

From the findings majority 20 (41.67%) of the respondents were attached to the Imara daima station, 16 (33.33%) of the respondents were attached to the Makadara station, while 12 (25.00%) were attached to the syokimau station. The findings implies that majority of the respondents were attached to the Imara daima station. The low response from Syokimau station was due to the fact that by the time of study the project had already been completed hence challenge of finding a group of the respondents.

4.4 Project Performance

The dependent variable that the study sought to achieve was the performance of the railways infrastructure projects, the data collected in this section were presented in the table 4.11;

Table 4. 11 Project Performance

Project performance indicators	Mean	SD	Mean Rank
Time performance	1.9583	.87418	6
Cost Performance	2.2083	.89819	5
Quality Performance	3.7917	.82406	3
Client satisfaction	3.7083	1.14777	4
Design Team Satisfaction	4.0208	.83767	2
Contractors Satisfaction	4.1875	.70428	1

From the findings majority of the respondents reported that contractor satisfaction was highly achieved as this was shown by a mean score of 4.1875, other respondents also reported that design team satisfaction was greatly achieved as shown by a mean score of 4.0208, further respondents also reported that project performance was manifested through client satisfaction as this was shown by a mean score of 3.7083. From the analysis based on the participants (client, contractor, consultant), contractor satisfaction was perceived to have had the highest rating of project performance with the Client the least rating. Concurrently based on time, cost

and quality performance the respondents contend that project performance was manifested greatly through Quality performance as shown by a mean score of 3.7917, however the project performance was less in the cost performance and time performance as was shown by a mean score of 2.20 and1.95 respectively. The findings of the study therefore imply that Contractors Satisfaction was highest followed by the Design Team Satisfaction with the Client satisfaction being least satisfied. Further, Performance was least in Time performance followed by Cost Performance and Quality Performance respectively.

Being the dependent variable that the study sought to measure, the study findings established two set of indicators namely time, cost, quality performance against Client, design team, contractor satisfaction. The two sets are advanced by both Baker et al. (1983) and Baccarini (1999) who in their studies consider project performance under two components of project management success (golden triangle) and product success (perceived performance).

From the literature review, the first category conventionally referred to as the "golden triangle". (Atkinson, 1999), performed generally dismally with time scoring the least. This was attributed mainly to the fact that the projects overran their initial project period as well as cost. Appendix 3 gives project data on the time and cost of the study projects to validate this. It was a general view of respondents from all categories that the projects underperformed in these areas. The time performance is in line with (Balachandra, 1997) who argues that in most organizations, project management principles are followed, yet less than 10% of projects are finished on time. According to Flyvbjerg et al. (2005; 2009) the average cost overrun for infrastructure large-scale projects could range from 20.4% to 44.7% and that nine out 10 projects have cost overrun worldwide. Traditional estimation practices have been shown to be

particularly vulnerable to issues like over-optimism about outcomes of planned actions, resulting in poor estimation accuracy (Flyvbjerg et. al., 2002). On the other hand other studies have shown that technical factors lead to cost overruns, including lack of experience, the size of the project, mistakes in design, overall price fluctuations, inaccurate estimations, etc (Memon et.al., 2010). Further Love et.al., (2011) in their study on the causes of cost overruns within two case studies (hospital and school) found that technical factors (such as design errors) are the major issues leading to cost overruns. However under the second sub-set, while it recorded higher scores indicating high levels of satisfaction, the Client recorded the least. This was attributed to the fact that the client satisfaction levels are majorly influenced by the results of the golden triangle parameters (time, cost, quality) which in this case performed dismally leading to low client satisfaction levels on general project performance.

According to research conducted in the UK among consultants (Kometa, Olomolaiye and Harris, 1996) investigating the fundamental needs of clients by computing the relative importance index enabled the needs to be ranked in terms of importance. In the study quality, time and cost were ranked third, fourth and fifth after the first ranked functionality of the building and the second safety, both during construction and through the life of the project. In South Africa a similar study conducted investigating the importance of eleven parameters according to architects (Smallwood, 2000a), based on importance index ranked client satisfaction first followed by project quality, project cost, project time, project health and safety, public health and safety, labour productivity, environment, worker satisfaction, designer satisfaction and contractor satisfaction respectively.

Based on the project findings that ranked Contractor satisfaction highly and time, cost and quality low was a perfect show that there was a general underperformance on the NCR projects based on the importance index ranking as postulated by the research findings of Smallwood, 2000a. Stakeholders' satisfaction continues to remain an important approach to performance measurement and clients are the most important stakeholders as the project objectives are derived from them and their requirements are the focus of projects. Kotler (2000) maintains that satisfaction or dissatisfaction can result from the performance of a product as compared to the person's expectations and feelings. Neto et al (2007) states that marching or exceeding the client's expectation results in a satisfied client.

4.5 Influence of Project manager related factors on the Performance of NCR Projects

Objective one of the study sought to establish how project manager related factors influence the performance of the NCR Projects, the data collected from the respondents were represented in the table 4.12;

Table 4. 12 Project Manager Related Factors

Project Manager Related Factors	Mean	SD	Rank	Criticality
Technical capability of the project manager	3.5625	1.18333	3	3
Project managers competence	3.4167	1.19988	6	3
Project managers experience	3.3958	1.23322	7	3
Leadership skills of the project manager	3.3750	1.10367	8	3
Project managers authority to make decisions	3.4583	1.05100	5	3
Organizing & Coordinating skills of project manager	3.5000	1.11087	4	3
Project managers ability to delegate authority	3.7917	1.25407	1	4
Project managers early/continued involvement in the project	3.6667	1.15470	2	3
Valid N (listwise)				

From the findings, majority of the respondents strongly agreed that Project managers ability to delegate authority had great influence on the performance of the project as this was shown by a mean score of 3.7917, also respondents agreed that Project managers early & continued

involvement in the project was a project performance related factor as this was shown by a mean score of 3.6667, Technical capability of the project manager also influenced on the performance of the project this was shown by a mean score of 3.5625, Organizing & Coordinating skills of project Manager also influenced on the performance of the project this was shown by a mean score of 3.5000. Other factors reported to be involved in the project manager related factors included the Project Managers authority to make decisions, project managers competence, project managers experience and Project Managers authority to make decisions as shown by a mean score of 3.4583, 3.4167, 3.3958 and 3.3750 in each case.

According to Chua et al. (1999), the key factors for project manager included skills and characteristics of project managers, their commitment, competence experience and authority. The findings of the study seems to agree with the study findings by Saqib et al, 2008 which ranked project manager ability high even though on the other factors the findings in this study had a relatively lower criticality index as opposed to theirs.

4.6 Influence of Design team related factors on the performance of NCR Projects

Objective two of the study sought to establish the influence of Design and supervision team related factors on the performance of NCR Projects, the data collected were presented in the following Table 4.13;

Table 4. 13 Design and Supervisory related factors

Design and supervisory related factors	Mean	SD	Rank	Criticality
Technical competence of the design team	3.3125	1.18781	8	3
Design team experience	3.4792	1.25460	4	3
Project design complexity	3.4167	1.18202	6	3
Mistakes/delays in producing design documents	3.4375	1.16521	5	3
Adequacy of plans and specifications	3.5208	1.18483	2	3
Design team contributions to construction	3.5000	1.16692	3	3
Nature of engagement of the design team	3.5417	1.25407	1	3
Design team Organization	3.4792	1.18483	4	3
Facilitation of the design team	3.3958	1.19822	7	3
Motivation /remuneration of the design team	3.2292	1.03635	9	3
Valid N (list wise)				

From the findings, majority of the respondents strongly agreed that Nature of engagement of the design team (Full time or part time) greatly influenced the performance of the project as shown by a mean score of 3.5417, Adequacy of plans and specifications in design and supervisory followed closely as shown by a mean score of 3.5208, further other respondents also contend that Design team contributions to construction also influenced on the performance of the project as was shown by a mean score of 3.5000, further Mistakes/delays in producing design documents was also strongly significant to the performance of the project as shown by a mean score of 3.4375. By implication the study revealed that design and supervisory related factors contributed to the performance of the railways projects these factors include with the Nature of engagement of the design team (Full time or part time) having great influence with a mean score of 3.5417 and motivation/remuneration of design team being the least with a mean score of 3.2292.

The study findings agrees with Saqib et al. (2008) on adequacy of plans but introduces a critical factor on the nature of engagement of the design team which in this study was very critical. Comparatively the criticality indices are much lower than in the earlier study.

4.7 Influence of Contractor related factors on the performance of the NCR Projects

Objective three of the study sought to establish the contractor related factors on the performance of the NCR projects, the data collected were presented in the table 4.14;

Table 4. 14 Contractor related factors

Contractor related factors	Mean	SD	Rank	Criticality
Procurement methods used to get contractor on board	3.4167	1.12672	7	3
Contractors experience	3.4583	1.33621	5	3
Nature of the contract(extent of the subcontracting)	3.4375	1.23609	6	3
Qualification of the contractor's management	3.5417	1.03056	4	4
Supervision and qualification of the supervision staff	3.7083	.94437	3	4
Site management	3.8542	.87494	1	4
Contractors cash flow	3.8542	1.14835	1	4
Effectiveness of cost control system	3.7917	1.20210	2	4
Valid N (listwise)				

From the findings, majority of the respondents strongly agreed that the Site management and Contractors cash flow greatly influenced on the performance of the project as was shown by a mean score of 3.54 respectively, others contend that Effectiveness of cost control system greatly contributes on the performance of the project this was shown by a mean score of 3.79, Supervision and qualification of the supervision staff also contributed to influence on the performance of the project as was shown by a mean score of 3.70, also qualification of the management as shown by a mean score of 3.54, Nature of the contract(extent/involvement of the subcontracting) as was shown by a mean score of 3.43, Procurement methods used to get contractor on board and the Contractors experience as shown by a mean score of 3.45 and

3.41 respectively. By implication, Site management and Contractors cash flow had the greatest influence on the projects performance while procurement method employed to get the contractor on board had the least influence. While Saqil et al. (2008) found that contractors experience was most critical, this study established a different order with the contractors cash flow being top. The criticality indices were fairly close with their findings of most significant.

4.8 Influence of Clients related factors on the performance of the NCR Projects

Objective four of the study sought to establish the influence of clients related factors on the performance of the NCR Projects, the data collected were shown in the table 4.15;

Table 4. 15 Client related factors

Clients related factors	Mean	SD	Rank	Criticality
Nature of client (private or public)	3.8542	1.28807	8	4
Structure and the size of the client organization	4.0625	1.06003	2	4
Clients Knowledge of the project Organization	3.6250	1.31481	12	4
Clients experience in the managing projects	3.6042	1.16216	13	4
Clear definition of scope & objectives by the client	3.7917	1.09074	9	4
Clients confidence in the construction team	3.6458	1.13905	11	4
Clients project management style and competence	3.9375	1.06003	6	4
Clients ability and decision making process	4.0208	.99978	4	4
Clients speed of information flow	4.0000	1.05185	5	4
Availability of funds	4.1458	1.01036	1	4
Timely facilitation of payments	4.0417	.84949	3	4
Client risk attitude (willingness to take risks)	4.0000	.92253	5	4
Clients ability to define roles in the project	3.8750	.93683	7	4
Clients operational preparedness	3.7083	.98841	10	4
Valid N (listwise)				

From the findings majority of the respondents reported that Availability of funds was a key to project performance shown by mean score of 4.1458 followed closely by Timely facilitation of payments as was shown by a mean score of 4.0417. Clients ability and decision making

process influenced the performance of the project as was shown by a mean score of 4.0208, also, Clients speed of information flow as shown by a mean score of 4.000, Structure and the size of the client organization as shown by a mean score of 4.0625, Clear definition of the project scope and objectives by the client as was shown by a mean score of 3.79.

By implication under client related factors, availability of funds greatly influence the performance of the project under study (mean of 4.1458), with the Client experience of managing project as having the least influence (mean of 3.6042). Under client related factors, while Saqib et al. (2008) established timely decision making by client to be most critical, this study ranked availability of funds as most critical. However in general the level of criticality indices of the factor were very closely related.

4.9 Inferential Analysis

This section presents coefficient of correlation, coefficient of determination, ANOVA and regression coefficient. Coefficient of correlation shows the relationship between the dependent variable and the independent variables, coefficient of determination shows the contribution of independent variables to the dependent variable, ANOVA tests the significance of the regression model while the regression coefficient shows the effect of unit increase in dependent variable to the independent variable.

4.9.1 Coefficient of Correlation

To compute the correlation (strength) between the study variables and their findings the study used the Karl Pearson's coefficient of correlation (r). The findings are shown in Table 4.16.

Table 4. 16 Coefficient of Correlation

		Project Performance	Project Managers	Design & Supervision	Contractors	Clients
Project Performance	Pearson Correlation	1				
	Sig. (2-tailed)	-				
Project managers	Pearson Correlation	0.557	1			
	Sig. (2-tailed)	0.3079	-			
Design and supervision	Pearson Correlation	0.512	0.320	1		
	Sig. (2-tailed)	0.1855	0.0194	-		
Contractors	Pearson Correlation	0.520	0.1846	0.1107	1	
	Sig. (2-tailed)	0.0023	0.1857	0.4300	-	
Clients	Pearson Correlation	0.538	0.0072	0.2335	0.1027	1
	Sig. (2-tailed)	0.0422	0.9591	0.0925	0.4642	-

The correlation analysis revealed that there was a positive correlation between contractor satisfaction and authority to delegate shown by a correlation figure of 0.557, between contractor satisfaction and nature of engagement of the design team with a correlation figure of 0.512, between contractor satisfaction and contractor cash flow with a correlation figure of 0.52, between contractor satisfaction and timely facilitation of payment to the clients, with a correlation value of 0.538 was realized.

4.9.2 Coefficient of Determination

Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (Project performance) that is explained by all the four independent variables (Project manager, design and supervision, contractor and client related factors). The analysis produced a coefficient of determination, R of 0.545.This means that 54.5% of the critical success factors under study accounted to the overall performance of the projects under study with unaccounted factors not covered in this project being 45.5%. Further research can

be done to identify such factors to improve on the R^2 value. However, this does not in any way affect the integrity of the study findings compared to 21% by Johansson and Gustafsson (2009) and 62.9% by Cosmas et.al.(2013). The findings are tabulated in Table 4.17.

Table 4. 17 Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	0.738	0.545	0.214	0.160

4.9.3 ANOVA

In trying to establish significance of the model the study employed ANOVA. Table 4.3 gives the summary of the findings.

Table 4. 18 Anova

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	12.624	4	3.156	9.793	.009
	Residual	30.616	95	.322		
	Total	43.240	99			

The significance value is 0.009 which is less than 0.05 thus the model is statistically significance in predicting Project manager, design and supervision, contractor and client related factors impact to project performance. The F critical at 5 percent level of significance was 2.70. Since F calculated is greater than the F critical (value = 9.793), this shows that the overall model was significant.

4.9.4 Regression Coefficient

Multiple regression analysis was conducted as to determine the relationship between project performance and the four independent variables with the following general equation:

$(Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon)$ ----------Eqn 1

The SPSS generated results are tabulated in Table 4.19.

Table 4. 19: Regression Coefficients

Variable	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	
	B	Std. Error	Beta			Rank
(Constant)	1.180	0.3303		0.5449	0.5881	
Manager related factors	0.541	0.1530	0.0498	0.3731	0.0201	3
Consultant related factors	0.507	0.1658	0.0170	0.1210	0.0262	4
Contractor related factor	0.518	0.1502	0.3209	2.4461	0.0252	1
Clients related factors	0.528	0.1398	0.2527	1.9406	0.0223	2

From the SPSS generated regression coefficients in Table 4.19 the general equation becomes:

$Y = 1.180 + 0.0498 X_1 + 0.017 X_2 + 0.3209 X_3 + 0.2527 X_4$ ----------Eqn 2

Thus, the combination of the independent variables X_1, X_2, X_3, and X_4 significantly predicts the dependent variable Y.

The ranking of the project participants' related factors based on the standardized beta coefficient, which also shows the actual level of impact or contribution of independent variable to any change in the dependent variable is as follows:

$1^{st} = X_3$: Contractor related factor

$2^{nd} = X_4$: Client related factors

$3^{rd} = X_1$: Project manager related factors

$4^{th} = X_2$: Consultant related factors

Table 4. 20: Comparison of frequency ranking and Beta ranking of the factors

	Variable/Factors	Beta Ranking	Frequency Ranking	Consistency test	Comment
X1	Manager related factors	3	3	Yes	No difference
X2	Consultant related factors	4	4	Yes	No difference
X3	Contractor related factor	1	2	Yes	Difference low
X4	Clients related factors	2	1	Yes	Difference low

Table 4.20 gives 100% consistency showing that the respondents demonstrated good knowledge of the subject under study hence valid entries.

4.9.5 Test of Hypothesis

The research hypothesis was postulated as follows: Project participants' (Client, Consultant, Contractor and Project manager) related factors have no significant correlation on the performance of railway infrastructure projects.

Null Hypothesis: Project participants related factors do not influence the performance of railway infrastructure projects

Alternate Hypothesis: Project participants' related factors influence the performance of railway infrastructure projects

From the ANOVA, the significant F is 0.009 and the from the t-test with all values less than 0.05, it can be concluded that the null hypothesis be rejected and that all the project participants' related factors have a significant influence on the performance of railway infrastructure projects.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, discussions, conclusions and recommendations of the study findings. The chapter discusses the findings in relation to the literature review and the objectives identified for the study. The recommendations drawn were based on the outcomes of the study.

5.2 Summary of Main study findings

As mentioned in the research methodology, a questionnaire survey was used, where respondents were asked to rate the criticality of the project participant related factors listed in the questionnaire to the performance of the NCR projects.

5.2.1 Inferential Analysis

The findings of the study answered the research questions since the influence of project manager related factors, design and supervision team related factors, contribution of contractor related factors and client related factors have been quantified through empirical analysis and quantitative statistics. The summaries of findings were presented for each of the four variables of the study.

Table 5. 21 Project Manager related factors and Contractor related factors

CSF	Project Manager Related Factors				CSF	Contractor Related Factors			
	Mean	SD	Mean Rank	Criticality Index		Mean	SD	Rank	Criticality Index
CSF1	3.5625	1.18333	3	3	CSF1	3.4167	1.12672	7	3
CSF2	3.4167	1.19988	6	3	CSF2	3.4583	1.33621	5	3
CSF3	3.3958	1.23322	7	3	CSF3	3.4375	1.23609	6	3
CSF4	3.3750	1.10367	8	3	CSF4	3.5417	1.03056	4	3
CSF5	3.4583	1.05100	5	3	CSF5	3.7083	.94437	3	3

CSF6	3.5000	1.11087	4	3	CSF6	3.8542	.87494	1	4
CSF7	3.7917	1.25407	1	4	CSF7	3.8542	1.14835	1	4
CSF8	3.6667	1.15470	2	3	CSF8	3.7917	1.20210	2	4
Category mean criticality Index				**3.125**	Category mean criticality Index				**3.375**

Table 5. 22 Design/Supervision team related factors and Client related factors

CSF	Design/Supervision Team Related Factors				CSF	Client Related Factors			
	Mean	SD	Mean Rank	Criticality Index		Mean	SD	Mean Rank	Criticality Index
CSF1	3.3125	1.18781	8	3	CSF1	3.8542	1.28807	8	4
CSF2	3.4792	1.25460	4	3	CSF2	4.0625	1.06003	2	4
CSF3	3.4167	1.18202	6	3	CSF3	3.6250	1.31481	12	3
CSF4	3.4375	1.16521	5	3	CSF4	3.6042	1.16216	13	3
CSF5	3.5208	1.18483	2	3	CSF5	3.7917	1.09074	9	4
CSF6	3.5000	1.16692	3	3	CSF6	3.6458	1.13905	11	3
CSF7	3.5417	1.25407	1	3	CSF7	3.9375	1.06003	6	4
CSF8	3.4792	1.18483	4	3	CSF8	4.0208	.99978	4	4
CSF9	3.3958	1.19822	7	3	CSF9	4.0000	1.05185	5	4
CSF10	3.2292	1.03635	9	3	CSF10	4.1458	1.01036	1	4
Category mean criticality Index				**3.0**	CSF11	4.0417	.84949	3	4
					CSF12	4.0000	.92253	5	4
					CSF13	3.8750	.93683	7	4
					CSF14	3.7083	.98841	10	3
					Category mean criticality Index				**3.714**

When running multiple projects as in the case of NCR projects, over and above the project managers skills and competence, his ability to delegate and his early involvement in the project have great influence in determining project performance. This is evident by the two factors CSF7 and CSF8 emerging tops in ranking in this category. Increase in the complexity of coordination of project parties usually makes it harder to meet projects preset targets. These relates to issues such as contractor's poor site management and supervision, additional work,

lack of communication among parties, mistakes during construction, slow information flow between parties, design errors, project size, incomplete drawings, inadequate specifications, scope change of the project and delay in the preparation and approval of drawings which account for up to 38% of project performance.

The nature of Consultant design team engagement whether full or part time(CSF7) and the adequacy of plans and specifications(CSF5) were critical in the performance of the projects under study. When the design team are engaged part time as was the case in the projects under study, not full focus and attention is give to the project and this adversely affects the projects by slowing down the implementation process. Further considering that the projects were a first after a long time of not having implemented railways projects, the project designs were characterised by multiple alterations which equally had a big role in the overall performance. In the Allahaim et.al.,(2011) typology on project performance, lack of experience of project type, poor technical performance, impractical and complicated design generalised under novelty accounting for 20% on project performance.

Considering that the projects were characterised by delay in client facilitating payments to the contractor, this is evident by the Contractor's cash flow(CSF7) recording the highest influence under this category. This is in tandem with the typology on project performance as advanced by Allahaim et.al.(2011) that identifies monthly payment difficulties from agencies, cash flow during construction, financial difficulty of client, cash flow and financial difficulty of contractor, slow payment of completed works also categorised as market volatility as accounting to about 20% of project performance. The same is the case with the delay in decision making process by the client leading to contractor concurrence on the speed of

information flow(CSF9). In this case, the typology provides aspects such as unrealistic contract duration and requirement, incorrect planning and scheduling by contractors, poor designs and delay in designs, delay in decision making, inadequate planning all falling under time pressures to account for almost 10% of project performance.

From the combined averages for the criticality indices, all the project participants namely project manager (3.125), contractor (3.375), design/supervision team (3.00), and client (3.714), it shows that all participants had a moderate influence on the projects performance. However the client had a greater influence on the projects performance either positively or negatively depending on the individual CSFs. As it is evident from the Availability of funds (CSF10) under the client related factors, this played role in the performance of the projects as funds were readily available and had been allocated for by central government and Kenya Railways for the implementation of the project. While this could have been a positive influence its effect might have been reduced due to the negative influence from structure and size of client's organization(CSF2), Timely facilitation of payment(CSF11), Client ability and decision making process(CSF8), Clients speed of information flow(CSF9) and Clients risk attitude(CSF12) which equally recorded high means due to lateness in facilitating payments, clients delay in decision making due to being risk averse.

5.2.2 Inferential Analysis

The correlation analysis portray that even though the correlations are positive, they are not significant. This shows that there was a moderate correlation between project performance and the project participants' categories under study; project manager, design and supervision,

contractor and client related factors. The lack of significance in the individual relationships could be due to interactive effects with the other variables.

From the coefficient of determination findings of Table 4.18, 54.5 percent of project performance was attributed to combination of the four independent factors (Project manager, design and supervision, contractor and client related factors) investigated in this study. A further 45.5 project performance is attributed to other factors not investigated in this study. Therefore, there is a dare need for further research that should be conducted to investigate the other factors (45.5 percent) that contribute to the project performance.

The regression equation Eqn 2 established that taking all factors into account (Project manager, design and supervision, contractor and client related factors) constant at zero, project performance will be 1.180. The findings presented also shows that taking all other independent variables at zero, a unit increase in project manager related factors will lead to a 0.0498 increase in project performance; a unit increase in design and supervision related factors will lead to a 0.017 increase in project performance; a unit increase in contractor related factors will lead to a 0.3209 increase in project performance and a unit increase in client related factors will lead to a 0.2527 increase in project performance. This infers that contractor related factors contribute most to project performance followed by clients related factors then design and supervision related factors and lastly project manager related factors contributed the least to project performance.

5.3 Conclusion of the study

The conclusions of the study are based on the four independent variables of the study: project manager related factors; consultant (design and supervision team) related factors; contractor related factors; client related factors on the performance of the NCR projects.

According to the literature review, there should be a small number of critical success factors (CSFs). Rockart, 1979 recommends 10 or fewer. From the study findings project participants' related factors that had the most influence on the performance under study were summarised as in the table below.

Table 5. 23 Summary of most critical factors that influence projects performance

CSF	Mean	SD	Mean Rank	Criticality Index
Client Related Factors (Category mean criticality index =3.714)				
Availability of funds	4.1458	1.0104	1	4
Structure and size of clients organization	4.0625	1.0600	2	4
Timely facilitation of payments	4.0417	.8495	3	4
Clients ability and decision making process	4.0208	.9998	4	4
Clients speed of information flow	4.0000	1.0519	5	4
Clients risk attitude(willingness to take risk)	4.0000	.9225	5	4
Contractor Related Factors (Category mean criticality Index =3.375)				
Contractors site management	3.8542	.8749	6	4
Contractor's cash flow	3.8542	1.1484	6	4
Speed of information flow	3.7917	1.2021	7	4
Project Manager Related Factors (Category mean criticality Index =3.125)				
Project manager's ability to delegate	3.7917	1.2541	7	4
Project manager's early involvement	3.6667	1.1547	8	3
Design/Supervision Team Related Factors (Category mean criticality Index= 3.000)				
Nature of engagement (Full or Part time)	3.5417	1.2541	9	3
Adequacy of plans and specifications	3.5208	1.1848	10	3

The inferential analysis showed a positive moderate correlation among the factor groups, with the coefficient of determination establishing that the four participants related factors accounted for up to 54.5% of the performance of the projects with the null hypothesis being

rejected and accepting the alternate that project participant related factor influence the performance of railway infrastructure projects.

5.4 Recommendations

The study findings and conclusion highlight the focus areas for Nairobi Commuter Rail projects and serves as a guideline for the future performance for such infrastructure projects.

As suchhe study makes the following recommendations;

1. The project manager should have adequate team to delegate functions whenever dealing with multiple projects.
2. Engagement of consultant (design/supervision team) should be more on full time as opposed to part time to the extent practically possible and that design plans should be made as detailed and adequate to facilitate their constructability
3. To improve on future performance of such infrastructure projects, over and above contractors experience, due care should be taken on contractor site management skills, cash flow and speed of information flow.
4. The Client should consider streamlining its systems especially with regard to Payments, decision making and information flow to enhance performance of their infrastructure projects.

5.5 Direction for further study

Although this research has come up with certain critical success factors influencing performance of projects, the findings are limited to the case of Nairobi Commuter Rail (NCR) project, a first of its kind after many years of following neglect of railway development in Kenya. Further although it is believed that critical factors cannot be generalised for all

projects, CSFs identified in other cases or projects can help come up with a mode of generalization of the factors as well as the relationship among the factors.

The researcher therefore suggests that a similar study should be conducted in a different railway infrastructure project (like say the upcoming Standard Gauge Railway Project) to act as a control project while measuring the same and more variables to ascertain the objectivity of the findings in this study. This may also provide a large sample size of the target population to be able to come up with more collaborative findings since the nature of the study is critical based on other factors which could vary based on the geographical location and other indirect related project participants such as central government involvement and the general public.

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APPENDICES:

Appendix 1: Transmittal Letter

George O. Aoko
University of Nairobi
School of Continuing and Distance Education

The Respondent,

_____

P. O. Box NAIROBI

Dear Sir/Madam:

RE: ACADEMIC RESEARCH

I am a student at the University of Nairobi pursuing a Master of Arts degree in Project Planning and Management. I am conducting and academic research on the Influence of project participants to the performance projects: a case of Kenya Railways Nairobi Commuter Rail Projects.

I therefore seek you consent to facilitate my research process by participating as a responded to the questionnaire developed for this purpose. May I also take this opportunity to guarantee you of full confidentiality and that the resulting data will be used solely for academic purposes.

Yours faithfully
George Aoko

Appendix 2: Questionnaire (to Project manager, Contractor, Consultant and Client)

PART A

a. Under which of the following do/did you work?

   Client Contractor Consultant

   What is/was your role in the project…….

   What is your education level?

   Secondary Diploma Graduate Post graduate

   Years of work experience

   <2years >2-5years >5-10years >10years

   Section 2 please provide business information below if 2 or 3 in question 1 above

b. Nature of engagement in business

   Self/sole proprietor Partnership Company

c. Years of incorporation/ years in business

   <2years >2-5years >5-10 years > 10years

d. Types of the construction work performed

   Building works Road/civil works Electrical works Mechanical works ICT

e. Annual volume of work (annual turnover)

   <50M >50-100M > 100-250M >250-500M >500M

f. Number of permanent employees

   <2 >2-5 >5-10 >10

PART B

NCR Projects (Tick the project being assessed**)**

1. Syokimau Station
2. Makadara Station
3. Imara Daima Station

PROJECT PERFORMANCE

In your own assessment how would you rate the level to which the NCR project performed?

Least performance **Highest performance**

Parameter	1	2	3	4	5
Time performance					
Cost Performance					
Quality Performance					
Client satisfaction					
Design Team Satisfaction					
Contractors Satisfaction					

PART C.

Instruction to respondent

Criticality and influence level assessment

Factor Score range	Criticality index	Influence Level
0.5 – 1.25	1	Had least influence on project performance
1.25 – 2.5	2	Had minimal influence on project performance
2.5 – 3.75	3	Had moderate influence on project performance
3.75 – 5.0	4	Had most influence on project performance

Question

In your own assessment based on the criticality and the influence level assessment criteria above) how would you rate the level to which the following factors influenced the performance of this Nairobi Commuter Rail (NCR) infrastructure development project so far implemented

NRC Projects (Tick the project being assessed)

1. Syokimau Station
2. Makadara Station
3. Imara Daima Station

Project Participants Factors influencing project Performance

		1	2	3	4	5
A	**Project Manager related factors**					
CSF1	Technical capability of the project manager					
CSF2	Project managers competence					
CSF3	Project managers experience					
CSF4	Leadership skills of the project manager					
CSF5	Project Managers authority to make decisions					
CSF6	Organizing & Cordinating skills of project Manager					
CSF7	Project managers early & continued involvement in the project					
CSF8	Project managers adaptabtability to changes in the project plan					
B	**Consultants (Design & supervision Team) related factors**					
CSF1	Technical competence of the design team					
CSF2	Design team experience					
CSF3	Project design complexity					
CSF4	Mistakes/delays in producing design documents					
CSF5	Adequacy of plans and specifications					
CSF6	Design team contributions to construction					
CSF7	Nature of engagement of the design team (Full time or part time)					
CSF8	Design team Organization					
CSF9	Facilitation of the design team					
CSF10	Motivation /remuneration of the design team					

C	**Contractor related factors**					
CSF1	Procurement methods used to get conctractor on board					
CSF2	Contractors experience					
CSF3	Nature of the contract(extent/involvement of the subcontracting)					
CSF4	Qualification of the management					
CSF5	Supervision and qualification of the supervision staff					
CSF6	Site management					
CSF7	Contractors cash flow					
CSF8	Speed of the information flow					
D	**Client related factors**					
CSF1	Nature of client (private or public)					
CSF2	Structure and the size of the client organization					
CSF3	Clients Knowledge of the project Organization					
CSF4	Clients experience in the managing projects					
CSF5	Clear definition of the project scope and objectives by the client					
CSF6	Clients confidence in the construction team					
CSF7	Clients project management style and competence					
CSF8	Clients ability and decision making process					
CSF9	Clients speed of information flow					
CSF10	Availability of funds					
CSF11	Timely facilitation of payments					
CSF12	Client risk attitude (willingness to take risks)					
CSF13	Clients ability to define roles in the project					
CSF14	Clients operational preparedness after after project completion					

Appendix 3: PROJECT DATA AND ORGANIZATION ESTABLISHMENT

KENYA RAILWAY CORPORATION
SCHEDULE OF CAPITAL PROJECTS FOR 2012/2013

NO.	PROJECT DESCRIPTION	CONTRACTOR	CONTRACT AMOUNT Kshs.	PAYMENT BY 30TH OCTOBER	CONTRACT PERIOD	START DATE	COMPLETION DATE	REVISED DATE	% OF PROG.	STATUS	CHALLENGES
1	PROPOSED CONSTRUCTION OF 2 NO. BLOCKS AT WESTLAND	DINESH CONSTRUCTION LTD.	1,235,916,450.00	620,642,247.50	91 WEEKS	8/9/2011	9/6/2013	8/1/2013	70	ON- GOING	Extra excavations for foundations in the upper block due to low bearing capacity at the initially anticipated depth
2	BUILDING AND ASSOCIATED CIVIL & MECHANICAL WORKS FOR IMARA DAIMA INTERMODAL RAILWAY STATION	H.K.BUILDERS	297,444,378.88	230,512,981.15	Revised 62 WEEKS	1/23/2012	4/9/2012	31/3/2013	98	ON- GOING	Storm water ponded in the excavated carpark causing delays in executing works
3	BUILDING AND ASSOCIATED CIVIL & MECHANICAL WORKS FOR MAKADARA INTERMODAL RAILWAY STATION	CENTER STAR CO. LTD	399,023,228.00	229,631,375.45	Revised 58 WEEKS	1/4/2012	4/10/2013	30/6/2013	98	ON- GOING	delayed lifting of the second existing railway line at the yard by RVR caused a delay in completing works for the second platform
4	REPAIRS AND REFURBISHMENT OF NAIROBI CENTRAL STATION	CENTER STAR CO. LTD	50,963,397.63	49,666,263.00	Revised 20 WEEKS	3/16/2012	31/8/2012		100	PROJECT COMPLETE	Completed
5	CONSTRUCTION OF TOILETS AT THE PLATFORM AREA, BICYCLE, PASSENGER WATING SHED AND EXTERNAL WORKS AT SYOKIMAU STATION	EL-NOOR GENERAL CONTRACTORS	182,971,363.68	177,734,257.00	8 MONTHS 5 MONTHS FOR PHASE I & II, 3 MONTHS FOR PHASE III AND AN AGREEMENT TO BE DONE	30/5/2012	30/1/2013	12/8/2013	100	PROJECT COMPLETE	Completed
	CONSULTANNCY SERVICES FOR MASTER PLANNING AND FEASIBILITY STUDY FOR THE DEVELOPMENT OF MODERN OFFICE SUITE AND SHOPPING MALL AT KISUMU UPPER ESTATE	MAESTRO ARCHITECTS	26,012,000.00	NIL		29/5/2013	29/2/2013	N/A		SUBMITTED INCEPTION REPORTS	

KRC AUTHORISED ESTABLISHMENT: APRIL, 2011

Job Group	AUTHORISED ESTABLISHMENT	DESIGNATION/POSITIONS
M1	1	MANAGING DIRECTOR
M 2	1	CORPORATION SECRETARY
	1	GM CONCESSION MANAGEMENT
	1	GM BUSINESS DEVPT & CORPORATE PLANNING
	1	GM FINANCE
	1	GM CORPORATE AFFAIRS & PUBLIC RELATIONS
M 3	1	HUMAN RESOURCES & ADMIN MANAGER
	1	ICT MANAGER
	1	RISK & AUDIT MANAGER
	1	PROCUREMENT MANAGER
	1	CORPORATE AFFAIRS MANAGER
	1	INFRASTRUCTURE MANAGER
	1	SHE MANAGER
	1	ERS MANAGER
	1	PROJECT MANAGER
	1	ESTATE MANAGER
	1	BUSINESS DEVPT MANAGER
	1	RESEARCH & PLANNING MANAGER
	1	PORT MANAGER
	1	SECURITY SERVICES MANAGER
	1	TREASURY MANAGER
	1	FINANCIAL ACCOUNTANT
	1	MANAGEMENT ACCOUNTANT
	2	SENIOR LEGAL OFFICER
M4	1	LEGAL OFFICER
	2	HR & ADMIN. OFFICER
	1	CORPORATE AFFAIRS OFFICER
	1	SYSTEMS ADMIN
	1	DATA BASE ADMINISTRATOR
	2	PROCUREMENT OFFICER
	1	INTERNAL AUDIT OFFICER
	1	RISK & COMPLIANCE OFFICER
	1	ASSIST FINANCIAL ACCOUNTANT
	1	ASSIST REVENUE ACCOUNTANT
	1	MUSEUM CURATOR
	1	LAND SURVEYOR
	4	ESTATES OFFICER
	1	PLANNING OFFICER
	1	ENG. ASSIST(PW)
S 1	8	ADMIN. ASST/SECRETARY
	1	RECORDS MANAGEMENT OFFICER
	1	SECURITY OFFICER

			SECURITY OFFICER ASST HR OFFICER ENG. ASSISTANT (4) INSPECTOR OF WORKS(3) (2 VACANT) ESTATES ASSISTANT (6) MANAGEMENT TRAINEES (10)
S 2	8	8	LEGAL ASSISTANT (2) ASST MUSEUM CURATOR WHARF OFFICER CHAUFFER/SENIOR DRIVER ACCOUNTS ASSISTANT (2) HELP DESK ASSISTANT
S 3	24	21	DRIVERS (9) (2 VACANT) HR ASSISTANT RECORDS ASSISTANT(2) (1 VACANT) PROCUREMENT ASSISTANT (2) RECEPTIONIST/TEL OPER AUDIO VISUAL ASST SECURITY ASST (8)
S4	4	4	OFFICE ASSISTANT (4)
	115	**93**	

REVIEWED BY ... HRAM.....SIGN.....DATE:.....

APPROVED BY... MD.....SIGN.....DATE.....

Appendix 4: SAMPLING TABLE

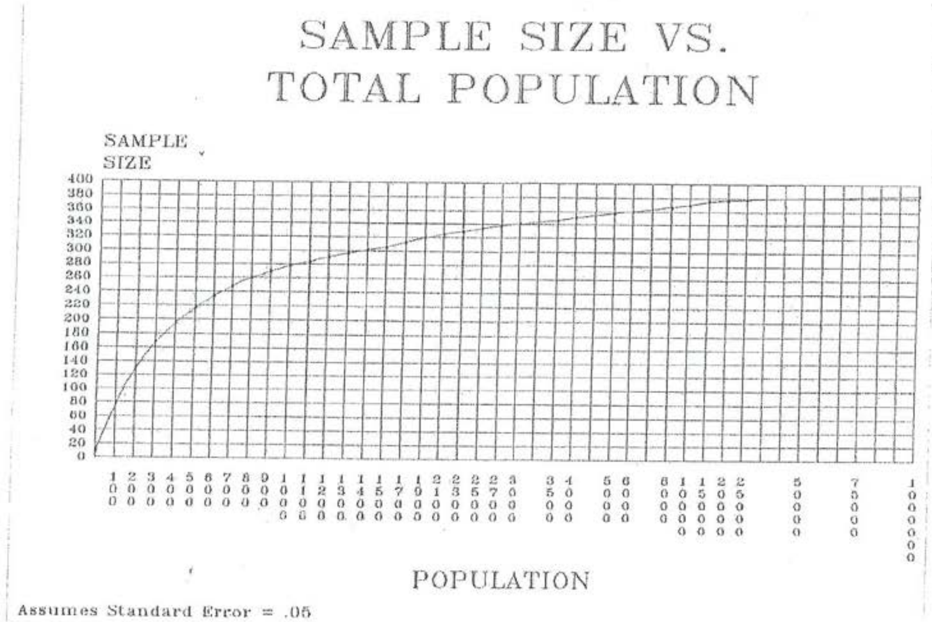

TABLE FOR DETERMINING SAMPLE SIZE FROM A GIVEN POPULATION

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size
"S" is sample size.

Krejcie, Robert V., Morgan, Daryle W., "Determining Sample Size for Research Activities", Educational and Psychological Measurement, 1970.