FACTORS INFLUENCING MAINTENANCE OF RURAL ROADS NETWORK IN IGEMBE SOUTH SUB COUNTY, MERU COUNTY KENYA

NJANGU JACKBED TURI

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

2015

DECLARATION

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

Signature: …… Date: …….

NJANGU JACKBED TURI

L50/65343/2013

This project report has been submitted for examination purposes with my approval as university supervisor

Signature: …… Date: …….

PROF. DAVID MACHARIA EBS

COLLEGE OF EDUCATION AND EXTERNAL STUDIES

UNIVERSITY OF NAIROBI

DEDICATION

I dedicate this project to my spouse Julius and my son Sean, for their understanding and support during the entire period of study.

ACKNOWLEDGEMENT

First I wish to acknowledge the guidance, support and consistent instructions of my supervisor, Prof. David Macharia, for helping me in the preparation of my project. I am also highly indebted to my lecturers for the time they spent to impact knowledge in me and also my colleagues at work for taking up my duties when I was away, attending to my studies.

Lastly, I wish to express my sincere thanks and appreciation to my course mates for their moral support throughout the study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATION AND ACRONYMS

ADB	-	African Development Bank
CDF	-	Constituency Development Fund
CEM	-	Country Economic Memorandum
GDP	-	Gross Domestic Product
KERRA	-	Kenya Rural Roads Authority
KRB	-	Kenya Roads Board
MDG	-	Millennium Development Goals
MOR	-	Ministry of Roads
OECD	-	Organization for Economic Cooperation and Development)
TOC	-	Theory of Constraints

ABSTRACT

Improving the general road network in the rural areas has been used as a measure to alleviate poverty and attain the Vision 2030. Beyond alleviation of poverty the importance of rural roads extends to all aspects of development of rural communities including demand for and access to health, education, information. However, most rural roads in Kenya experience numerous challenges in their maintenance. This study seeks to focus on the factors influencing maintenance of rural road network in Igembe South with the objectives being: to determine the cost effect on maintenance of rural road network, to establish political effect on maintenance of rural road network, to determine the technology effect on maintenance of rural road network and to establish time factor effects on maintenance of rural road network. The study employs a descriptive survey design using both qualitative and quantitative approaches. The findings of the study include proper planning which is done by expert and estimation is based on cost per unit as the method of approximation, skilled labour, construction materials and machinery are limited thus affecting the total cost of a project. There is political interference on prioritization and budgeting of roads projects, the technology used in the implementation of project is not appropriate for the traffic loading in the area and that projects were not completed on time. The recommendation of the study includes: actual costs per kilometer needs to be established and the information shared by the Ministry of Transport and Infrastructure to all key stakeholders such as Kenya National Highways Authority (KENHA), Kenya Rural Roads Authority (KeRRA), Kenya Urban Roads Authority (KURA), County departments of transport and Infrastructure and any other road agencies in the country so that a more informed opinion may be formed. Inclusion of a better appropriate technology that would be used in rural road maintenance by the Ministry of Transport and Infrastructure. Technology was too widely perceived by the respondents. Political leadership was found to be the key influence, there would be a good reason as to have all key stakeholders look at the wider societal benefits and a balance between cost and political millage balanced. Both the national assembly and the county assembly should clearly come up with an act and procedure on the extent of involvement of the political leaders influence in rural roads development.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Improving the general road network in the rural areas has been used as a measure to alleviate poverty and attain the Vision 2030. Beyond alleviation of poverty, the importance of rural roads extends to all aspects of development of rural communities including demand for and access to health, education, information, etc. According to Donnges et al (2007) massive investments have been made in rural roads since the early 1980s in Sub-Saharan Africa. There were several reasons for this. In the first place it was a natural extension of investment into the lower parts of the road networks given the major investments that had been made in the national highways of most countries of the region.

However, improving the roads in Africa has experienced numerous negative factors. Most countries in Africa lack funds to improve their road networks and rely on donors for funding. As these past investments are observed to deteriorate at rates exceeding expectations, concern has mounted that policies be undertaken to improve maintenance efforts in order to sustain past and current road investments and delay replacement of this necessary infrastructure (Schroeder, 1988).

The Kenya Government has attempted to address the problems of road network by establishing the Kenya Rural Roads Authority (KeRRA) to foresee the improvements of rural roads in the country. Since its establishment KeRRA has improved over 340km of rural roads to bitumen standards in 2012 alone with a projection of maintaining over 300,000 km. However, the KeRRA cites several factors that influence the overall projects. In their report in 2013 they observed that the fund allocated for the general improvements of the roads was less the expected amount. (2012 -2013 Kenya Rural Roads Authority Annual Report).

Most of the rural roads in Kenya according to the Ministry of Roads (2012) still remain unfinished yet the contracts were awarded a long time ago. This in their report is as a result of

awarding contracts to companies which lack the capacity to handle the jobs. Some of the companies were also reported to have done sub-standard jobs resulting into poor quality roads with bridges being washed away during the rainy season. This was attributed to poor policies during construction.

Meru county area is 6936 sq. km. with a total road network of 5000 km with only 350 km of the roads are paved, 306 km are gravel roads and 4344 km are earth roads which are impassible during the rainy seasons. (Meru County Integrated Development Plan)

Igembe South has a total road network 177 km with only 16 km of paved roads which translates to 9% of total road network in the Sub County. The 16km are highway roads connecting from Meru via Mikinduri to Maua and also Meru via Kangeta to Maua. This means that all rural roads are gravel and earth roads. This region is mainly the miraa growing area in Kenya hence there is need to have good roads to boost social - economic activities in the area.

The study therefore aims at investigating cost, politics, technology and time as some of the factors influencing road maintenance of rural roads in Igembe South with an aim of scaling up measures to avoid the drains on the meager resources.

1.2 Statement of the Problem

There are millions of kilometers of rural roads all over the world which have helped ease movements among local communities. However, maintaining these roads has always been a challenge. It is estimated that each year 17 trillion dollars are used for general maintenances of rural roads (World Bank's Country Economic Memorandum, 2009). Besides, most of the roads in the rural areas have been difficult to maintain due to the fact that these roads lack accessibility as well as interference from local communities and administration (Center for Rural Policy and Development, 2013).

In Africa like the other developing regions in the world maintenance of rural roads is a nightmare experienced by almost all government. Unlike most developed countries the African nations lack funding and adequate technology for improvements of roads. In most cases accessible roads are

only found in urban areas and even countries which have put emphasis on rural roads have made little improvements (Torero and Chowdhury, 2005). The African Development Bank, ADB (2010) cites poor improvements of rural infrastructure to result from political interferences and instability. Furthermore, most of the governments' budgets do not put into consideration rural roads improving as they do not consider them vital to the economy. The local authority also according to Malmberg (1998) lack proper planning for their local roads and always put limited time for maintenances with majority rushing over contracts to complete roads before start or end of seasons. The Kenya Rural Road Authority maintenances also have their challenges. KeRRA (2013) cites lack of adequate funding and technical support has incapacitated effective rural roads maintenance.

Although KeRRA has set up policies to regulate the type of technology employed in maintaining rural roads the available funds cannot accommodate the use of such technology on all rural roads. Nevertheless, the Kenya Roads Board, KRB (2013) cites other factors like political interferences, long duration between tendering to completion and inadequate labor as the major factors influencing maintenance or rural roads.

In Igembe South accessible roads are only found in the one urban area, that is, Maua Town; and nothing much has been done on the rural roads. The status of the roads in Igembe South are poor; this means that accessibility is a problem with people, goods and services taking longer time to get to their destination. It is for this reason that this study intends to establish the factors influencing maintenance of rural roads network in the Sub County. Igembe South has a total road network 177 km with only 16 km of paved roads which translates to 9% of total road network in the Sub County; 91% of the total roads are gravel and earth roads which require regular routine maintenance.

1.3 Purpose of the Study

The purpose of the study is to investigate the factors influencing maintenance of rural roads network in Igembe South Sub County.

1.4 Objectives of the Study

The study objectives are:

I. To determine the influence of cost on maintenance of rural roads network.
II. To establish the influence of politics on maintenance of rural roads network.
III. To determine the technology influence on maintenance of rural roads network.
IV. To establish the time influence on maintenance of rural roads network.

1.5 Research Questions

The research questions are:

I. How does cost factor influence maintenance of rural road network?
II. How does political leadership influence maintenance of rural road network?
III. How does technology influence maintenance of rural road network?
IV. How does time factor influence maintenance of rural road network?

1.6 Significance of the Study

By investigating the factors influencing maintenance of rural roads the study scales up policies that assist policy makers both in the government and the communities to come up with proper methods of handling maintenance. Moreover, the stakeholders in various ministries that are concerned with both funding and supervising the projects can come up with a standard rate for the projects as well as estimate the timeline required for the projects. Understanding the factors influencing maintenance of rural road network would help either to encourage or discourage political involvements in the projects by the community, regionally or nationally. The study also opens up avenues for other scholars who have interests in studying the factors influencing rural road network in Igembe South.

1.7 Delimitation of the Study

The study is confined to Igembe South Sub County and within the variables of the study which included; cost, politics, technology and time. The study population entails 150 KeRRA officers 36 County Representatives and 103 CDF officers i.e. both technical and non-technical staff in the three organizations that are directly involved in maintenance of roads in the Sub County.

1.8 Limitations of the Study

Shortage of time and funding are expected to be limiting factors as the researcher requires to move from one region to the other to collect data in only a few months before graduation. Inaccessibility of some areas due to the nature of rural roads also poses a challenge to the researcher. The researcher therefore worked very hard within the limited time and resources to distribute the questionnaires to the target group who responded very well. On the accessibility the researcher had to use whatever means of transport that was available.

1.9 Assumptions of the Study

The study assumes that all respondents are to be co-operative and provide complete, reliable and true responses. As shown in 4.1, the respondents are very cooperative with a response rate of 94% which is far higher than what is considered as adequate for this kind of study.

1.10 Definitions of Significant Terms

Cost: Refers to the final amount used in maintaining of rural roads in Igembe North District. In relation to all the equipment used, labour and materials in maintenance of rural roads

Maintenance of Rural Roads network: This is the actual work of ensuring accessibility by improving of the rural roads by keeping them in motorable condition.

Network:	It is a system of interconnecting lines that represent a system of roads for a given area,
Political leadership:	Refers to the involvement of leaders both local and national in exercising their positions of governance in the planning and implementation of road projects in Igembe Sub County.
Technology:	Refers to the knowledge of techniques, methods or processes used in road maintenance by the contractors in Igembe Sub County.
Time:	Refers to the duration taken to complete a road maintenance project.

1.11 Organization of the study

The study is organized in five chapters. Chapter One provides an introduction that includes; the background of the study; statement of the problem; purpose of the study; the research objectives; research questions that guides the study; significance of the study; delimitations and limitations of the study; the basic assumptions of the study and finally definitions of significant terms used in the study.

Chapter Two is the literature review of relevant works done related to rural roads network. The section describes the factors influencing maintenance of rural roads network globally, in Africa, Kenya and locally at Igembe South Sub County in Meru County. This chapter seeks to identify the gaps in research in maintenance of rural roads network. The section also provides the theoretical and conceptual frameworks of the study.

Chapter Three is a description of the Research Methodology used. The research design and target population is explained. There is also a description of the sample size and sample selection. A description of the research instruments to use, their validity and reliability is also included. There is also an elaboration of data collection procedures, data analysis techniques and ethical considerations.

Chapter Four presents analysis, presentation and interpretation of data while Chapter Five deals with summary of findings, discussions, conclusions, recommendations and suggestion for further studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This Chapter discusses the literature on factors influencing maintenance of rural roads from global, African and local perspectives. It presented the theories that would support the study as well as the conceptual framework for the study.

2.2 Maintenance of Rural Roads Network

The Kenya Constitution has two categories of roads i.e. National Roads and County Roads. Rural road infrastructure is a broad term that embraces key inter-village rural roads, normally within the jurisdiction of County governments, as well as the tracks, paths and footbridges that carry village level traffic. The network of rural county government roads in most countries constitutes about 70 percent of the total network. This is excluding national or urban roads. The network of village paths and roads – also known as rural roads which are very important in maintaining rural economies and livelihoods. In general most of the rural roads are unclassified. In most developing countries, the total length of rural roads, tracks, trails and paths is largely unknown, although surveys indicate it is often twice the length of the local government road network. Most of the rural road network is largely used by non-motorized vehicles, pedestrians and motor-bikes and .is not passable by trucks and cars for some part of the year (Joaquin, 2007)

The rural transportation system is really a system of disparate parts. It is also much decentralized. Rural transportation is essential not only for connecting people to jobs, health care, and family in a way that enhances their quality of life, but also for contributing to regional economic growth and development by connecting business to customers, goods to markets, and tourists to destinations. Commodities including timber, fuel, and agricultural products must be moved from rural areas where they are produced, to urban areas where they are consumed, processed, or sent out of the state or country. Ultimately, transportation is a rural community's essential connection to the nation and the world (Federal Highway Administration, 2012).

Maintenance of rural roads needs to be an integral part of poverty reduction strategies to enable our country to succeed in reaching the MDG's. Maintenance of rural roads is, therefore, not simply a financial and economic issue but also a humanitarian priority (Ministry of Roads, 2013). Rural roads are found to play an important part in improvement of most countries' GDP. The developed countries rely on industries as a major source of income and therefore can put little emphasis on rural roads; however, the developing countries have more than 50% of their GDP from agriculture which is practiced in the rural areas. The farmers need health, education and other services and these can only be accessed through good roads (Central Bank of Lesotho, 2006).

Most of the rural roads are earth and gravel roads. According to O'Neil (2011) a major constraint with developing and maintaining rural roads is the fact that they are, unfortunately rural because they are entirely graveled and muddy. The areas where they are needed are often difficult to access, logistics become complicated, local contracting capability is limited, engineers are few and far between, and younger engineers especially, are not keen to leave the urban environment. Hemala (2006) adds that maintenance and improvement of rural roads do not occur in a vacuum. Majority of the roads are earth and makes it difficult to access; improving these roads need so many considerations like climate and the seasonal pattern.

As nations try to achieve improved road safety, casualties remain high on low-volume and isolated roads. This has resulted in redistribution of road upgrading and safety funding in favor of secondary and rural roads in a number of OECD (Organization for Economic Cooperation and Development) countries. The risks associated with climate change, with new temperature and rain patterns and extreme weather events; also call for updated construction and maintenance standards (Fraissard, 2011). Water has always been seen to cut through most of the rural roads. This has made many potholes even on paved rural roads. As the weather worsened in rainy seasons rural roads are the worst affected unlike the urban roads which have underground drainage systems (Ratha et al, 2011).

Another worrying problem with rural road maintenance is labor force. As the labor force in the department of roads in most countries reduces majority of the rural roads are left at the mercies

of contractors; some of whom lack the experience in maintaining rural roads (Campbell, 2011).Most countries had adopted the use of community labor in rural road maintenance. However, with the continued rural-urban migration of the youthful age has left most rural areas with an old population that cannot do hard labor like road maintenances (Banjo and Richard, 2002).

Government policies have also been seen to interfere with most rural road projects. Walley and Cratty (2002) argue that governments in most countries tend to interfere with donor plans and preferences. These governments seem at most times to disagree on the type of road to be built in a given area. Grootaert (2001) observed that most of the governments believe that they can fund all the roads in the rural areas to bitumen roads projects that have always ended up as white elephants. Also, these governments take long in prioritizing on roads to construct, rehabilitate or maintain.

2.3 Cost influence on Maintenance of Rural Roads

The cost of a rural road network is more difficult to estimate than that of typical rural infrastructure such as wells, buildings, or small-scale irrigation projects since they are subject to severe damage by users, the natural environment and unpredictable interactions between the two. They are also expensive to maintain for the same reason. Furthermore, local responsibility for maintenance, effective for village infrastructure, and just as necessary for remote rural road networks, is difficult to promote. Since roads serve many people over a wide area, responsibility is too diluted and local people, as the history of roads management teaches us, refuse reasonably pay enough to so that others, often are not better off than them, can benefit (Tighe, 2008).

Stakeholders in the rural areas have always attempted to determine the lowest cost of maintaining rural roads. The World Bank according to Cook et al (2013) came up with a strategy called Low Volume Rural Roads as a measure of establishing the cheapest cost of maintaining rural roads. However, Tasmania Grant Commission (2012) argues that the cost estimation of rural roads is done per kilometer just like the urban areas. Although the rural roads might not require heavy machinery they too are equally hectic to maintain and even worse considering the terrains that are encountered.

The Kenyan Ministry of Road (2011) argues that estimating the cost of maintaining roads including the rural roads requires consideration of all the inputs. Although the estimates are usually generalized and categorized as rural and urban other factors need to be put into consideration whether the funding should be increased or reduced. Kocher et al (2005) observes that roads vary in their configuration and designs. These factors are needed when bidding any construction of any given road. When comparing two scenarios they argue that the cost of maintaining a mountain and a plain road cannot be the same unless other factors are considered. Mountain roads experience landslides, very steep slopes, rocks etc need to be considered unlike the plain roads. Nevertheless, Eres Consultants Inc (1995) points out that plain lands roads can be equally too expensive. Considering a scenario where one is maintaining roads on a flood and swampy areas the contractors will have to incur extra costs in diverting the flow of water. The cost estimated might end up higher than the highland regions where one would cut through the slope once.

According to Yuzdespki and Merkosky (2004) the cost of maintaining rural roads tend to outweigh the cost of construction of a bitumen road. They believe that ideally rural roads carry far much weight in terms of raw materials despite the weather conditions but have always been ignored. In most countries across the globe the estimate cost of maintaining rural roads whether gravel or earth has always been a task as there is no better method of minimizing those costs. The Australian Rural Roads Group (2010) tends to argue that the cost of maintaining rural roads does not involve money alone. As much as money is the only means of estimating the cost of maintaining the rural roads it does not solve most of the challenges. The cost of maintenance therefore should involve the frequency the road is used and the importance. Some roads might use a lot of money to maintain but do not serve any economical purpose.

Cost of road projects like any other service is important for completion of a project. Estimating the cost of rural roads is one of the most difficult tasks. Most of the cases in Kenya like other countries costs are estimated per km not considering topography and technology employed. This see engineers and contractors having difficult on which equipment to use considering the cost implication. This study will therefore investigate the cost effect in rural road maintenance projects.

2.4 Political Leadership influence on Maintenance of Rural Road Network

Issues of political salience or patronage may affect road construction, while community dynamics may shape local use and access to roads (Wales and Wild, 2012). Governments in the Sub-Saharan Africa are made of politicians. For any decision to be arrived politicians have to be engaged (Riverson, 1998). As it is known politicians are elected by communities so as to represent them and their needs. These politicians make the government and will tend to favor certain areas when it comes to development (Levick, 2003).

In Bangladesh according to Farhad (1997) politics plays an important role in any form of development. Road construction and any form of maintenance largely dependent on politics. According to him like any other developing country without any proper structures some areas are more developed than the rest as a result of political decisions. Rural areas whose representatives are not in government tend to be less developed as most of the government projects are deviated to other areas whose representatives are directly in power. And not in developing countries are the issues of politics on roads a challenge. In Britain according to Barton (2014) councilors summoned their Prime Minister to witness the state of roads in Devon and Cornwall arguing that politics is taking a center stage in maintenance of rural roads leading to lack of funds.

In South Africa (SA) there was an attempt to shift all developments to the local government so as to ensure equitable development. However, there are number of problems identified in SA showed how local politics could worst affect development than even the national politics. The local governments ended up divided into local tribes and clans each demanding development at the same time without considerations of the costs and the after benefits (Muradzikwa, 2004). A similar or worse observation was also observed in Brazil where politics and racism run the economic. Most of the respondents in a study by Fabio (2003) argued that the government ignores most of the regions and tend to do everything politically. He argues that the government should stop politicizing development projects as this will hinder equity and leading to increased population pressures in towns. According to him if the governments developed the rural areas equally without selectivity then most people won't move to towns as they will be able to be served with better roads as they would in towns.

In Malawi like the other African Countries as observed by the World Bank's 2009 Country Economic Memorandum (CEM, 2009) the poor state of the unpaved rural roads can be attributed to politics. The regime during the time of survey had its pressure on maintaining and rehabilitating some given roads due to political pressure from certain individual politicians. Leyland (2003) notes that in East Africa Countries there is also often little recognition by politicians of the importance of routine maintenance and preserving the existing maintainable network as opposed to spending money on opening up or improving other roads which garners more political support.

Even though politics is important road maintenance need an independent body from political interferences. Allowing politics to interfere with project allocations and planning will see most roads especially in rural areas with little political support having little or no development. Most of these studies like the case of Kenya have reported political interferences with road maintenance matters especially in rural areas. Kenya though has established bodies to control road projects politics still find its way especially in appointment of key personnel and as well as allocation of funds by the CDF.

2.5 Technology Influence on Maintenance of Rural Road Network

Currently technology is vital for any form of development (Mohapatra and Chandrasekhar, 2007). Road engineering has become a complex discipline where road safety, environmental and socio-economic issues are important in technical designs. Unlike urban roads most rural roads are believed not to carry heavier road hence do not require complex designs. Argawal and Singh (2010) had observed that use of local technology in maintaining rural roads has led to their deterioration. Most of the rural roads in developing countries according to them do not employ any technology at all. You may find bridges that connect important villages being wooden and are expected to lift heavier loads.

According to Ipingbemi (2008) there is a great challenge when it comes to technology used in maintaining rural roads. He observes that in Nigeria majority of the contractors do not have heavy machinery for their job even in areas where they are required. On the other hand those with the machinery lack qualified personnel to operate them and thus they do not employ the

standard technology for their job. A similar observation was also made by the Faiz (2012) in most developing countries. In their report they noted that most of the technologies used in maintaining rural roads in India, Sub-Saharan Africa and Some South American Countries were not standard. These are mostly attributed to lack of machinery or skilled power to carry out operations.

In Uganda Magidu et al (2010) argue that the economic backlog in most rural countries is owed to the poor state of roads that no one regulates their construction and maintenance. Most of these roads are chaired by unqualified personnel. If all engineers are concentrated in urban areas there are no way the rural roads will have the required technology. Furthermore, they argue that the education system teaches engineers to build sophisticated design roads a technology they cannot employ in rural areas as they won't make economic sense. A similar concern is also brought forth by the Ministry of Roads and Public Works (2012) in Kenya. According to the annual report it is high time the government consider allocating more engineers and revise put emphasis on technology to be used in developing rural roads and not urban roads only. It points that the technologies currently being taught in universities need to accommodate those that can be used in designing cheaper rural roads.

All the studies support use of technology in rural road maintenances. Nevertheless, these studies do not consider which technology to employ where and why. Although technology increases speed and efficiency there is need to ensure that using sophisticated technology on a less economical road is not cost effective. On the other hand using inappropriate technology will also lead to loss of revenue as the roads will not last even in cases of traffic. On the other hand some rural roads also carry heavier traffic especially in agricultural areas that require the use of heavier machinery during construction.

2.6 Influence of time on Maintenance of Rural Road Network

Time like any other factor is vital for any form of maintenance including rural road maintenance. According to Sunitha et al (2012) the scheduling of road maintenance and rehabilitation is a critical task. It is probably the key decision variable in any asset management system. This

decision process relies upon the capacity to predict the future maintenance condition as a function of time.

Many studies have shown the importance of time on maintenance of rural roads (Mu and Van de Walle, 2007; Hemala, 2006). Rural roads unlike the sophisticated urban roads have a short time season of completion. Considering the fact that it is almost impossible to do maintenance in wet weathers contractors always have limited time. Besides, these roads also consider the agricultural pattern of the area. As it is known that the rural roads are meant to assist in transportation of agricultural products maintenance should consider which time of the year trucks are not likely to use the roads. If the roads are in well rain fed areas the contactors might have little time left during the time of planting and harvesting.

Nevertheless, country policies also dictate the time given to a contractor to complete a road. This is always as a result of government intending to ensure completion of rural roads at a particular time. The time set for constructions is mostly set based on millage and expects contractors to be done at a particular time of the year as per the distances they are covering (ADB, 2012).

Time also is always a factor highly influenced by the general population. If the community has demanded the need for use of a road at a given time it requires that the responsible contractor to be up and finish his job in the shortest time possible. Going beyond the time limit set always triggers questions of competency.

According to Tighe (2000) the reason for most of the countries giving limited time for any form of road project is the belief that all contractors have the necessary technology for the job. In his article “Why use Labor based Technology?” he argues that the labor based technology improves speed of construction. It enables easy movement of earth and gravel that reduces the time needed for construction. Fahard (1997) argue that in most countries maintenance of rural roads is always considered a fast job. It is expected that within less than 6 months of initiating projects all rural roads need to have been completed. The MOR (2012) reported that all rural roads in Kenya need to be completed before the next budget reading even though the contracts as per the report are awarded in March and the budget is read in June.

All these studies find the time for rural road maintenance as appropriate. Irrespective of the advancement in technology there is an aspect of topography in any road project. Moreover, the engineering difficulties met during maintenance like landslides, loose soils, high water tables are not put into considerations when setting time. The study would therefore explore the time allocated for road construction in an attempt to find if time is one factor that has led to uncompleted projects in the company and poor state of roads in most rural areas including Igembe South.

2.7 Theoretical Framework

The theory employed in the study is the Constraint Theory. This theory was developed by Eliyahu Goldratt in 1984. The Theory of Constraints (TOC) is a management paradigm that views any manageable system as being limited in achieving more of its goals by a very small number of constraints. There is always at least one constraint, and TOC uses a focusing process to identify the constraint and restructure the rest of the organization around it. TOC adopts the common idiom "a chain is no stronger than its weakest link." This means that processes, organizations, etc., are vulnerable because the weakest person or part can always damage or break them or at least adversely affect the outcome (Goldratt, 1984).

The TOC is used as a methodology for identifying the most important limiting factor (i.e. constraint) that stands in the way of achieving a goal and then systematically improving that constraint until it is no longer the limiting factor. The core concept of the TOC is that every process has a single constraint and that total process throughput can only be improved when the constraint is improved. A very important corollary to this is that spending time optimizing non-constraints will not provide significant benefits; only improvements to the constraint will further the goal (achieving more profit) (Learn Productivity, 2013).

TOC seeks to provide precise and sustained focus on improving the current constraint until it no longer limits throughput, at which point the focus moves to the next constraint. The underlying power of TOC flows from its ability to generate a tremendously strong focus towards a single goal (profit) and to removing the principal impediment (the constraint) to achieving more of that goal. In fact, Goldratt considers focus to be the essence of TOC.

In project management the TOC is based on the idea that all projects look like A-plants: all activities converge to a final deliverable. As such, to protect the project, there must be internal buffers to protect synchronization points and a final project buffer to protect the overall project. According to Khan (2010) the TOC is an in improving common process. This is most applicable when handling large projects e.g. road projects, building projects, manufacturing etc. TOC when implemented benefits in improving speed, reducing the lead time and saving on costs.

2.8 Conceptual Framework

The study is guided by the model that shows how different factors relate to rural road maintenance. The relationship is as shown in Figure 1.

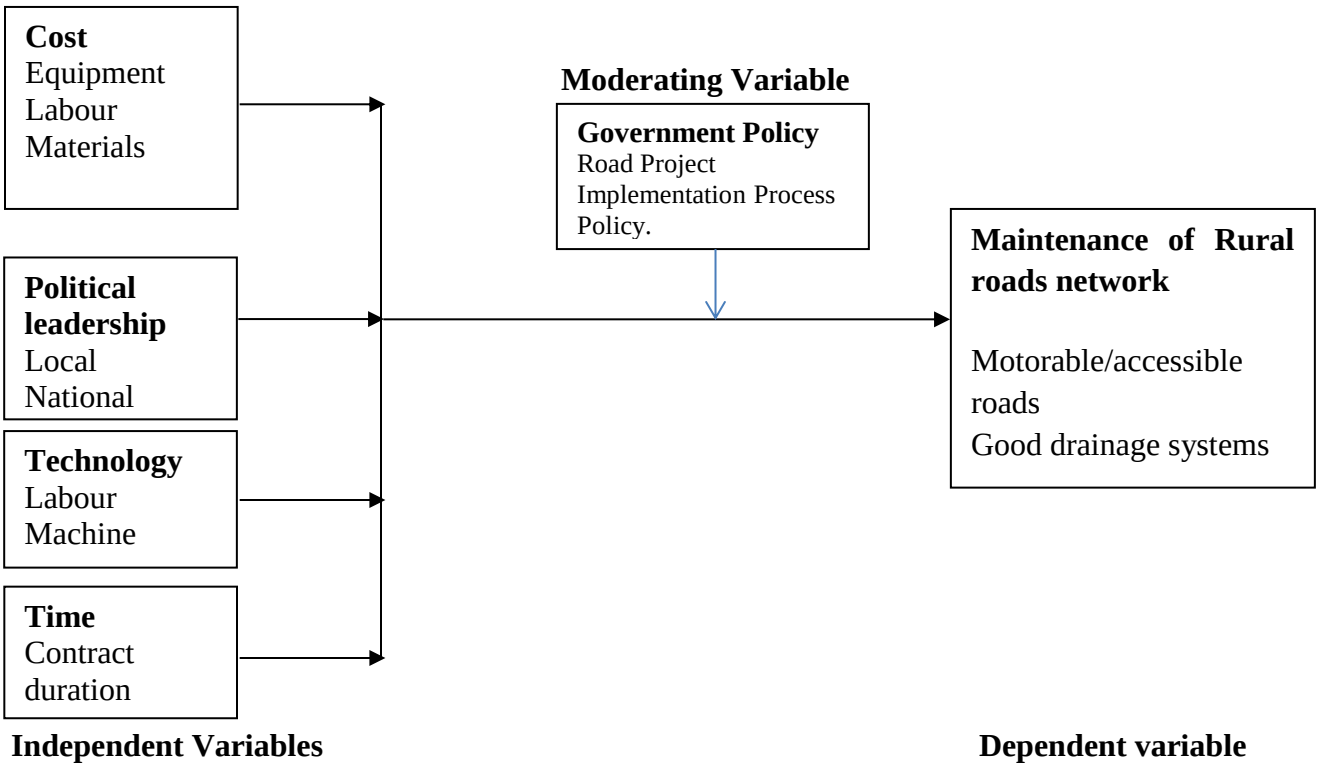

Figure 1 Conceptual Framework

2.9 Research Gap

The conceptual framework gives the relationship between the independent variables namely availability of cost, politics, technology and time influence rural road maintenance in Igembe South. The four independent variables have high propensity of influencing rural road maintenance in Igembe South. The study concentrated on establishing this influence.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology to be used in conduction of the study. It also offers an operationalization of variables table that is used in the field situation.

3.2 Study Design

The study uses the descriptive survey design using both qualitative and quantitative approaches. The survey design enabled the researcher to explore a wide range of factors influencing rural road maintenance. The design assisted in getting possible antecedents of events that have happened and cannot be manipulated by the researcher (Kerlinger, 2000). The design was appropriate for the study since it enabled the researcher to study the effects of an independent variable on a dependent variable without any manipulation.

3.3 Target Population

The population of the study comprises KERRA officers, County government officer and CDF officers both technical and non-technical staff in Igembe South. According to Explorable.com (2009), a research population also known as a well-defined collection of individuals or objects known to have similar characteristics. All individuals or objects within a certain population usually have a common, binding characteristic or trait. The study population entails 150 KeRRA officers, 36 County Representatives and 103 CDF officers. The population is chosen as the area has major rural road issues. Moreover, being the stakeholders they knew the challenges reported by contractors maintaining rural roads in the area.

3.4 Sampling Procedure

According to Kothari (2009) sample sizes are ideally a given fraction of the total fraction. For populations less than 500 at times it is advisable to use a sample size of almost half the

population to enhance accuracy. The study having a population of 289 individuals uses a sample size of half the population, equal to 145 respondents, as shown in Table 3.1

Table 3.1: Sample Size

Organization	Population	Percentage	Sample
KeRRA	150	50	75
County representatives	36	50	18
CDF officers	103	50	52
TOTAL	**289**	**50**	**145**

3.5 Research Instruments

The study employs a questionnaire as the research instrument. Oppeinheim (1992) argues that as an important research instrument and a tool for data collection, a questionnaire has its main function as measurement. Moreover according to Wilkinson and Birmingham (2003) questionnaires can be designed and used to collect vast quantities of data from a variety of respondents. They have a number of benefits over other forms of data collection: they are usually inexpensive to administer; very little training is needed to develop them; and they can be easily and quickly analyzed once completed. The questionnaire comprised both open and closed ended questions.

3.6 Validity

Validity is the degree to which a test measures what it purports and consequently permits appropriate interpretations of scores (Nachmias and Nachmias (1996).To access the content validity of the instrument; the researcher seeks the expert opinion from the University, particularly the supervisor.

3.7 Reliability of the Instruments

Reliability is the measure of degree to which a research instruments yields consistent results on repeated trials as said by Mugenda and Mugenda (2003). The split half technique was used to test reliability of the questionnaire. In this method the instrument was split into two and then reliability co-efficient was assessed by correlating results of the two halves. Results are used to obtain correlation coefficient and the reliability coefficient for the whole instrument. The latter is expected to be equal to or greater than 0.7, otherwise the instrument would be reviewed.

3.8 Methods of Data Analysis

Data collected was sorted out, coded and entered into a computer for statistical analysis using the SPSS version 17 software. Data was analyzed using descriptive and inferential statistics. Summary is done through frequencies and percentages and presented as tables. Frequencies and percentages according to Kothari (2009) are easier to interpret. The analyzed data is interpreted taking the set objectives into account. Results are presented using tables, graphs and descriptions. The latter is necessary for qualitative data.

3.9 Ethical Considerations

For the researcher to carry out the study, she search for permission from the National Council of Science and Technology and the Administrators of Igembe South Sub County through the Dean of the School of Continuing and Distance Education, University of Nairobi. Participation in the study was free and voluntary. The researcher informed the respondents that the purpose of the study was purely academic and assured them of confidentiality and anonymity. Participants were not required to indicate their names on the questionnaire. The researcher administered the questionnaires personally and collected them at the agreed time once they were filled.

3.10 Operationalization of variables

Table 3.2 Operational Definition of Variables

Research Objectives	**Type of Variable**	**Variable**	**Indicators**	**Measuring of Indicator**	**Data Collection Methods**	**Level measurement Scale**	**Types of Analysis**
To determine the cost of maintenance of rural road network in Igembe South	Independent	Cost	Maintenance cost Materials Labour Eqipment	Kenya shillings SI units Numbers Type and number	Questionnaire,	Ordinal Nominal	Quantitative
To establish political effect on maintenance of rural road network Igembe South	Independent	Politics	Local political leaders National politics	Political decisions made and implemented	Questionnaires	Ordinal Nominal	Descriptive
To determine the technology effect on maintenance of rural road network in Igembe South	Independent	Technology	Type of technologies in place Standards and specifications	Names of technologies used Availabilities of Manuals	Questionnaires	Ordinal Nominal	Descriptive
To establish time factor effects on maintenance of rural road network in Igembe South	Independent	Time	Contract duration	Months Years	Questionnaires	Ordinal Nominal	Quantitative

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the analysis of data collected from the items in the study questionnaire. The findings are analyzed and presented in the form of frequency tables, numerical values and percentages for comparison of the responses.

4.2 Response Return Rate

The questionnaires were distributed to KeRRA, CDF officers and County representatives, from which 137 were completed and returned, giving a response rate of 94%. The collection procedures involved personal administration, reminder and personal collection whenever possible. Compared to other responses rates for similar results by Chiocha (2009) - 47.14%, Buys (2004)- 32.2 % and Crafford (2002)- 19.3% the overall response rate of 88% is found to be adequate for analysis and for discussions of the study findings.

Reliability Statistics is based on all variables in the procedure. The study has a value of 0.873 according to Cronbach's Alpha which is considered very high on a scale of 0.00-1.00 as it tends to 1.00 on attitudinal measurement scales and above the 60 percent cut off value for being acceptable (Sekaran, 2001).

4.3 Demographic Information of Respondents

This section presents background demographic of the respondents and shows gender, age of respondents and the duration the respondents have worked in the organization. This information shows that there is fair representation of the two genders, 63% are youths and 19% had an experience of more than 10 years in the organization. This information is shown in Table 4.2.

Table 4.1 Demographic Information of Respondents

	Frequency	Percent
Gender of the Respondents		
Male	75	55
Female	62	45
Total	137	100
Age of respondents		
18-25 yrs	46	35
26-35 yrs	38	28
36-45yrs	44	32
Above 46 yrs	9	7
Total	137	100
Duration respondents worked in organization		
Less than 5 yrs	82	60
5-10 yrs	30	21
11-15 yrs	5	4
Over 15 yrs	20	15
Total	137	100

As showed in Table 4.2, 55% were male 45% were female, while on the age of respondents 35% were between 18-25 years while 7% were above 46 years. On the duration respondents worked in the organization 15% had over 15 years and those less than 5years were 60%.

4.3. Cost of Maintenance of Rural Road Network in Igembe South Sub County

This section presents responses on who estimates the cost of road maintenances, method of cost estimation used, the appropriate method of cost estimation, availability of skilled labour, cost of locally available materials, availability of construction equipment and how they affect the overall cost of maintenance. This information is shown in Table 4.3

Table: 4.2. Cost of Maintenance of Rural Roads Network

	Frequency	Percent
Who estimates the cost of road maintenances?		
Road engineers	103	75
Politicians	29	21
Do not know	5	4
Total	137	100
Method of cost estimation always used		
Rating per item	114	83
Surveying area	23	17
Total	137	100
Appropriateness of the method of cost estimation		
Strongly Agree	41	30
Agree	91	66
Disagree	5	4
Total	137	100
Availability of construction materials		
YES	74	54
NO	63	46
Total	137	100
Availability of construction equipment		
YES	52	38
NO	85	62
Total	137	100
Skilled labor influence on road maintenance cost		
Strongly Agree	34	25
Agree	70	51
Disagree	30	22
Strongly Disagree	3	2
	137	100

As shown in Table 4.3 the responses on the cost of maintenance of rural road network in Igembe South Sub County and shows that the majority 75% of respondents said road engineers estimates the cost of maintenance of rural roads, 83% said rating was done per item while 17% of respondents said surveying area. On the respondent's opinion on the appropriateness of method of cost estimation, a 96% of the majority respondents agreed. This therefore shows that the right people undertook the costing exercise hence the estimation of rural road maintenance is realistic. On whether the construction materials were readily available 54% of respondents said yes. Based on whether the construction equipment is readily available 62% of respondents said no. On whether the road construction skilled labour influenced the overall cost 76% of the majority respondents agreed. Therefore despite the good planning by the roads engineers more resources in terms of materials, equipment and skilled labour are required.

4.4. Political leadership influence on Rural Road Maintenance

This section presents responses on importance of politics in development, politics playing a role in decision making for rural roads maintenance, influence of funding on rural roads, influence of the development of the rural areas, politician engaged in decision making in maintenance of rural roads, time when the relevant bodies do not respect political decisions on which roads to maintain.

Table 4.3 Political leadership Influence on Rural Road Maintenance

	Frequency	Percent
Importance of political leadership in development Strongly Agree	29	21
Agree	64	47
Disagree	29	21
Strongly Disagree	15	11
Total	137	100
Political leadership playing a role in decision making for rural roads maintenance		
Strongly Agree	25	18
Agree	81	59
Disagree	18	13
Strongly Disagree	13	10
Total	137	100
Political leadership influence of funding on rural roads		
Strongly Agree	25	18
Agree	91	66
Disagree	21	15
Total	137	100
Influence on the development of the rural areas		
Strongly Agree	39	29
Agree	86	63
Disagree	12	9
Total	137	100
Politician engaged in decision making in maintenance of rural roads		
YES	95	69
NO	42	31
Total	137	100
Time when the relevant bodies do not respect political decisions on which roads to maintain		
YES	101	74
NO	36	26

	Frequency	Percent
Importance of political leadership in development Strongly Agree	29	21
Agree	64	47
Disagree	29	21
Strongly Disagree	15	11
Total	137	100

Table 4.3 presents the responses on the political leadership influence on rural road maintenance and shows that on respondent's opinion on whether politics is important in development 68% of the majority respondents agreed. On respondent's opinions on whether political leadership play a role in decision making for rural roads maintenance 84% of respondents agreed. On whether political leadership play a role in decision making for rural roads maintenance influence funding on rural roads 74% of respondents agreed. On respondent's opinion if political leadership influence the development of the rural areas 63% of respondents agreed. On the respondent's opinion on whether politician should be engaged in decision making in maintenance of rural roads 69% of respondents said yes, while 74% of respondents agreed that at times the relevant road implementing bodies did not respect political decisions on roads maintenance**.**

4.5. Technology on Maintenance of Rural Road Network

This section presents responses on whether Rural roads in Igembe South carry heavier traffic of more than 25 tones, Roads meet the standards for the capacity they carry, Technology employed in rural roads appropriate for the maintenance of roads in Igembe south, Determinant for setting the technology used, Government determine the technology used in maintaining rural roads, Technology used be similar to that used for construction and maintaining urban roads

Table: 4.4. Technology on Maintenance of Rural Road Network

	Frequency	Percent
Rural roads in Igembe South carry loads of more than 25 tonnes		
YES	103	75
NO	34	25
Total	137	100
Roads do not meet the standards for the capacity they carry		
Strongly Agree	52	38
Agree	65	47
Disagree	15	11
Strongly Disagree	5	4
Total	137	100
Technology employed in rural roads is not appropriate for the maintenance of roads in Igembe south		
YES	87	64
NO	50	36
Total	137	100
Determinant for setting the technology used		
Availability of local Labour	36	26
Engineers suggestions as per works	44	32
Type of Road	57	42
Total	137	100
Government determine the technology used in maintaining rural roads		
YES	100	73
NO	37	27
Total	137	100
Technology used is not similar to that used for construction and maintaining urban roads		
YES	105	77
NO	32	23
Total	137	100

Table 4.4 presents the responses on the technology on maintenance rural roads network and shows on whether rural roads in Igembe South carry heavier traffic of more than 25 tones, 75% of the respondents said yes. On whether the roads do not meet the standards for the capacity they carry 85% of the majority respondents agreed. On whether the technology employed in rural roads is not appropriate for the maintenance of roads in Igembe South 77% of the respondents said yes, On what was the determinant for setting the technology used 42% of respondents said type of road, while 26% of the respondents said availability of local labour. On whether, the government determines the technology used in maintaining rural roads 73% of the respondents said yes while 27% said no. On whether the technology used is not similar to that used for construction and maintaining urban roads 77% said yes. This therefore indicates that the technology used should be reviewed in order for the roads to bear the traffic loading without causing much deterioration.

4.6. Time Factor On Maintenance of Rural Road

This section presents responses on whether rural roads maintenance projects are carried out on time, The time estimated for a project based on, idealness for contractors to be allowed to schedule their completion time, are there penalties on contractors who do not complete projects the on time, contractors complain of shorter time limit for completion of projects

Table: 4.5. Time Factor on Maintenance of Rural Roads Network in Igembe South

	Frequency	Percent
Rural roads maintenance projects carried out on time		
YES	62	45
NO	75	55
Total	137	100
The time estimated for a project based on		
Type of Maintenance	43	31
Scope of the project	94	67
Total	137	100
Contractors complain of shorter time limit for completion of projects		
YES	46	34
NO	91	66
Total	137	100
Are there penalties on Contractors who do not complete projects the in time		
YES	88	64
NO	49	36
Total	137	100
Idealness for contractors to be allowed to schedule their time completion time		
Strongly Agree	15	11
Agree	51	37
Disagree	40	29
Strongly Disagree	31	21
Total	137	100

Table 4.5 presents the responses on time factor on maintenance rural road and shows that on rural roads maintenance projects carried out on time 55% of the respondents said no, while 45% of the respondents said yes, on what time is estimated for a project based on 67% of the respondents said scope of the project, while 31% of the respondents said type of maintenance. On the respondents opinion on whether, the contractors complain of shorter time limit for

completion of projects 66% of the respondents said no, while 34% of the respondents said yes, and on whether those who do not complete the projects in time are there penalties, 64% of the respondents said yes while 36% of the respondents said no. On whether idealness for contractors to be allowed to schedule their time completion time 37% of respondents strongly agreed, while 11% agreed that it was ideal for contractors to be allowed to schedule their time completion time

4.7. Inferential Statistics –Chi Square

The non-parametric test statistics results on influence of technology on maintenance of rural road network has a critical value of .000 which is less than 0.05 (P>0.05) and hence has a significant influence at 5% significance level of confidence the study accepts that technology on maintenance of rural road network has significant influence on maintenance of rural roads network in Igembe South Sub County, Meru County Kenya

4.8. Summary of Data Analysis

On the cost of maintenance rural road network in Igembe South Sub County; on who estimates the cost of road maintenances 75% of respondents said road engineers, on which method of cost estimation is always used 83% of respondents said rating per item. On the respondent's opinion on the appropriateness of method of cost estimation, 66% of respondents agree. On whether the construction materials are readily available 54% of respondents said yes. Based on the response on the construction equipment availability 62% of respondents said no. On whether the road construction skilled labour influenced the overall cost of road maintenance 51% of respondents said they agreed. On influence of cost on maintenance of rural road network and shows a critical value of 0.347, which is more than 0.05 (P>0.05) and hence has a no significant influence at 5% significance level of confidence

On the political leadership influence on rural road maintenance and shows that on respondent's opinion on whether politics is important in development as 47% of respondents agreed. On respondent's opinions, on whether political leadership plays a role in decision making for rural roads maintenance 59% of respondents agreed. On respondents opinion if political leadership influence the development of the rural areas 63% of respondents agreed. On the respondent's opinion on whether politician should be engaged in decision making in maintenance of rural roads 69% of respondents said yes, and 74% of respondents agreed that there was time when the

relevant bodies do not respect political decisions on which roads to maintain. On influence of technology on maintenance of rural road network has a critical value of .000 which is less than 0.05 (P>0.05) and hence has a significant influence at 5% significance level of confidence on the technology on maintenance of rural road network and shows that on whether rural roads in Igembe South carry heavier traffic of more than 25 tones, 75% of the respondents said yes. On whether the roads do not meet the standards for the capacity they carry 47% of the respondents agree. On whether the technology employed in rural roads was not appropriate for the maintenance of roads in Igembe South 64% of the respondents said yes. On what was the determinant for setting the technology used 42% of respondents said type of road. On whether, the government determines the technology used in maintaining rural roads 73% of the respondents said yes. On whether the technology used was not similar to that used for construction and maintaining urban roads 77% of respondents said yes. On influence of politics on maintenance of rural road network has a critical value of, 0 .000 which is less than 0.05 (P>0.05) and hence has a significant influence at 5% significance level of confidence

On time factor on maintenance rural road and shows that on rural roads maintenance projects carried out on time 55% of the respondents said no, while, on what time is estimated for a project based on 67% of the respondents said scope of the project. On the respondents' opinion on whether the contractors complain of shorter time limit for completion of projects 66% of the respondents said no, and on whether those who do not complete the projects on time are there penalties, 64% of the respondents said yes. On whether I dealness for contractors to be allowed to schedule their time completion time 37% of respondents strongly agreed. On maintenance of rural road network has a critical value of .001 which is less than 0.05 (P>0.05) and hence has a significant influence at 5% significance level of confidence

CHAPTER FIVE

SUMMARYOF FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction.

Chapter Five gives the study's summary of findings, discussions, conclusions and appropriate recommendations that the researcher considered necessary together with the suggestions for advanced studies that needs attention.

5.2. Summary of Findings

The following is the summary of the key findings of the study on the factors influencing maintenance of rural roads network in Igembe South Sub County. The findings are as per the four objectives of the study; the influence of cost, politics, technology and time on maintenance of rural road network in Igembe South.

5.2.1 Cost

The study found out that the cost of maintenance rural road network in Igembe South Sub County; was mostly estimated by the road engineers as depicted by 75% of respondents and on the method of cost estimation used 83% of respondents indicated the rating per item. On the respondent's opinion on the appropriateness of method of cost estimation, 66% of respondents agree that the rating per item was the most appropriate. On the availability of construction materials 54% of respondents noted that road construction materials were readily available. Based on the response on the construction equipment availability 62% of respondents said no. On whether the road construction was influenced by skilled labour and the overall cost of road maintenance 51% of respondents said they agreed

5.2.2 Political leadership

On the political leadership and its influence on rural road maintenance the study found out that on respondent's opinion on whether politics is important in development 47% of respondents agreed. On whether political leadership plays a role in decision making for rural roads maintenance 59% of respondents agreed. On the extent to which political leadership influence the development of the rural areas 63% of respondents agreed and on whether politician should be engaged in decision making in maintenance of rural roads 69% of respondents said yes, and 74% of respondents agreed that there was time when the relevant bodies do not respect political decisions on which roads to maintain.

5.2.3 Technology

On influence of technology on maintenance of rural road it was discovered that technology influenced rural roads maintenance and on whether rural roads in Igembe South carry heavier traffic of more than 25 tones, 75% of the respondents said yes. The study also found out that roads in Igembe South do not meet the standards for the capacity they carry 47% of the respondents agree. On whether the technology employed in rural roads was not appropriate for the maintenance of roads in Igembe South 64% of the respondents said yes. On what was the determinant for setting the technology used 42% of respondents said type of road. On whether, the government determines the technology used in maintaining rural roads 73% of the respondents said yes. On whether the technology used was not similar to that used for construction and maintaining urban roads 77% of respondents said yes.

5.2.4 Time

On time factor on maintenance rural road the study found out that rural roads maintenance projects were not carried out on time as was depicted by 55% of the respondents, while, on what time is estimated for a project based on 67% of the respondents said scope of the project. On the respondents' opinion on whether the contractors complained of shorter time limit for completion of projects 66% of the respondents said no, and on whether those who do not complete the projects on time are there penalties, 64% of the respondents said yes. On whether idealness for

contractors to be allowed to schedule their time completion time 37% of respondents strongly agreed.

5.3 Discussion

The discussions are guided by the research objectives of the study. These discussions are based on data collected from KeRRA officers, County government officers and CDF officers in Igembe South in the year 2015.

5.3.1. Influence of cost on maintenance of rural road network in Igembe South

The study established, that cost on maintenance of rural road network has a significant influence on maintenance of rural roads network in Igembe South Sub County, Meru County Kenya. Planning was done by the experts who carried out estimation using the appropriate method however other factors like skilled labour, construction materials and equipment were not readily available hence had an impact on the overall cost on maintenance of rural road network in Igembe South Sub County.

The findings agree with Hemala (2006) who found that maintenance and improvement of rural roads do not occur in a vacuum. Majority of the roads are earth and makes it difficult to access; improving these roads need so many considerations like climate and the seasonal pattern. Also in agreement was Tasmania Grant Commission (2012) who established that the cost estimation of rural roads is done per kilometer just like the urban areas. Although the rural roads might not require heavy machinery they too are equally hectic to maintain and even worse considering the terrains that are encountered. These factors are needed when bidding any construction of any given road. When comparing two scenarios they argue that the cost of maintaining a mountain and a plain road cannot be the same unless other factors are considered. Mountain roads experience landslides, very steep slopes, rocks etc need to be considered unlike the plain roads. Nevertheless, Eres Consultants Inc (1995) points out that plain lands roads can be equally too expensive. Considering a scenario where one is maintaining roads on a flood and swampy areas the constructors will have to incur extra costs in diverting the flow of water. The cost estimated

might end up higher than the highland regions where one would cut through the slope once. The study findings are therefore supported by The Australian Rural Roads Group (2010) who found that the cost of maintaining rural roads does not involve money alone. As much as money is the only means of estimating the cost of maintaining the rural roads it does not solve most of the challenges.

5.3.2. Influence of technology on maintenance of rural road network in Igembe South

The study established that technology on maintenance of rural road network has significant influence on maintenance of rural roads network in Igembe south sub county, Meru county Kenya. This is because the technology used in maintenance of roads was not appropriate. The findings are supported by Argawal and Singh (2010) who found that use of local technology in maintaining rural roads has led to their deterioration. Faiz (2012) also agrees with the study findings as he found that those with the machinery lack qualified personnel to operate them and thus they do not employ the standard technology for their job.

5.3.3. Influence of political leasdership on maintenance of rural road network

The study established that politics on maintenance of rural road network has significant influence on maintenance of rural roads network in Igembe south sub county, Meru county Kenya. This is because the political leadership had influence in prioritization of roads to be maintained as well as the budgetary allocation.The findings agree with Farhad (1997), who found that politics plays an important role in any form of development. Road construction and any form of maintenance largely dependent on politics. According to him like any other developing country without any proper structures some areas are more developed than the rest as a result of political decisions. The findings also agree with Wales and Wild, (2012) who found Issues of political salience or patronage may affect road construction, while community dynamics may shape local use and access to roads). In developing and developed countries the findings seem consistent as Barton (2014) found that councilors summoned their Prime Minister to witness the state of roads in Devon and Cornwall arguing that politics is taking a center stage in maintenance of rural roads leading to lack of funds

5.3.4. Influence of time on maintenance of rural road network in Igembe South

The study established that time on maintenance of rural road network has significant influence on maintenance of rural roads network in Igembe south sub county, Meru county Kenya, Prolonged completion period of a contract resulted to more deteriorations of the unfinished section which would result to increase in cost in addition to inaccessibility of roads. Sunitha et al (2012) the scheduling of road maintenance and rehabilitation is a critical task. It is probably the key decision variable in any asset management system. This decision process relies upon the capacity to predict the future maintenance condition as a function of time.

The findings are also in agreement with Mu and Van de Walle, (2007); Hemala, (2006) who found that Rural Roads unlike the sophisticated urban roads have a short time season of completion and considering the fact that it is almost impossible. Also the findings agree with Tighe (2000) who found that the reason for most of the countries giving limited time for any form of road project is the belief that all contractors have the necessary technology for the job to do maintenance in wet weathers contractors always have limited time. Besides, these roads also consider the agricultural pattern of the area.

5.4. Conclusion

While cost as a factor is well taken care of in the planning stage since the experts ensure that the estimates are based on the most appropriate method, however other implementation resources like skilled labour, availability of equipment and construction materials are not readily available. The technology used is not appropriate for the kind of traffic loading in the region therefore there should be an appropriate technology for the implementation of the roads in Igembe South to ensure accessibility.

Political leadership influences the maintenance of rural roads because from the findings it plays an important part in the development; it also plays a role in decision making which influences the funding of projects under maintenance. Time is a factor that influences maintenance of rural roads through delays in completion of works, the longer the completion period the more deterioration of the unfished part leading to inaccessibility of area. This may also have an impact on the overall cost of a project.

5.5. Recommendations of the study

The following are the recommendations of the study.

1. The actual costs per kilometer need to be established and the information shared by the Ministry of Transport and Infrastructure to all key stakeholders such as Kenya National Highways Authority (KENHA), Kenya Rural Roads Authority (KeRRA), Kenya Urban Roads Authority (KURA), County departments of Transport and Infrastructure and any other road agencies in the country.
2. The Ministry of Transport and Infrastructure should advice on the most appropriate technology to be used in rural road maintenance.
3. Political leadership being a key influence, there is need to have all key stakeholders look at the wider societal benefits and a balance between cost and political millage balanced. Both the national assembly and the county assembly should clearly come up with an act and procedure on the extent of involvement of the political leaders influence on rural roads development.

5.6. Suggestions for further Research

The study has found that cost is a major factor that influences the maintenance of rural Roads in Igembe South though this has in previous studies been found to have some significant influence. There is therefore need to have a similar study replicated or an independent study on the influence of cost elements on the maintenance of rural roads undertaken in the same location or similar contextual environments**.**

The influence of technology on the maintenance of rural roads was found to be significantly influencing the maintenance of rural roads; however, there is need to come up with the most appropriate method. Few studies have made that attempt, therefore technological elements that influence rural roads maintenance would be a suitable study.

REFERENCES

ADB. (2010). *Public Resource Mobilization and Aid in Africa.* Tunis, African Economic Outlook. World Bank, Washington D.C.

Agarwal, P. K. and Singh, A. P. (2010). *Some Strategies for Sustainable Maintenance of Rural Roads in India.* International Journal of Advanced Engineering Technology: Vol. 1; (3)

Australian Rural Road Group (2010). *Going nowhere: The rural local road crisis its national significance and Proposed reforms*. Juturna Consulting Pty Ltd, Melbourne.

Banjo G. and Richard R. (2002). *Developing Rural Transport Policies and Strategies; World Bank Technical Paper.* World Bank, Washington D.C.

Barton L. (2014). *Rural roads in Devon and Cornwall under threat as repair bills mount, councils admit.* Western Morning News, January 16, 2014.

Campbell J. (2011). *Rural roads important to global development*. Cold Chon Ltd, Galway.

Center for Rural Policy and Development (2013). *Rural Reality*. Minneapolis, County Council of Minnesota

Central Bank of Lesotho (2006). *The Upward Revision of Road Maintenance Levy: Implications for Lesotho Economy.* CBL Economic Review

Chambers R. L. and Skinner C. J. (2003), *Analysis of Survey Data*, Wiley, ISBN 0-471-89987-9

Cook J. R., Petts R. C. and Rolt J. (2013). *Low Volume Rural Road Surfacing and Pavements; A Guide to Good Practice.*OTB Engineering, London.

Donnges, C., Edmonds, G. and Johannessen, B. (2007) *Rural Road Maintenance. Sustaining the Benefits of Improved Access.* International Labour Organization. Washington, DC: ILO

Eres Consultants Inc (1995). Rural *Road Design, Maintenance, and Rehabilitation Guide*. South Dakota Department of Transportation; Office of Research, Illinois.

Faiz A. (2012). *The Promise of Rural Roads; Review of the Role of Low-Volume Roads in Rural Connectivity, Poverty Reduction, Crisis Management, and Livability.* Transportation Research Board, Washington D.C.

Farhad A. K. A. (1997). *Financing Rural Feeder Road Maintenance in Bangladesh: Towards a Sustainable Approach.* Journal of the Eastem Asia Society for Transportation Studies, Vol. 2, No. 6, Autumn, 1997

Federal Highway Administration (2012). *Planning for Transportation in Rural Areas*. US Department of Transportation, Washington.

Fraissard M. P. (2011). *Rural roads important to global development.* World Highways, Route One Publishing Ltd, Beijing.

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

Grootaert C. (2001). "*Socioeconomic Impact Assessment of Rural Roads: Methodology and Questionnaires," mimeo*. INFTD, World Bank, Washington D.C.

Hemala H. (2006). *When do Rural Roads benefit the Poor and How? An In-depth Analysis Based on Case Studies.* Asian Development Bank, Manila.

Ipingbemi O. (2008). *Exploring Labour-Based Approach for Rural Road Maintenance in Nigeria.* J. Soc. Sci., 17(2): 103-111

Joaquin C (2007). *Rural Infrastructure Maintenance*. The International Forum for Rural Transport and Development, Geneva

KERRA (2013). *Annual Report 2012–2013*. Nairobi, Kenya Rural Roads Authority.

Khan K. (2010). *Applying Theory of Constraints to Manage Bottlenecks.* Isisamax, New York.

Kocher D. S., Gerstein M. J. and Harris R. R. (2005). *Rural Roads; A construction and Maintenance Guide for California Landowners.* University of California, Department of Agriculture and Natural Resources, Los Angeles.

KRB (2013. *Rural Reality*. Nairobi, KRB.

Learn Productivity (2013). *Theory of Constraints.* Retrieved at: http://www.leanproduction.com/theory-of-constraints.html

Levick K. (2003). *How to sell the message "Road maintenance is necessary" to decision makers*. Norwegian Public Roads Administration, Oslo.

Leyland J. (2003). *Prioritising a process: Community participation in prioritising rural road improvements in East Africa.* Community Transport Specialists, Nairobi.

Malmberg Calvo, C (1998). *Issues of local level management, Rural Transport Knowledge Base*. Rural Travel and Transport Programme

Ministry of Roads (2011). *Cost Estimation Manual for Road Maintenance Works*. Republic of Kenya Press, Nairobi.

Ministry of Roads (2012). *Annual Report*. Nairobi, Government of Kenya

Ministry of Rural Roads (2013). *Maintenance of Rural Roads: Policy Framework*. International Labour Organization, New Delhi.

Mu, R. and Van De Walle D. (2007). *Rural Roads and Poor Area Development in Vietnam*. World Bank Policy Research Working Paper, Washington D. C.

Mugenda,O.M. and Mugenda,A.G,(2003). *Research Methods: Quantitative and Qualitative* Approaches. Nairobi; Acts press.

Muradzikwa S. (2004). *Complexities of Infrastructure Financing and Provision: A Case Study of Rural Road Infrastructure in Ingwavuma District, Kwazulu Natal Province, South Africa*. University of Cape Town, School of Economics, Cape Town.

O'Neil P. (2011). *The problem with rural transport is that it is rural, the solution is in branding.* World Bank, Geneva.

Oppenheim, A. N. (1992). *Questionnaire Design, Interviewing and Attitude Measurement.* London: Pinter Publishers Limited.

Ratha, D., Mohapatra, S., Özden, C., Plaza, S., Shaw, W., and Shimeles, A. (2011). *Leveraging Migration for Africa: Remittances, Skills, and Investments*. The International Bank for Reconstruction and Development and World Bank, Washington DC.

Schroeder L. (1988). *Managing and Financing Rural Road Maintenance in Developing Countries.* Vermont, Metropolitan Studies Program/Maxwell School of Citizenship & Public Affairs.

Sunitha V. A., Veeraragavan K., Srinivasan K. and Mathew S. (2012). *Cluster-Based Pavement Deterioration Models for Low-Volume Rural Roads.* International Scholarly Research Network, Vol. 2012

Tasmania Grants Commission (2012). *Review of Road Maintenance Costs.* Jeff Roorda & Associates, Taswana.

Tighe D. (2008). *Cost Estimation. Planning Rural Roads. Ottawa*, Department of Roads.

Torero, M. and Chowdhury, S. (2005). *Increasing access to infrastructure for Africa's rural poor*. International Food Policy Research Institute: 2020 Africa Conference Brief. Workshop16. Retrieved on 29 February on www.itu.int/ITU-D/ict/material/ISSP09-AFR_final-en.pdf

Wales J. and Wild L. (2012). *The political economy of roads; an overview and analysis of existing literature.*Overseas Development Institute, London.

World Bank's Country Economic Memorandum (2009). *Malawi Country Profile.* World Bank, Washington D.C.

Yuzdespki and Merkosky (2004). *Annual Conference and Exhibition of the Transportation Association of Canada*. Quebec, Transportation Association of Canada.

APPENDICES

APPENDIX I: INTRODUCTORY LETTER

JACKBED NJANGU

P.O. BOX 120 - 60200
MERU

4th April, 2015

Dear Respondents,

Re: Request for Questionnaire Responses

This is to request you to participate in this purely academic research study. I kindly request for your assistance in responding to the attached questionnaire, to provide the much valued data for the research study analysis.

The questionnaire is strictly for academic purposes and any information given shall be treated with strict confidentiality; please give the information as accurately as possible. Thanking you in advance

Yours faithfully**,**

Jackbed Njangu

University of Nairobi

APPENDIX II: QUESTIONNAIRE

SECTION A: DEMOGRAPHIC DATA IN IGEMBE SOUTH SUB COUNTY

1. Indicate gender
    a. Male [ ]
    b. Female [ ]
2. Indicate your age
    a) 18 - 25 yrs [ ]
    b) 26 – 35 yrs [ ]
    c) 36 -45 yrs [ ]
    d) Above 46 yrs [ ]
3. How long have you been working in your organization?
    a. Less than 5 years [ ]
    b. 5-10 years [ ]
    c. 11-15 years [ ]
    d. More than 15 years [ ]

SEC B: COST ON MAINTENANCE RURAL ROAD NETWORK IN IGEMBE SOUTH

1. Who estimates the cost of road maintenances?
    a. Roads Engineers [ ]
    b. Politian [ ]
    c. The local people [ ]
    d. Don’t know [ ]
2. Which method of cost estimation is always used?
    a. Rating per item [ ]
    b. Surveying area [ ]
    c. Guessing [ ]
    d. Don’t know [ ]

3. According to you is the method of cost estimation appropriate?

Strongly agree	Agree	Disagree	Strongly disagree

4. Are road construction materials readily available in Igembe South?
   a. Yes [ ]
   b. No [ ]
5. Are road construction equipment readily available in Igembe South?
   a. Yes [ ]
   b. No [ ]

6. Does the road construction skill labour influence the overall cost of road maintenance?

Strongly agree	Agree	Disagree	Strongly disagree

SECTION C: POLITICAL LEADERSHIP INFLUENCE ON RURAL ROAD MAINTENANCE

1. Do you think political leadership is important in development?

Strongly agree	Agree	Disagree	Strongly disagree

2. Do political leadership play a role in decision making for rural roads maintenance?

Strongly agree	Agree	Disagree	Strongly disagree

3. Depending on your answer above does this influence funding on rural roads too?

Strongly agree	Agree	Disagree	Strongly disagree

4. Does this influence the development of the rural areas?

Strongly agree	Agree	Disagree	Strongly disagree

5. Do you think political leaders should be involved in decision making in maintenance of rural roads?
    a. Yes [ ]
    b. No [ ]
6. Is there a time when the relevant bodies do not respect political decisions on which roads to maintain?
    c. Yes [ ]
    d. No [ ]

SECTION D: TECHNOLOGY ON MAINTENANCE RURAL ROAD NETWORK

1. Do the rural roads in Igembe South carry heavier traffic of more than 25 tonnes
    a. Yes [ ]
    b. No [ ]
2. Do the roads meet the standards for the capacity they carry?

Strongly agree	Agree	Disagree	Strongly disagree

3. Is the technology employed in rural roads appropriate for the maintenance of roads in Igembe south?

a. Yes [ ]

b. No [ ]

4. What is the determinant for setting the technology used?
   a. Availability of local labour [ ]
   b. Engineers suggestion as per the works [ ]
   c. Type of road [ ]
   d. Others (specify) _____
5. Should the government determine the technology used in maintaining rural roads?
   a. Yes [ ]
   b. No [ ]
6. Is the technology used be similar to that used for construction and maintaining urban roads?
   a) Yes [ ]

   b) No [ ]

SECTION E: TIME FACTOR ON MAINTENANCE RURAL ROAD

1. Are all rural roads maintenance projects carried out on time?
   a. Yes [ ]
   b. No [ ]
2. What is the time estimated for a project based on?
   a. Type of maintenance [ ]
   b. Scope of the project [ ]
   c. Others (specify) _____
3. Do the contractors complain of shorter time limit for completion of projects?
   a. Yes [ ]
   b. No [ ]

4. If they do not complete the projects in time are there penalties?
   a. Yes [ ]

b. No [ ]

5. According to the reports you have got from contractors is it ideal for contractors to be allowed to schedule their time completion time

Strongly agree	Agree	Disagree	Strongly disagree

THANK YOU