

**FACTORS INFLUENCING IMPLEMENTATION OF INFRASTRUCTURAL  
PROJECTS: A CASE OF ROAD CONSTRUCTION IN MACHAKOS COUNTY,  
KENYA**

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## DECLARATION

This research project is my original work and has not been submitted for the award of a degree or certification in any other institution

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## **DEDICATION**

To my mother, Ruthyanna Mumbua Ngundo and sister, Lillian Kimanthi with whose inspiration and motivation gave me the zeal to get to this point. I am forever indebted to their continued support. May God bless them as I forge ahead with my future endeavours in life.

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## ABSTRACT

Transport and infrastructure development projects have become central in the progress agenda for Kenyan Counties, in particular Machakos County. The research project sought to offer an insight into road projects executed in Machakos County and methodologies used in implementation. The dependent variable discussed was the implementation of road infrastructure projects while the independent variables include; project needs assessment, design methodology, stakeholder engagement, monitoring & evaluation, and post review systems of road infrastructural projects. A descriptive research design was employed to conduct the study. Structured questionnaires and interviews were used in collection of qualitative and quantitative data. The participants for the study included 14 county engineers employed on permanent basis by Machakos County Government, 40 ward representatives from the elected Machakos County Assembly members, and 14 road contractors who have completed construction of road project to bituminous standards. The target population was 68. Due to the small population and the need to increase data accuracy so that true findings would be acquired, a population census was conducted. The data acquired was analysed using percentages, frequencies, and presented in tables. The study based its conclusions on primary data sources retrieved from questionnaires administered with the aid of research assistants. The success of the dependent variable, which is implementation of road infrastructural projects, was based on user satisfaction, economic growth and expansion, and ability to ensure seamless connectivity within Machakos County. The study concluded that although project needs assessment was considered vital for the successful implementation of projects, it was not carried out while implementing road projects. Similarly, the study findings indicated that design methodology was ignored as evidenced by the absence of preliminary and as-built drawings, which is an indication that material investigation, traffic survey, engineering survey, and hydrological survey were not carried out. The study demonstrated the evidence of stakeholders being involved, but the participation was only limited to the prioritization stage. Most of the stakeholders were not involved during and after implementation of road projects, making it difficult to check conformity of the road project to the initially agreed deliverables. Monitoring and evaluation models for checking project status, time, and cost were absent with an insufficient management and maintenance system for implementation of road projects. The study concluded that post review systems were not used as a means to learn from past mistakes and to discern best practices for replication in the future. It was recommended that that human resource capacity, technical and financial feasibility be carried out prior to implementation of road projects to avoid project from stalling midway by ensuring there is adequate funds and sufficient personnel. The study also recommended that material investigation, traffic survey, engineering survey, and hydrological be carried out by separate teams who would consolidate their report and offer a preliminary design that can be used as a benchmark for implementation. The study also recommended the involvement of stakeholders beyond the prioritisation stage and the use of monitoring and evaluation tools to check whether the project was within the required cost limit and period. Ultimately, the study concluded that short and long-term appraisal to be carried out with economic indicators to show that implemented road projects have achieved the perceived socio-economic goals.

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background to the study

The factors influencing implementation of infrastructural projects include; projects needs assessment, design methodology, stakeholder engagement, financing, monitoring & evaluation, and post review systems. The influencing factors are appreciated as being capable of augmenting or reducing user satisfaction in some, but not all situations (Linger, et al., 2013). Road infrastructural projects are considered capital-intensive ventures with the sole funding often coming from the government. The magnitude of the projects is such that private entities cannot engage in constructing long kilometres of road. A successful road infrastructural project must tackle macro problems like economic, political, institutional, social, and environmental aspects because they affect the prioritization of policies in a country (Howes & Robinson, 2006).

Applying the critical chain project management to infrastructural projects can lead to eliminating or reducing the uncertainties of the limiting factors or constraints. In focusing on the resources required to execute each activity of the infrastructural project, it would be possible to achieve desired goals of the capital-intensive road ventures. However, there has been minimal focus on the critical chain as a sequence of activity and resources related to it. The effect is a profound ignorance on the ‘limiting factors’, which are not identified or realized prior to commence of road projects. According to a report from the International Monetary Fund (2007) agency, road infrastructure projects in Kenya did not focus on the limiting factors, thereby leading to major repairs and road failures, which made it difficult for the roads to achieve the goal of intended socio-economic growth. Other limiting factors that were ignored but affected road infrastructure projects were on time, information technology, and mobilization (Njenga, 2014).

Past studies focused on the factors influencing infrastructure projects from the viewpoint of balancing time, cost and quality, but the proposal will aim at touching on projects needs assessment, design methodology, stakeholder engagement, monitoring & evaluation, and post review systems with the focus emphasized on the resources and activities (Reviere, 2013). The unique nature of the study is that by dealing with the processes, it will be possible to

identify the activity and resources, which will make it trivial to capture the limiting factors. In eliminating, the constraints or limiting factors associated to resources and activity, implementation of infrastructural projects may become successful.

Machakos County Government, through funds received from the Kenyan Government, is increasing investment on infrastructural road projects as part of its constitutional mandate (County Allocation of Revenue Act, 2014). The aim is to ensure seamless connectivity that can spur economic growth. Sectoral budget for Transport & Infrastructure in the fiscal year 2013/2014 passed by the Machakos County Assembly amounted to 1.362 billion Kenya Shillings (Controller of Budget, 2014). The allocation indicated priority in the implementation of infrastructure projects. From the budgetary expenditure on Transport & Infrastructure, 1.214 billion Kenya Shillings were used on development out of 4,118,560 Kenya Shillings, and in particular civil works, which consumed a significant chunk of the entire 2013/2014 budget, hence the need to analyse, research, and ensure successful implementation of road infrastructure projects (County Budgets 2013-2014).

Among the dependent variables, project needs assessment, appears as the initial step in ensuring successful implementation of road projects. Carrying out technical, human resource and financial feasibility form part of the core elements of project needs assessment. Failure to carry out technical feasibility leads to uninformed cost and type of pavement structure. Technical feasibility, which involves material investigation, hydrological survey, geometric design, and structural design, offers the design team with an overview of the quantities, resources, and activity during atypical road implementation project (Skinner, 2008). For instance, construction of Makutano-Kithimani (C100) road did not have feasibility studies (Ouko, 2015). It was financed through a supplementary budget FY 2013/2014 Ref No: MKSCA/FIN/BCT (VOL.2)/16 dated 24<sup>th</sup> March 2014 amounting to Kshs 765,000,000 under Department of Public Works, Roads, Transport & Housing. Even then, the specialized audit report on the road project indicated that there were no feasibility studies, community participation, and cited delayed payments to contractors. The contract meant to run from 25<sup>th</sup> February 2014 to 25<sup>th</sup> June 2014 still had delayed payments with no contractor cleared of their obligation, despite elapse of the contract period, hence indicating the consequences of an absent project needs assessment (Ouko, 2015).

The design methodology for road construction follows the Ministry of Transport Road Design Manual, which offers conventional procedures on design supervision and contract management (Chief Engineer Materials (Roads & Aerodomes), 1981). The manual is intended for use after completion of the procurement procedures as stipulated in the Public Procurement and Disposal Act (2005). The assumption is that the county government's ministry will have included the project in the work plan and have it approved through the county assembly. Due to the huge cost of implementation, the road projects ought to be included in the initial yearly work plan and budget to facilitate proper planning and cash flow. The design methodology offers checks and balances by attempting to develop measures that can curb unnecessary expenditure of public funds (Transportation Research Board, 1982). The design methodology offers a guide to senior and junior participants in the implementation of road infrastructure projects by optimizing on resources, activities and time.

Stakeholder engagement takes into consideration views of the immediate community, private partners, contractors, county and national government officers to ensure that prioritization of road projects is in line with the needs assessment (Roeder, 2013). The community needs to participate in identification of their immediate needs and ways that road projects can elevate their social and economic status without prejudice and in an informed manner. The road projects should have grass root ownership and community initiative as part of the planning process. Not only does involving the community lead to reduction in costs, and project ownership, but it also increases transparency and accountability during prioritization of the road projects (Teipelke, 2014). Spending public money requires an adequate consolidation of the stakeholders involved. The immediate community input is vital in creating the framework for community-initiated projects. Other stakeholders engaged in implementation of road infrastructure projects include; the technical personnel comprised of project managers, engineers, surveyors, and environmental officers who execute project supervision in various construction stages. During stakeholder engagement, the community is invited to take part in preparation of the budget. Involving the community in public budget participation should not appear as a constitutional requirement, but rather as an attempt to increase transparency, eliminate discrepancies, and inform the public of the intentions of the County Government in service delivery (National Council for Law Reporting, Public Finance Management Act No 18, 2012).

Monitoring and evaluation techniques are a prerequisite for the stakeholders engaged in a project, especially the key participants like the professionals. Key participants ought to have skills that will equip them with the knowledge of gauging project performance in line with scheduled resources and time elapsed. Therefore, road infrastructure projects ought to have baseline surveys on socio-economic indicators prior to commencement, after completion and years later. The indicators will form the basis of monitoring and evaluation by giving the impact of the road projects before, during, and after completion (United Nations ACC Task Force on Rural Development-Panel on Monitoring and Evaluation, 1985). Similarly, the implementation of the road projects would require frequent assesses and checks on the activities and resources confined for use. The aim of monitoring and evaluation is to ensure that resources are linked to deliverables in a timely, efficient, and effective means (Muhia, 2010).

Post review systems are vital in the road projects because they assist in establishing the lessons learned and forging better ways of executing road projects than before. The post review systems can offer a benchmark on the costing of infrastructure projects. For instance, completed road projects that are well documented can be used to analyse costs of material availability, human resource capacity and the optimal technical approach from an evidence-based approach (Cook, 2005).

Factors influencing transport infrastructure projects can be improved if the on going case scenario in Machakos County is revisited and recommendations offered. However, if the prevailing gaps in the current implementation of road projects are not monitored, the road projects will lack sustainability and appear as avenues of wasting taxpayers money. Road projects are not only expensive capital ventures, but also entities that require routine maintenance. The periodic maintenance costs are aimed at increasing the lifespan of the road. However, without clarity on the actual costs incurred, including overhead costs, it would be impossible to quantify the actual costing of the road (Adelback & Johansson, 2013). While it is essential to increase connectivity through road construction, value for money must be at the epicentre of the expenditure. Value for money in road construction is essential because it increases the deliverables while ensuring prudent accountability of funds. For instance, it is admirable, for both social and political mileage, to construct roads at 17million per kilometre. However, spending little and using extra for routine maintenance does not lead to prudent accountability. If the counties are to realize the fruits of devolution, road projects can be the

focus of increased economic growth (Kenya National Assembly Official Record (Hansard), 2007).

Road construction would spur economic growth by reducing journey times and opening up the county for transportation of commodities. There is a chance of increasing the revenue collection base through seamless connectivity if the roads are sustainable and durable. However, failure to prudently plan for the construction and mitigate on construction risks will lead to undue maintenance costs (Weisbrod, 2000). For instance, when the roads do not last for the intended design life, it is impossible to realize spurred economic growth. It is obvious that carrying out project needs assessment, auditable design methodology, ensuring stakeholder engagement, monitoring, and evaluation, and post review systems will go along way in curbing the runaway problems affecting implementation of infrastructural projects in Machakos County. Since the road infrastructure projects in Machakos County will play a key role in opening up the area, the factors influencing infrastructure projects must have solutions and mitigation measures, in order to spur socio-economic development.

## **1.2 Statement of the problem**

Implementation of road infrastructure projects requires the identification of the limiting factors and constraints associated with the projects. Technical and financial feasibility studies carried out often include traffic surveys and material availability as the conventional methods, but fail to focus on the possible limiting factors (Skinner, 2008). Furthermore, the costs are a dictate of the traffic class and the native alignment soil profiles. Ideally, irrespective of the traffic class achieved and the native alignment sub grade, there is always a pavement structure that can be retrieved from the Road Design Manual (Chief Engineer Materials (Roads & Aerodomes), May 1981). According to the Transportation Research Board (1982), there are no inherent mechanisms that deal with the limiting factors emanating from resources and activities to be executed during implementation of the road projects; hence, each project will face unique limiting factors affecting the resources and activities for successful implementation.

The same approach of considering traffic class and native alignment soils for road implementation is supposed to be adopted in Kenya at both the national and County level of governance. After promulgation of the Kenyan Constitution in 2010, there were two distinct

government levels, which included National and County governments. The road implementation process and its intended desire for socio-economic growth began earlier and was noted in the Sessional Paper No. 5 of 2006 adopted and passed by parliament outlining the importance of seamless connectivity and facilitation of the 93% of freight through Kenyan roads (Ministry of Roads, 2012). The devolved system saw Transport and Infrastructure functions devolved to the county governments (National Council for Law Reporting, 2010). However, the fuel levy fund used for construction of new class A, B, C roads and their maintenance, remains in the custody of the national government through bodies like the Kenya National Highways Authority as the implementing agency. At the national level, the traditional and conventional method of implementing road projects is observed, but with little focus on the limiting factors touching on the resources and the activities of road construction, especially on post review systems (Teipelke, 2014).

Failure to take into consideration the limiting factors and constraints leads to most road projects in Kenya not meeting the desired design life of 10 to 20 years without repairs, especially after heavy rainfall, and contributes to non-futuristic methods that can predict traffic growth with certainty (Chief Engineer Materials-Roads and Aerodomes, 1981). With the Transport & Infrastructure duties devolved to the county government, there is a need to take into consideration the limiting factors. The constraints or limiting factors ought to be identified for each road project bearing in mind the challenges and technicalities will vary depending on magnitude and location of the road project. Since the constraints are not conventional, the possibility of an overlook is high.

This study assessed limiting factors influencing implementation of infrastructural projects like projects needs assessment, design methodology, stakeholder engagement, monitoring & evaluation, and post review systems with the effect of delayed payments coming in as a moderating variable. The improvements proposed would be on changing the county organizational culture, developing planning strategies, proposing monitoring and evaluation models, and looking at possible post review strategies. The research project touched on the conventional ways of implementing road projects, and their significance in Machakos County, and the failure to identify the influencing factors at the design stage. For example, construction of Makutano-Kithimani C100 road project lacked feasibility studies and detailed designs (Ouko, 2015). Failure to carry out traffic surveys, leads to an uninformed justification of the pavement structure and subsequently the cost of roads; hence the need to adequately plan, monitor and evaluate with the focus of ensuring sustainability and durability in the road

projects. Local studies conducted by Njenga (2014) on factors affecting effective and efficient delivery of road construction projects indicate that failure to have technical feasibility and financial feasibility also leads to lack of transparency on actual funding of roads and unprecedented expenses going into routine maintenance. There is an evident necessity to determine and research on the limiting factors, which include; projects needs assessment, design methodology, stakeholder engagement, monitoring & evaluation, and post review systems, which affect implementation of infrastructural projects, especially road construction in Machakos County.

### **1.3 Purpose of the study**

The intention of the study was to investigate factors influencing implementation of infrastructural projects by focusing on road construction in Machakos County.

### **1.4 Research Objectives**

The following objectives guided the study

1. To establish the influence of project needs assessment on implementation of road infrastructure projects in Machakos County.
2. To establish the influence of design methodology on implementation of road infrastructure projects in Machakos County.
3. To establish the influence of stakeholder engagement on implementation of road infrastructure projects in Machakos County.
4. To assess the influence of monitoring and evaluation systems on implementation of road infrastructure projects in Machakos County.
5. To determine how post review systems influences implementation of road infrastructure projects in Machakos County.

### **1.5 Research Questions**

1. What is the influence of project needs assessment on implementation of road infrastructure projects in Machakos County?
2. What is the influence of design methodology on implementation of road infrastructure projects in Machakos County?
3. What is the influence of stakeholder engagement on implementation of road infrastructure projects in Machakos County?

4. To what level does monitoring and evaluation systems influence implementation of road infrastructure projects in Machakos County?
5. How do post review systems influences road construction projects in Machakos County?

### **1.6 Significance of the study**

The research will inform road stakeholders in Machakos County on the need to carry out feasibility studies, detailed designs, community participation, monitoring and evaluation and creation of post review systems to assess the impact of completed road projects. In discussing the limiting factors, stakeholders involved in infrastructure projects will appreciate factors influencing implementation of road projects as being unique and dependent on location and magnitude of the project. It will save the development budget funds, which can be channelled into similar road projects or other ventures. There will be increased value for money with the little funding offered from the national government to the counties.

Not only will the cost savings implicate positively to the counties, but also it would ensure deficit funds acquired through borrowing by the Kenyan National government are utilized at the grass roots with additional value being acquired. The research would ensure that county executives cannot channel money meant for development of road projects into other funds without proper consultation. With the rising cases of the county seeking supplementary budget, it would ensure that money already used and its deliverables can be felt, and short-term results are evident to the immediate community.

### **1.7 Delimitations of the study**

The aim of the study was to evaluate influencing factors on infrastructural projects with the domain limited to Machakos county road projects. The study questionnaire was to be answered by engineers working in Machakos County Government –Department of Transport and Roads, ward representatives and contractors. It borrowed from the specialized audit report conducted by the Auditor General’s Office on low volume seal roads implemented in Machakos County. The research focused on Machakos County’s implementation of road infrastructure projects using data acquired from the self administered questionnaires. It focused on the allocation of the county monies and the exact values offered to the ministry to implement road infrastructure projects. As a result, it evaluated the planning, implementation

and post review systems used in Machakos County. It focused on methods of planning, budgeting, implementation, and possible post review systems for the road. Information from implemented road projects was included in the study. Ultimately, the study demonstrated seamless connectivity being achieved and the possible tenets of economic growth being realized. Albeit the research focused on Machakos County only, the expected outcome is supposed to offer an insight into the practises in other counties.

### **1.8 Limitations of the study**

It is appreciable that the data and conditions from other counties may not be similar to Machakos County, hence the limitation of consistency and relevancy in implementing the project outcomes to other counties. However, the researcher overcame the limitation by indicating that road construction projects, follow a predefined procedure irrespective of the location. Another limitation is on the eventuality that road construction alone can spur economic growth, bearing in mind there are other factors that affect economic growth. However, the limitation was dealt with by indicating various means in which road construction is linked to other economic factors like inflation through transportation costs, employment through job creation in road construction among others.

### **1.9 Assumptions of the study**

The assumption was that the respondents would offer fair information, and that political allegiance would not contribute to distortion of the data. Owing to the fact that the region may be divided in areas that support and oppose the existing county government, it is assumed that the data captured was devoid of political interference and perception of residents.

### **1.10 Definition of Significant Terms Used in the Study**

#### **Project Needs Assessment**

It is a systematic and organized approach of evaluating and determining gaps between current and desired requirements on procurement planning system, technical and financial feasibility, and human resource capacity.

### **Design Methodology**

A planned and chronological procedure used in road construction, which includes traffic survey, material investigation, engineering survey, hydrological survey, and analysis of drainage structures and release of preliminary drawings.

### **Stakeholder Engagement**

It is a holistic effort that ensures community and national government participation, county government involvement as beneficiaries and private sector in implementation of infrastructure projects.

### **Monitoring and Evaluation**

Monitoring is the systematic collection of data using key indicators on project status, time, and cost to inform management and stakeholders on achievement of goals and objectives and evaluation is the assessment of objectives on on-going programmes.

### **Post review systems**

It is the evaluation of the completed project using both short and long-term appraisals in the determination of socio-economic growth.

### **1.11 Organization of the study**

The research has five chapters. Chapter one gives an introduction on factors influencing implementation of infrastructure projects, purpose of study, research objective and questions, significance, delimitations, and limitation to the study. Chapter two entails the literature on implementation of road infrastructure projects and limiting factors associated with project needs assessment, design methodology, stakeholder engagement, monitoring, and evaluation, and post review systems. Chapter three comprises of research design, target population, research instrument, validity and reliability of research instrument, method of data collection, and operationalization of variables. Chapter presents the analysis and interpretation of collected data. Chapter five offers the findings, conclusions and recommendations drawn from the proposed study.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviews past literature on factors influencing implementation of infrastructure projects by focusing on the global and African perspective, and narrowing down to the local level viewpoint. It gives a theoretical framework on constraints or limiting factors associated to resources and activities used in implementation of road infrastructure projects. Ultimately, the chapter offers a conceptual framework on which the whole study was centred.

#### **2.2 Implementation of Road Infrastructure Projects**

Globally, implementation of road infrastructure projects commences with the sourcing of funds due to the capital-intensive nature of the projects. In most cases, funding comes from international organizations or the governments within which the road is to be constructed. Prior to implementation of the road projects, a standard guide for executing the projects is set out by the stakeholders. Different continental regions have varying approaches from which standards used for construction are pre-determined. For instance, the European Norms are widely used in setting out standards for design of highways and bridges, Indian Standards form a benchmark for construction in India, and American Standards are used in the United States (Schoon, 2000). International practise on implementation of infrastructure projects require that different road elements be designed based on the specific standards as a basis of uniformity and guide to practising engineers. The standards used in a prevailing region will form the special conditions used to develop contracts and agreement with contractors executing the road projects (Great Britain Department of Transport, 2004).

In Europe, International federation for Consulting Engineers (FIDIC) or the red book forms the basis for contract supervision and management. The contract outlines the module of operation and implementation procedure for the civil and structural works involved in a road project. International procedures for implementation of road projects include; planning, procurement, traffic survey, material investigation, geotechnical reporting, hydrology survey, engineering survey, release of preliminary drawings, setting out, construction, monitoring & evaluation, and post review of completed road projects (Politis, 2009). In each process, there exists limiting factors that will influence the overall performance and implementation of the

road infrastructure project. The Transportation Research Board in Europe outlines the necessity for carrying out project needs assessment as a prerequisite to informing the design engineer and stakeholders on the resources and activities in a project (Ceran & Newman, 1992). For instance, overseas Road Note 29 and Road Note 31 details that baseline surveys carried out will offer economic indicators to benchmark the economic status of the people prior to implementation of the road project (Look, 2014). Similarly, Europe's Transport Roads and Research Laboratory outlines minimum specification of materials to be used in road construction while taking into consideration the design methodology (Albalate, 2014). The design methodology appears as a factor influencing implementation of road infrastructure projects because it affects the quality and strength of the completed road surface. For instance, In America implementation of road projects must ensure that gravel materials used in the design methodology exceeds a California Bearing Ratio of 160% (Hicks, 2007). The California Bearing Ratio (CBR) is a standard used to measure the strength of gravel used in construction of base layer of roads. In Europe, British Standards require that the gravel used in the design methodology should have an unconfined compressive strength of more than 1600 (KN/M<sup>2</sup>) Kilo Newton per square meter (Baker, 1975). Roads that have failed to meet the minimum design criteria have proved unsustainable and weak in withstanding loading from motor vehicles. For instance, Appalachia section I-81 in Virginia, United States failed from the bottom to top surfaces causing cracking on the road pavement because it could not withstand heavy loading (Fisher & Smith, 2007).

In Africa, infrastructure development is seen as the key to bridging the existing economic gap in the continent. According to a report by Ernest & Young on implementation of infrastructure projects stakeholders from the private sector invested \$12.8 billion into infrastructure projects (Ernest & Young, 2014). Implementation of road infrastructure projects varies depending on the regions in Africa. Unlike, the global scenario, implementation of road projects in Africa is guided by the financing entities. Owing to the capital-intensive nature of the projects and the need to develop infrastructure, funding comes from different avenues including African governments, multilateral and bilateral agencies, or through Official Development Assistance (Ernest & Young, 2014). The funding agencies often dictate the mode of execution and implementation of the infrastructure projects. For instance, the National Transport Authority will dictate the design methodology if the funding comes from the government. For instance, Tunisia borrowed € 300 million meant for

upgrading of its highways and motorways from the European Investment Bank (World Bank, 2015).

Nonetheless, the design methodology and needs assessment appears as a crucial factor in the implementation of road infrastructure projects. Failing to take into consideration materials requirements and conducting adequate planning leads to pavement cracking and deterioration. According to Awoyinfa (2012) most roads in Nigeria fail because implementation does not adhere to construction standards; hence, leading to defective designs. The significant factors affecting implementation of infrastructure projects in Africa often touch on delayed payments. Most road projects are an exception using contract, which begs the need for timely payment in order to ensure the projects are completed on schedule. Cash flow issues affect contractors' performance and quality of work because they compromise on the designs and fail to conduct an effective needs assessment. The shortcut measures adopted by contractors appear as cost cutting tools, but they lead to defective designs and non-adherence to stipulated construction standards. The ultimate effect is delay on implementation of infrastructure projects. Furthermore, the need for tracking of costs by lending and national road agencies in Africa is emphasized as part of the planning process in an attempt to ensure that citizens acquire value for money, sustainable and durable roads (Mubila et al., 2014).

In South Africa especially Cape Verde, monitoring, and evaluation of road infrastructure projects have achieved notable milestones. International lending agencies or financing banks have conducted monitoring, evaluation on implementation of paved, and unpaved roads leading to successful project implementation. For instance, the Inter-urban construction in Cape Verde that began in 31<sup>st</sup> December 2005 was successfully completed by 11<sup>th</sup> July 2006 because of the involvement of the African Development Bank in monitoring and evaluation (Mubila et al., 2014). Not only did the routine checks by the bank ensure successful implementation, but also it limited the variations on the project costs, which led to a reduction in cost overruns. Effective monitoring and evaluation leads to proper documentation, which facilitates ex post analysis of completed road units. Post analysis appears as a benchmark for pegging future implementation of roads through identification of cost cutting measures and effective was of adhering to construction standards. The ultimate effect is that it eliminates the possibility of defective designs and prevents road failure, thereby promoting durability and sustainability. According to World Bank report on results

achieved on strategic city project meant to ensure access and connectivity in urban areas, post indicators sufficed to denote that the country had paved 152 urban roads (World Bank, 2014).

In Kenya, infrastructure projects are the key to socio-economic growth; hence, the huge budgetary allocation passed to fund road projects and open up links in the transport network. Implementation of infrastructure projects in Kenya faces the problem of funding mostly caused due to inadequate planning. Okero (2011) attributes the increasing number of uncompleted infrastructure projects financed through Local Authorities Transfer Fund (LATF) to inadequate technical capacity, minimal community participation, political interference, delayed payments, poor monitoring and evaluation techniques. The aspect of project needs assessment and its consideration in the Kenyan context is vital, but often lacking in implementation of infrastructure projects. Makajuma (2011) advocates that an eminent need to involve the community during prioritization of projects and to shun political interference is some of the aspects that would improve efforts to carrying out project needs assessment. For instance, infrastructure projects executed in Mombasa County did not have the initiative of the community; hence, they lacked grassroots ownership. The society dissociated itself with the projects and considered them alien since they were not involved from inception (Okero, 2011). Therefore, implementation of the infrastructure projects did not address the immediate needs of the community, which prompts the society to remain discontented with the implementing authority's decision.

Local studies by Kilaka and Omwega (2015) on factors affecting public private partnerships financing by considering infrastructure projects carried out by Kenya Urban Roads Authority indicated that lack of transparency, bribery and non-competitive bidding affected the quality, time and cost of implementing road infrastructure projects. Non-competitive bidding indicated inadequacy of the project needs assessment as it touches on the procurement system and planning of the country. Provided the bidding is non-competitive, it is difficult to find the right contract to execute road infrastructure projects within the desired period without compromising on quality. Barasa (2014) adds that bribery and corruption affects the ability to carry out an effective project needs assessment as it looks out the opportunity towards tenders based on technical and human resource capacity. The result becomes uncompleted and abandoned projects since the contractors did not have financial and technical capacity to execute the works. Kilaka and Omwega (2015) point out that in cases where the projects are complete, value for money is not evident and road failures ensue due to defective designs

arising from failure to adhere to construction standards. Despite the challenges of procurement system and planning managers in road construction agencies view performance contracts as a new tool to assist in increasing community participation and accountability by making senior officials accountable (Koskei, 2012).

In Machakos County, the 2015/16 budget presented to the Machakos County Assembly was 10.94 billion Kenya shillings, out of which 5.69 billion Kenya shillings was directed towards development- an indication of the augmented commitment to execute infrastructure projects in the county (Nzyoka, 2015). Specialized Audit report from the Office of the Auditor general Kenya on the 2013/2014 fiscal year indicated a total expenditure of 598 million Kenya Shillings to tarmac Makuatno-Kithimani road-see *appendix IV and V* (Ouko, 2015). However, the report cited the lack of feasibility and detailed designs in implementation of road infrastructure projects; thereby making it difficult to judge the economic impact and value for money on the construction. Failure to have detailed designs meant that traffic survey, as part of project needs assessment was not carried out; hence, making it difficult to point out with certainty the axle limit for the road. Sustainability and durability as pointed out by Ouko (2015) in the audit report remain vague, especially due to conspicuous absence of project needs assessment.

Delayed payments to contractors implementing road infrastructure projects influenced performance on implementation due to cash flow related problems. While the issue on delayed payment is partly associated with the delay of funds from national government and deficit in revenue collection, poor planning as cited by Ouko (2015) remain central in accounting for the increased number of uncompleted and abandoned road projects.

### **2.3 Project Needs Assessment and Implementation of Road Infrastructural Projects**

Project needs assessment touches on procurement systems, technical and financial feasibility, and release of preliminary drawings for road construction. An informed project needs assessment will be justified by including the road infrastructure projects in the procurement plan. By virtue of inclusion in the procure plan, the road project is assumed to have undergone a needs assessment justifying it to be part of the procurement plan and budget items (Barasa, 2014). There have been several developments on the procurement systems as it forms the first check performed by decision-makers prior to implementation of a road

project. The planning process requires that adequate funding be identified prior to engaging in the procurement process. The first tenets of economic growth through informed and unbiased procurement system were spurred through Sessional Paper No 10, '*African Socialism and Its application to Planning in Kenya*' of 1965 introduced and proposed in parliament to increase equity (Park, April 2014).

Economic growth was considered crucial for the growth and development of the Kenyan people at the grass roots level. The session paper touched on increasing the per capita income of the Kenyan people through development of transport infrastructure. Through the Ministry of Economic Planning and Development charged with mandate of prioritizing infrastructure projects, efforts to spur economic growth In Kenya began to be realized (Ochieng & Muehle, 2014). Despite meetings from the Planning and Advisory Development Committee there were little reforms aimed at improving infrastructure to spur economic growth. Even though the sentiments were present for economic growth, infrastructure development policies appeared weak to realize an improved transport system. Most of the road infrastructure was because of the colonial government efforts. There was a need to increase commerce from the Kenyan Coast and its interior. However, road policies originating from Kenyan government after independence did not offer much focus on its planning. Evidence of increased commerce was apparent after construction of the Mackinnon-Scalter road of approximately 1000 kilometres from Mombassa to Busia. The intention was to open up the coast regions with the interior for transfer of commodities. The colonial government undertook the road construction, and the implementation of the road followed British procedures, which ensured the use of the Imperial British East African Company (Park, 2014).

Road construction projects that make part of the development budget are often contracted to ensure quality of works. In 1955, the Central Tender Board controlled award and regulated bidding to ensure impartiality. However, the weak policy framework did not curb the runaway need for adequate policy planning due to lack of a linkage that would justify costing and funding source for road projects. There was no vivid framework indicating the actual source of funds for road construction apart from revenue collection, which had to be shared between recurrent and development expenditure. In 1959, the Ministry of Works developed the Department of Supplies and Transport to aid in procurement procedures, which would include impartiality in award of road infrastructure projects. Despite the existence of the Cental Tender Board, it was not until the treasury released circular referenced 12/57/02 dated

19<sup>th</sup> January 1960 that a formal structure to ensure impartiality in award of local and over seas purchase, and colony-wide contracts ensued (Ochieng & Muehle, 2014).

The system continued to the late 1974s with crown agents carrying out procurement procedures for the government. In 1978, the Kenyan Government issued the Supplies manual, and the Director of Government Supplies offered the mandate to monitor and ensure checks. The creation of the supplies manual coupled with the 1982, District Focus for Rural Development Strategy sparked milestones in the procurement process. District Tender Committees were created, which meant that communities through the board would have their immediate concerns addressed. Despite the existence of circulars and supplies manual for procurement, the review carried out in 1999 cited serious gaps that created loopholes during award of large road construction projects. The review of 1999 on the Central tender Board indicated the absence of a uniform procurement procedure over the country due to the numerous District Tender Committees, which operated based on the decision of the members. The previous systems lacked penalties and sanctions on public officers that did not follow the manual. The only existing reprimand was based on internal discoing. Furthermore, failure to make the rule strict meant that the norms be violated. Presumably, the notable discrepancy on the 1978 Supplies Manual was the conspicuous absence of laid down procedures for procurement of works. The weakness in the supplies manual lead to lack of confidence from the citizens who felt that they did not acquire significant value for money, which was mostly spent on procurement processes.

Despite the reforms on procurement beginning in 1998 through support from World Bank major efforts were realized thorough the creation of the Public Procurement and Disposal Act of 2005. The Act led to creation of the Public procurement And Oversight Authority, Public procurement Advisory Board, and ensured continuity of Public Procurement Complaints. There were serious sanctions imposed on officers found to have been found and charged for graft allegations (National Council for Law Reporting, Public Finance Management Act No 18, 2012). The sanctions and penalties meant that due process would be followed, to some extent in the planning and procurement process.

#### **2.4 Design Methodology in Implementation of Road Infrastructural Projects**

The conventional procedure of implementing road infrastructure projects begins with planning for the project. It includes developing a work plan in the preceding financial year

with the target of executing the works in the coming fiscal year. The work plan forms the basis for deriving the program based and finally the itemized budget (Coogan, 2000). However, the road infrastructure projects included in the work plan do not always have the initiative of the community. The decision makers supposedly consider the most critical links without including the immediate community.

The process is followed with a technical feasibility that involves finding the traffic limits for the proposed road project. Based on the amount of traffic limits, there can be technical viability for justification of the project or dismissal.

Assuming that the project acquires technical justifiability material investigation and topographical survey are conducted to produce preliminary designs for the road construction. The design includes geometric consideration for ease of driving. Based on the material investigation and traffic class of the road, a pavement structure for construction is chosen by the Engineer (National Cooperative Highway Research Program, 2010). The financier can then proceed to advertise for the works and invite bidders to tender for the jobs. However, there must be sufficient evidence in the vote book to allow for the implementation of the project. Ultimately, the design methodology forms the criteria for successful implementation of road projects (Coogan, 2000).

After notification of award the contractors are offered notification of award and commencement letters to execute the contracts upon which the employer officially hands over the site through writing. The contractors work within the specified period, which is mutually agreed by both parties (Rodrigue, 2012). Depending on the stipulations in the contract, the contractor is allowed to raise certificates monthly for payment. Since the assumption is that the employer has made a plan to budget for the road projects, the monies are supposed to be released to ensure timely completion of the projects.

Upon completion of the road infrastructure projects, the contractor is allowed to request for a substantial completion pending the defects liability period. The defects liability period offers time for the employer to check for defects and request the contractor to remedy them. Ultimately, the contractor is issued with a Taking over Certificate and Defects Liability Certificate, upon which they can claim the retention monies. After confirmation that the retention monies are remitted to the contractor, the employer issues a completion certification that completely exonerates the contractor from any liability and marks end of the project.

Ideally, the process is controlled and guided either through the FIDIC, Conditions of Contract for works of Civil Engineering Construction”, fourth edition, *Federation International des Ingenieurs-Conseils*, 1987). In order to ensure careful execution of the works, the following manuals are used for supervision: Standard Specification for Road and Bridge Construction, 1986 (SSRBC), Road Maintenance Manual, May 2010 (RMM), Contract Management Manual, Planning Manual for Preparation of the Annual Road Works Programme (ARWP) by Road Agencies, Kenya Roads Board, February 2010. The typical process is adopted from European Norms, and is meant to ensure checks and conformity. However, decision makers have largely ignored the procedure leading to escalated costs of constructing roads.

## **2.5 Stakeholder Engagement and Implementation of Road Infrastructural Projects**

The capital-intensive nature of road projects requires that several individuals take part in the conceptualization and prioritization of the roads to be constructed. Stakeholders include; the financiers, contractors, consultants, beneficiaries, community and the government. Successful implementation of road projects must eliminate constraints emanating from stakeholders by taking into considerations their views and trying to accommodate their perception in the project. The community participates in prioritizing the roads for construction so that they can own the project, reduce overhead costs, and increase transparency (Adelback & Johansson, 2013). Not only does this ensure project security, but also it makes the community perceive the desired benefits. Therefore, constraints that may occur from the community geared towards hindering the projects are not likely to occur. Furthermore, involving the community will ensure that an informed decision on the economic impact of the road project becomes realized. For instance, the Ministry of Lands, Housing and Urban Development through the Kenya Informal Settlements and Improvement Program initiated a slum-upgrading program in Swahili and Kariobangi village located in Machakos Town Constituency, Machakos County, Kenya where they involved community to participate in the conceptualization of the infrastructure projects. The result was that the community owned the project and defended its implementation, thereby eliminating constraints that would interfere with the success of the project.

## **2.6 Monitoring & Evaluation and Implementation of Road Infrastructural Projects**

Class A and class B roads were constructed based on political decisions, without serious considerations on the economic impact. Prioritization of roads was not based on economic

impact, but political ambitions and desire to fulfil electoral pledges. The District Tender Committees and the Central tender Board could not curb misallocation and misuse of public funds due to the defunct sanctions and penalties. Moreover, the absence of procurement procedures on execution of works offered a broad base for malpractice.

Kenyan Districts, and in particular Machakos did not receive adequate funding for road projects. Instead, projects were executed on urgency and because of squashing political dissent. Models required to monitor and evaluate the project are crucial in ensuring that the project cost, quality and timeframe are maintained, and it assists to prevent cost overruns (Mubila *et al*, 2014). This meant that the budget allocations would have a global focus instead of distinct projects aimed at increasing economic growth.

The Public Procurement and Disposal Act require that Accounting Officers in government must confirm availability of funding for infrastructure projects prior to developing tenders or embarking on road infrastructure, which are extensive and intensive (Ministry of Roads, 2012). It means that accounting officers must include the road projects in the work plan before adding it into the budget. Therefore, the work plan developed in 2013/2014 was to inform Machakos County Government during the creation of the 2014/2015 budget. While the budget offered for civil works and road projects in the itemized development budget, the monies would not suffice in implementing a major road infrastructure project. Failure to incorporate a work plan meant that the 2014/2015 budget from Transport and Roads section would remain global without essential focus on the distinctive works to be executed in the itemized budgets. The illusion of a global budget amounts to poor planning and offers a platform for cash shortfall, which will affect implementation of road construction projects. Furthermore, failure to conduct baseline surveys leads to the inadequate determination of the project needs assessment. The feasibility studies for road infrastructure projects follow a well-stipulated procedure that offers technical justification for the project followed by economic feasibility.

## **2.7 Post Review Systems and Implementation of Road Infrastructural Projects**

It involves carrying out an analysis to determine the effectiveness of the project and its ability to meet the forecasted goals and objectives. Post review systems enable managers to understand and learn from past mistakes (Muhia, 2010). It also makes it trivial to improve

performance and service delivery. Kenya Roads Board has conducted post review system on road infrastructural projects in an attempt to mirror seamless connectivity to economic growth. While the national government and road authorities aligned to it carry routine post review systems, there is yet a lot to be undertaken in Machakos County. Establishing post review systems would not only inform past mistakes and procedures, but would eliminate unnecessary wastage of public funds on unsustainable projects.

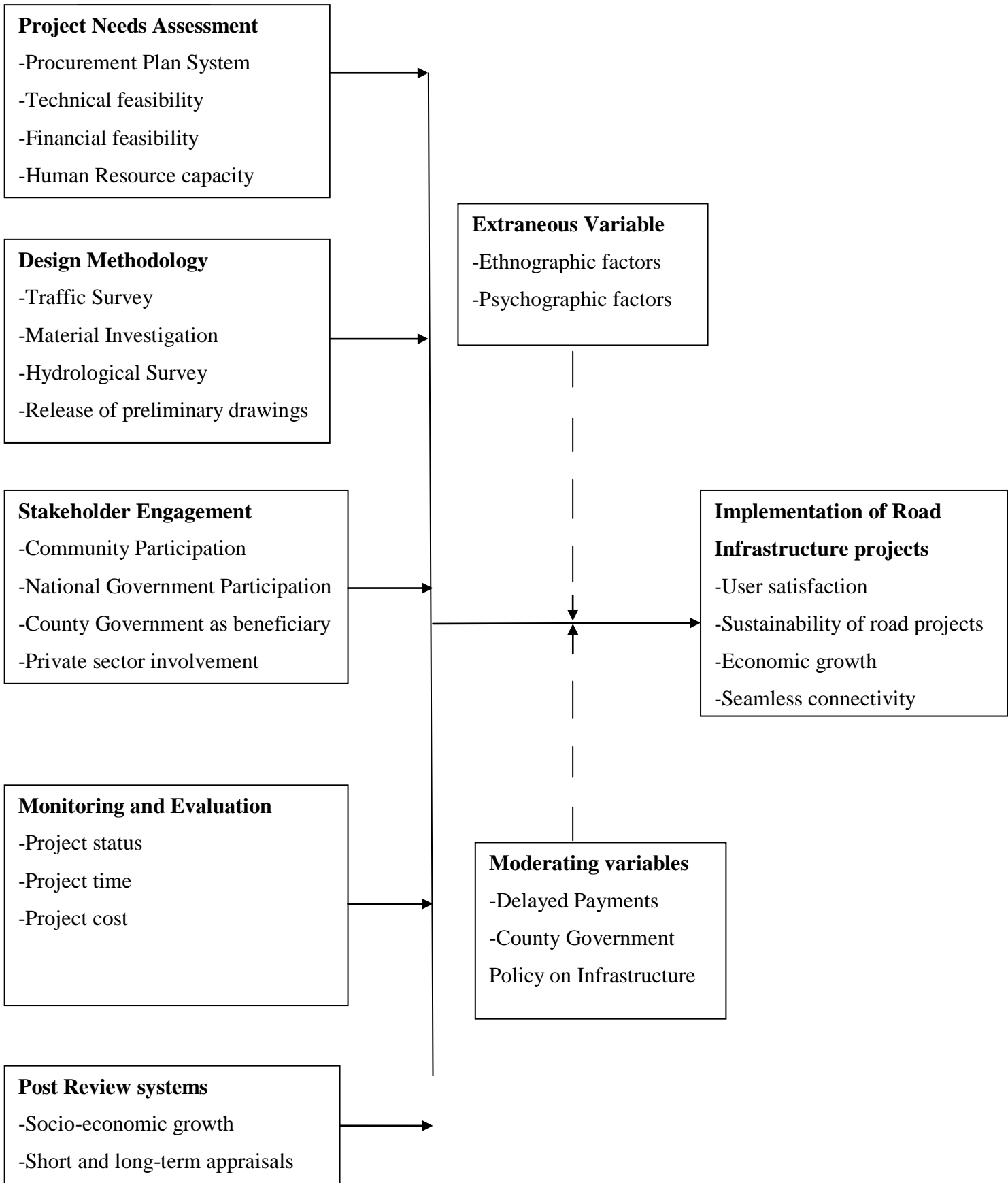
## **2.8 Theoretical Framework**

The theory of constraints advanced by Eliyahu Goldratt as a management paradigm posits that an organization or system may fail to achieve its goals due to the restrictions that are inherent in the system (Goldratt, 2010). The postulation of the theory is that constraints of inventory, operational expense and throughput measure and control infrastructural projects. The aim is identification of limiting aspects implementation of road infrastructural projects that will prevent achievement of both short-term and long-term goals. The theory of constraints follows five distinct steps, which include identification of constraints, decisions on exploitation of limiting factors, subjecting each process to the previous decisions, elevation of constraints and warning mechanism (Estache & Strong, 2000). The theory follows a reduction to absurdity approach in justifying its relevancy in infrastructural projects, which follows that a system would infinitely achieve its goals if there were no constraints (Pincher, 2010). However, in real systems, such a scenario does not exist, hence application of the theory of constraints. Similarly, the implementation of road infrastructural projects will either achieve or fail to realize their goals due to the limiting factors or constraints (Committee, 2012). If there is a limiting factor, it will influence the implementation of the road infrastructural project (Ren & Du, 2014). The constraints touch on resources and activities in the project, and they include; project needs assessment, design methodology, stakeholder engagement, financing, monitoring, & evaluation, and post review systems

## **2.9 Conceptual Framework**

The conceptual framework is composed of five independent variables, which include; project needs assessment, design methodology, stakeholder engagement, monitoring and evaluation, and post review systems. They count as the limiting factors, which influence the dependent variable on implementation of road infrastructural projects. Extraneous variables like psychographics and ethnographic factors often have an effect into the perception, belief, and

attitude of the individual towards the agency implementing road projects. In a way, it affects the ability to implement road infrastructural projects by influencing the independent variables. For instance, senior managements attitude and opinion on project needs will dictate whether it will be executed or deemed unnecessary.



**Figure 1: Conceptual Framework**

## **2.10 Summary**

The chapter focused on literature concerning project needs assessment, design methodology, stakeholder engagement, monitoring & evaluation, and post review systems. The literature review indicated that there exists a significant lapse in the nature of implementing road infrastructure projects in Machakos County, which has ultimately contributed to uninformed construction steps. However, the essence and importance of roads in ensuring social and economic growth remained apparent and appeared as a key indicator to achieving a self-sustainable economy in the county and seamless connectivity.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

The chapter discusses, the research design used, target population, sampling procedure and size, sampling frame methods of data collection, validity and reliability of instruments, data analysis and Operationalization of the variables. It offers an in-depth procedure with which data will be sourced, analysed and checked for consistency prior to making meaningful conclusions.

#### **3.2 Research Design**

According to Ogola (2005), the research design is a structure, plan, framework that offers a guide to the researcher in the study. The study used a descriptive research design. Descriptive research design involves collection of information that would give precise characteristics of a particular group. The advantage of using descriptive research design is that it can give information from a population based on its characteristic. The information collected was acquired through questionnaires administered with aid of research assistants.

#### **3.3 Target Population**

Ominde (1988) defines a target population as a unit set from which experimental or survey data is used to make informed inferences for purposes of correcting or improving an existing phenomenon. Machakos County has 40 electoral wards within which road projects are implemented. It has 14 county engineers employed on permanent basis by Machakos County Government and 14 road contractors who have completed implementation of road projects to bituminous standards. The target population was 68, which is the total of the ward representatives, county engineers, and road contractors.

**Table 3.1 Target Population**

<b>Respondents</b>	<b>Population</b>
County Engineers	14
Ward representatives	40
Road Contractors	14
<b>TOTAL</b>	<b>68</b>

### **3.4 Population**

A population census was preferred because of the small number of participants and the need to increase data accuracy (Bokea & Ikiara, 2000) According to Mugenda and Mugenda (2003) sampling small populations is not necessary if the resources and time are not a limiting constraint. Therefore, all the 14 county engineers and road contractors were issued with questionnaires. Similarly, all the 40 ward representatives were issued with questionnaires. Considering the size of the population, time and cost allowed the entire population to be issued with questionnaires. The participants for the study were directly involved with the implementation of road projects in Machakos County. The ward representatives were included because they form the liaison between the community and road implementing agencies. The engineers were responsible for the design, supervisions and monitoring of the road projects while the contractors were charged with the responsibility of carrying out the road works to bituminous completion.

### **3.5 Research Instrument**

Primary data was acquired using questionnaires divided into seven sections with an introduction that offers background of the respondent. Each section dealt with a variable outlined in the study. Structured interviews were used and offered to key informants who take part in project construction. The primary data from the questionnaires and interviews informed the study on the implementation of road infrastructural projects in Machakos County. Secondary data was collected from Machakos County Government records on road infrastructure programs. According to Flanagan (2005) the questionnaire was preferable because of its ability to acquire information from the respondents without wasting time and without investing significantly on data collection. The interviews were used because of their ability to give exact and factual information from the key informants, namely engineers and contractors.

### **3.6 Validity of Research Instruments**

Validity refers to the degree of which an instrument measures the intended objectives for the study and performs as perceived by the researcher (Rubin & Babbie, 2009). Validity denotes the ability of the research instrument to determine whether it can measure attributes that are solely attributed to the study objectives. It refers to the capability of research instrument to acquire results that can be used to reflect on the concept or objective of the study, hence it

focuses solely on the use and efficacy of the research instrument (Cooper & Schindler, 2006). In order to ensure that the empirical measures were valid and capable to meet the objectives under study, key informants were chosen from the target population and issued with questionnaires in a pre-test to acquire feedback and input on critical issues that the research instrument may omit. With the assistance of the supervisor, the questionnaires were determined for validity based on evaluation of the underlying theory and the adequacy of the questionnaires to measure proposed constructs. It ensured that the instrument measures the actual and correct concepts for the study, hence its validity.

### 3.7 Reliability of Research Instruments

Reliability is an inference on the stability and consistency with which the research instrument will assist in answering the research questions (Jackson, 2014). Reliability is the ability of the instrument to ensure that the results can be reproduced, over repeated trials, using the same methodology (Cooper & Schindler, 2006). The reliability of the instrument was tested using Cronbach alpha. Cronbach alpha measures internal data consistency by evaluating the scale used for study. Cronbach alpha was preferred to other tests because of its ability to work in non-dichotomous and continuous data (Flanagan, 2005). The formulae for Cronbach

$$\alpha = \frac{N \cdot \bar{C}}{\bar{V} + (N - 1) \cdot \bar{C}}$$

**Figure 2: Formula Cronbach Alpha**

Where  $\alpha$  is the Cronbach coefficient, N is the number of components,  $\bar{C}$  is the average of all the covariance, and  $\bar{V}$  is the variance of the individual components (Cronbach & Meehl, 1955).

Cronbach alpha ranges between 0 and 1, with the consistency of the data sets represented with high values that are close to 1. Table 3.3 indicates the correlation of the alpha values with the degree of consistency of the data sets.

**Table 3.2 Cronbach alpha Values**

<b>Cronbach Alpha <math>\alpha</math></b>	<b>Internal Consistency</b>
$\alpha \geq 0.9$	Excellent
$0.7 \leq \alpha < 0.9$	Good
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

A Cronbach alpha value of 0.764 was found for the study. According to Cronbach and Meehl, (1955) a value of 0.764 considers the data collection instrument to be reliable and it is indication that the results found can be replicated.

### **3.8 Data Analysis Techniques**

The researcher collected the data and checked whether the questionnaires were responded to properly. The study acquired both qualitative and quantitative data, which was analysed using descriptive statistics, percentages, and frequencies. Descriptive statistics was utilized to analyse the data with inferential statistics used to check for correlation of the variables. Once analysis and checks on completeness were affirmative, the data was presented using frequency tables and percentages for illustrations.

### 3.9 Operationalization of Variables

**Table 3.3 Operationalization of Variables**

Objective	Variable	Indicator	Measure	Measurement Scale	Data Collection Method	Data Analysis
To establish the influence of project needs assessment on implementation of road infrastructure projects in Machakos County	<b><u>Independent Variable</u></b> Project Needs Assessment	-Technical feasibility -Financial feasibility -Human resource Capacity	Effectiveness and of efficiency assessment	-Nominal -Nominal -Ordinal	-Questionnaire/ Interviews Questionnaire/ Interviews Questionnaire/ Interviews	-Chi-square analysis, Frequency & Percentages Cronbach alpha
To establish the influence of design methodology on implementation of road infrastructure projects in Machakos County	Design Methodology	-Traffic Survey -Material Investigation Hydrological Survey -Drainage Structure analysis -Preliminary Drawings	Effectiveness and of efficiency methodology	Ordinal Ordinal Ordinal Ordinal Ordinal	Questionnaire/ Interviews Questionnaire/ Interviews Questionnaire/ Interviews Questionnaire/ Interviews	-Chi-square analysis, Frequency & Percentages Cronbach alpha
To establish the influence of stakeholder engagement on implementation of road infrastructure projects in Machakos County	Stakeholder Engagement	-Community --National Government -County Government -Private Sector	Effectiveness and of efficiency engagement	-Ordinal -Ordinal -Ordinal -Ordinal	Questionnaire Records Records/ Questionnaire Questionnaire	-Chi-square analysis, Frequency & Percentages Cronbach alpha

To assess the influence of monitoring and evaluation systems on implementation of road infrastructure projects in Machakos County	Monitoring and Evaluation	-Project status -Time -Cost	Effectiveness and efficiency of systems	-Nominal -Nominal -Nominal	Records/ Questionnaire Records/ Questionnaire Records/ Questionnaire	- Linear regression, narrative analysis Cronbach alpha
To determine how post review systems influences implementation of road infrastructure projects in Machakos County	Post review Systems	-Socio-economic Growth -Short & Long-term Appraisals	Effectiveness and efficiency of systems	Nominal  Nominal	Questionnaire  Questionnaire	-Chi-square analysis, Frequency & Percentages Cronbach alpha
Implementation of road infrastructure projects in Machakos County	<b><u>Dependent Variable</u></b> Road projects	-User satisfaction -Sustainability -Economy -Seamless connectivity		-Nominal -Nominal -Nominal -Nominal	-Questionnaire -Questionnaire -Questionnaire -Questionnaire	-Chi-square analysis, Frequency & Percentages Cronbach alpha

### **3.10 Ethical issues:**

The respondents were assured of confidentiality of information. It was made clear prior to conducting interviews that all information collected is strictly for academic purposes and would not be utilized otherwise, without the consent of the respondents or a legal authority. The study objectives were made vivid so that respondents are in tandem with the study objectives and to ensure openness.

## CHAPTER FOUR

### DATA ANALYSIS INTERPRETATION AND PRESENTATION

#### 4.1 Introduction

The chapter focuses on data analysis, interpretation, and presentation in line with the study objectives. The main objective of the research was to determine factors influencing implementation of infrastructural projects by focusing on road construction in Machakos County. The study sought to establish the effect of project needs assessment, design methodology, stakeholder engagement, monitoring, and evaluation, and post review systems in the implementation of infrastructure projects. Since the study relied on descriptive research design, descriptive analysis was carried out for each research objectives. The researcher used frequency tables, means, standard deviation, and percentages to present the data.

#### 4.2 Questionnaire Response Rate

A population census of 68 participants, who included county engineers, ward representatives, and contractors, was carried out for the study. Out of the 68 questionnaires that were administered, 45 questionnaires were duly filled and returned to the researcher.

##### Table 4.1 Response rate

The questionnaire return rate is indicated in Table 4.1.

<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Responded	46	67.65
Non-responses	22	32.35
<b>Total</b>	<b>68</b>	<b>100</b>

The responsive return rate for the questionnaire was 66.18% and non-responsive rate was 33.82%. The impressive return rate was because the eight sub county engineers assisted in distributing the questionnaires to their respective ward representatives, and contractors working within their jurisdiction. Furthermore, the participants had significant interest in the study and showed willingness to participate. According to Lodico, Spaulding, & Voegtle (2010), a response rate of 30% to 50% is typical, but a response rate of 60% to 70% is considered good for the study while above 70% is very good or excellent.

### 4.3 Demographic characteristics of the respondents

The section profiles the respondents in respect to their gender, category of work, age group and their highest level of education attained.

#### 4.3.1 Distribution of Respondents by Gender

Data was acquired indicate the gender of the respondents. There were no preferential treatment or prejudice in the distribution of the questionnaires.

**Table 4.2 Gender of the Respondents**

The gender of the respondents is presented in Table 4.2

<b>Gender</b>	<b>Frequency</b>	<b>Percentage</b>
Male	32	69.57
Female	14	30.43
<b>Total</b>	<b>46</b>	<b>100</b>

Table 4.2 indicates that the males were the highest with 69.57% response rate compared to the females with 30.43% response rate. This is an indication that there is gender representation because at least a third are females.

#### 4.3.2 Distribution of Respondents by Age Group

Table 4.3 indicates the age group of the respondents in years. The age groups were classified into four classes: 20 – 29 years; 30 – 39 years; 40 – 49 years; 50 and above years.

**Table 4.3 Age Group of the Respondents**

<b>Age</b>	<b>Frequency</b>	<b>Percentage</b>
20-29	12	26.09
30-39	11	23.91
40-49	22	47.83
50 and above	1	2.17
<b>Total</b>	<b>46</b>	<b>100</b>

Table 4.3 indicates that 26.09% of the respondents were in the age group of 20-29 years, 23.91% were in the age group of 30-39 years, 47.83% were in the age group of 40-49 years and finally 2.17% for the age group of 50 years and above. The results indicate that majority of the respondents at 47.83% were within the ages of 40-49, which implies that senior and

experienced individuals dominated the construction of roads. A minority of the respondents at 2.17% were within the ages of 50 and above, which meant that most of the workforce was productive.

#### 4.3.3 Distribution of Respondents by Category

Table 4.4 indicates the category of the respondents.

**Table 4.4 Category of the Respondents**

<b>Category</b>	<b>Frequency</b>	<b>Percentage</b>
Engineer	14	30.43
Ward Rep	20	43.48
Contractor	12	26.09
<b>Total</b>	<b>46</b>	<b>100</b>

Majority (43.48%) of the respondents were ward representatives, 30.43% were engineers working in Machakos County and 26.09% were contractors. However, it is vital to note that the contractors had an engineering background. Therefore, the respondents with an engineering technical background, especially in the construction of roads was cumulative at 56.52%.

#### 4.3.4 Distribution by Highest Level of Education

Table 4.5 indicates the highest education level of the respondents. The education levels were categorized into; primary school, secondary school, college, and university

**Table 4.5 Education level of the Respondents**

<b>Highest Education Level</b>	<b>Frequency</b>	<b>Percentage</b>
Primary	0	0.00
Secondary	2	4.35
College	23	50.00
University	21	45.65
<b>Total</b>	<b>46</b>	<b>100</b>

Majority of the respondents (95.65%) had attained higher education in colleges and universities. Only 4.35% of the respondents had attained secondary education. The results

indicate that all the respondents had surpassed the primary level of education. The education level was vital for the study because the respondents had to have basic literacy skills for them to fill the questionnaire individually.

#### **4.4 Project Needs Assessment**

The following section indicated the influence of project needs assessment in the implementation of road infrastructural projects.

##### **4.4.1 Project Needs Assessment and Implementation of Infrastructure Projects**

Project needs assessment has been used in construction of roads as part of the preliminary requirements to access the need for executing the capital-intensive infrastructure projects. The study sought to determine whether carrying out project needs assessment influences the implementation of road infrastructural projects. Table 4.6 indicates the importance of project needs assessment.

**Table 4.6 Use of Project Needs Assessment in Implementation of Infrastructural Projects**

<b>Carrying out project needs assessment</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	29	63.04
No	17	36.96
<b>Total</b>	<b>46</b>	<b>100</b>

The findings in Table 4.6 indicated that majority (63.04%) of the respondents considered carrying out project needs assessment to be vital in the implementation of road infrastructure projects while the other 36.96% did not consider it key in road project implementation.

##### **4.4.2 Reasons for Carrying out Project Needs Assessment**

Table 4.7 indicates the reasons attributed for carrying out project needs assessment while Table 4.8 indicates the reasons attributed neglecting project needs assessment given by the respondents in Table 4.6

**Table 4.7 Reasons for Choosing Project Needs Assessment**

<b>Reason for Yes</b>	<b>Frequency</b>	<b>Percentage</b>
Because roads constructed in Machakos County often involve the community to participate during prioritization and choosing of roads to be constructed	15	51.72
Because roads pass through major trade centres	9	31.03
Because the roads are used all year round	5	17.24
If yes, specify any other reason		
<b>Total</b>	<b>29</b>	<b>100%</b>

From the 29 respondents that opted for carrying out that project needs assessment, majority (51.72%) associated it with the involvement of the community during prioritization. 31.03% of the respondents said it was because constructed roads passed through major trade centres. 17.24% of the respondents said it was because the roads were in use all year round.

**Table 4.8 Reasons for Neglecting Project Needs Assessment**

<b>Reason for No</b>	<b>Frequency</b>	<b>Percentage</b>
Because roads constructed in Machakos County do not involve the community during prioritization	15	88.24
Because roads do not pass through major trade centres	1	5.88
Because the roads are not used all year round	1	5.88
If No, specify any other reason		
<b>Total</b>	<b>17</b>	<b>100</b>

From the 17 respondents that opted for neglecting project needs assessment, majority (88.24%) associated it with failure to involving the community during prioritization. 5.88% of the respondents said it was because constructed roads do not pass through major trade centres. 5.88% of the respondents said it was because the roads were not in use all year round.

#### **4.4.3 Project Needs Assessment and its Influence on Implementation of Infrastructural Projects**

The questions asked on project needs assessment and its influence on implementation of road infrastructure projects was responded as follows in Table 4.9.

**Table 4.9 Project Needs Assessment and Implementation of Infrastructural Projects**

The questionnaire was ranked as follows 1-Strongly Disagree 2-Disagree 3-Neutral 4-Agree 5-Strongly Agree											
Statement	1		2		3		4		5		
	F	%	F	%	F	%	F	%	F	%	
A work plan is important because it informs the procurement plan for the coming financial year	1	2.17	1	2.17	8	17.39	24	52.17	12	26.09	
All items in the procurement plan should be part of the work plan	1	2.17	2	4.35	8	17.39	24	52.17	11	23.91	
The procurement plan assists in making ministerial budgets for road infrastructural projects	1	2.17	3	6.52	18	39.13	14	30.43	10	21.74	
Road projects completed within Machakos County are usually in the procurement plan?	10	21.74	8	17.39	11	23.91	15	32.61	2	4.35	
Are all road infrastructural projects included in the approved County Assembly itemized budgets	5	10.87	11	23.91	22	47.83	6	13.04	2	4.35	
Road projects in Machakos County usually have a technical feasibility carried out. (Technical feasibility involves comparing road pavement structure with the cost of construction).	12	26.09	15	32.61	12	26.09	5	10.87	2	4.35	
Road projects in Machakos County usually have a financial feasibility carried out.	8	17.39	15	32.61	17	36.96	5	10.87	1	2.17	
Road projects completed in Machakos County are implemented with personnel that has the capacity to design, supervise, monitor & evaluate road projects without professional negligence	10	21.74	10	21.74	18	39.13	7	15.22	1	2.17	

Majority (52.17%) of the respondents agreed that a work plan was vital in informing the procurement plan for the coming financial year, 26.09% strongly agreed while 17.39% were

not sure. Minority (2.17%) did not agree that a work plan could inform the work plan for the coming financial year. The findings indicated that planning for road projects in advance was vital in developing a realistic procurement plan that would be used to advertise and tender for the projects. Similarly, 52.17% of the respondents agreed that the procurement plan should be part of the work plan, 23.91% strongly agreed while 17.39% were not sure and a minority (2.17%) strongly disagreed. The findings indicated that the respondents understood the process of developing a procurement plan and the need to include all road projects that are intended for implementation in the work plan.

However, 39.13% of the respondents were not certain whether the procurement plan assists in making ministerial budgets for road infrastructure projects, 23.91% strongly agreed while 17.39% were not sure and a minority (2.17%) strongly disagreed. The results indicated that despite most of the respondents appreciating that the procurement plan and work plan are an essential component in project needs assessment, they were not certain on its use in making ministerial budgets. When asked whether road projects implemented in Machakos County were within the procurement plan, 36.96% agreed while 39.13% did not and 23.91% were not certain. The results indicated that most (39.13%) road projects executed did not adhere to the procurement procedures as they were missing in the work plan. 47.83% were not certain whether the county assembly itemized budget included the road projects to be implemented in Machakos County while only 4.35% strongly agreed that it was included.

Majority (58.7%) of the respondents strongly objected to technical feasibility being carried out prior to implementation of road projects in Machakos County, 26.09% were not sure while a minority 13.04% affirmed that technical feasibility was carried out. The result indicated that most (58.7%) of the roads implemented in Machakos County lacked technical feasibility studies. Consequently, (50%) of the respondents were opposed to the fact that financial feasibility is carried out, 36.96% were not sure while a minority 2.17% affirmed that it was carried out. The result indicated that there was insufficient needs assessment in terms of assessing the capability to financing road infrastructure projects. 43.48% affirmed that roads implemented in Machakos County did not have sufficient personnel with the capacity to design, supervise, monitor, and evaluate, 39.13% were not certain but 17.39% strongly agreed that personnel was adequate. The results indicated that most of the respondents considered there was an inadequacy in the human resource staffing that implements road projects in Machakos County.

## 4.5 Design methodology

The following section indicated the influence of design methodology in implementation of road infrastructural projects.

### 4.5.1 Design Methodology and Implementation of Infrastructure Projects

Design methodology outlines the pavement structure and materials to be used for construction. Table 4.10 indicates the influence of design methodology in implementation of infrastructural projects.

**Table 4.10 Use of Design methodology in Implementation of Infrastructural Projects**

<b>Design Methodology</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	15	32.61
No	31	67.39
<b>Total</b>	<b>46</b>	<b>100</b>

The findings in Table 4.10 show that majority 67.39% of the respondents opined that the road infrastructural projects implemented in Machakos County lacked a design methodology. 32.61% of the respondents were of the opinion that design methodology is considered during implementation of road projects.

### 4.5.2 Reasons for Carrying out Design methodology

Table 4.11 indicates the reasons attributed by the 67.39% of the respondents (in Table 4.10) who believed that design methodology was not considered during road implementation while Table 4.12 indicates the reasons attributed by the 32.61% of the respondents (in Table 4.10) who were of the opinion that design methodology was considered in road project implementation.

**Table 4.11 Reasons cited as evidence of not carrying out Design Methodology**

<b>Reason for No</b>	<b>Frequency</b>	<b>Percentage</b>
Because roads constructed in Machakos County <b>DO NOT</b> last for more than five years without repairs	11	35.48
Because roads often flood after heavy rainfall	17	54.84
If No, specify any other reason	3	9.68
<b>Total</b>	<b>31</b>	<b>100</b>

From the 31 respondents who refuted that design methodology was carried out in Machakos County, majority (54.84%) believed that it was because implemented road projects flooded after heavy rainfalls and 35.48% believed that it was because the roads did not last for more than five years. 9.68% specified other reasons like designs not being available to the implementing agencies.

**Table 4.12 Reasons cited as evidence of carrying out Design Methodology**

<b>Reason for Yes</b>	<b>Frequency</b>	<b>Percentage</b>
Because roads constructed in Machakos County last more than five years without repairs	9	60.00
Because roads <b>DO NOT</b> flood after heavy rainfall	5	33.33
If yes, specify any other reason	1	6.67
<b>Total</b>	<b>15</b>	<b>100.00</b>

From the 15 respondents that confirmed roads implemented in Machakos County had designs, majority (60.00%) believed that it was because they lasted more than five years, while 33.33% said it was because the roads did not flood. Minority (6.67%) of the respondents cited other reasons like non-frequent repairs and availability of road furniture.

#### **4.5.3 Design Methodology and its Influence on Implementation of Infrastructural Projects**

The questions asked on design methodology and its influence on implementation of road infrastructure projects were responded as follows.

**Table 4.13 Design Methodology and its influence in implementation of infrastructural projects**

<b>The questionnaire was ranked as follows</b>	<b>1-Strongly Disagree</b>		<b>2-Disagree</b>		<b>3-Neutral</b>		<b>4-Agree</b>		<b>5- Strongly Agree</b>	
	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>
Material investigation is carried out prior to implementation of all road projects in Machakos County	7	15.22	18	39.13	9	19.57	8	17.39	4	8.70
Traffic Survey is carried out prior to implementation of all road projects in Machakos County	10	21.74	14	30.43	5	10.87	10	21.74	7	15.22

Engineering survey is carried out prior to implementation of all road projects in Machakos County	10	21.74	14	30.43	6	13.04	7	15.22	9	19.57
Hydrological survey is carried out prior to implementation of all road projects in Machakos County	13	28.26	11	23.91	7	15.22	13	28.26	2	4.35
Design assists in cutting down the cost of implementing road projects	1	2.17	2	4.35	15	32.61	13	28.26	15	32.61
A road project implemented without design will, in the long run, become expensive	1	2.17	3	6.52	5	10.87	18	39.13	19	41.30
Design ensures value for money because it informs the methodology of construction and road pavement layers	3	6.52	2	4.35	15	32.61	10	21.74	16	34.78
All roads implemented in Machakos County have preliminary and As-built drawings certified by a Highways Engineer from relevant parliamentary boards	14	30.43	16	34.78	7	15.22	6	13.04	3	6.52

Most (54.35%) of the respondents indicated that material investigation was not carried out prior to implementation of road infrastructure projects, while 19.57% were not sure and 26.09% affirmed that material investigation was carried out. The findings indicate that material investigation was neglected as depicted by majority (54.35%) of the respondents. It implies that the sub-grade class, which is one of the initial requirements for a complete road design was not determined prior to implementation. Majority 52.17% of the respondents believed that traffic survey was not done on implemented roads while 36.96% were of the opinion that it was executed and 10.87% remained uncertain. The results imply that the traffic class, which is one of the essential components of road design, was not determined as indicated by 52.17% of the respondents. Most (52.17%) of the respondents affirmed that there was no engineering survey carried out while 34.79% of the respondents affirmed it was done and 13.04% remained uncertain. The results indicate that the location and routing of the roads implemented was not included in the designs. Engineering survey assists in routing the road and mapping out its corridor. Majority (52.17%) of the respondents affirmed that there was hydrological survey was not carried out while 15.22% remained uncertain and only a minority 4.35% believed that it was implemented. The findings indicate that the climatic and

weather patterns were not considered during initial design of the roads. As such, the drainage structures placed were not based on an informed design. Material investigation, traffic, engineering, and hydrological survey are the vital components considered when developing the design methodology for executing a road and the findings indicate they were neglected.

Most (60.87%) of the respondents accepted that roads implemented with designs will have reduced cost while only 6.52% refuted that designs can cut road construction cost and 32.61% were uncertain. Similarly, 80.43% concurred that roads implemented without designs will become expensive in the end while a minority 2.17% thought otherwise. Consequently, 56.52% of the respondents attributed designs with value for money on implemented road projects while a minority (10.87%) opined that designs do not ultimately offer value for money. The findings show that most of the respondents appreciated the use of designs as a cost cutting measure in road construction, which means it could hasten the implementation period. Most (65.21%) of the respondents indicated that there were no certified preliminary and as-built drawings issued prior to implementation of the road while a minority 6.52% believed they were issued. The findings reiterate the fact that engineering survey, hydrological survey, traffic survey, and material investigation were not carried out. As such, it was impossible to produce preliminary and detailed road construction drawings.

#### **4.6 Stakeholder Engagement**

The following section indicated the influence of stakeholder engagement in implementation of road infrastructural projects.

##### **4.6.1 Stakeholder Engagement and Implementation of Infrastructure Projects**

Stakeholder engagement shows the level of community participation, inclusion of public and private bodies and their perceived level of influence during implementation of road infrastructural projects. Table 4.14 indicates the level of influence of stakeholder engagement in implementation of road infrastructural projects.

**Table 4.14 Stakeholder Engagement in Implementation of road Infrastructural Projects**

<b>Involving Stakeholders</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	36	78.26
No	10	21.74
<b>Total</b>	<b>46</b>	<b>100</b>

The findings in Table 4.14 show that majority 78.26% of the respondents agreed that the community, private and public sector was included in the implementation of road projects 21.74% of the respondents were of the opinion that stakeholders were not considered in implementation of road projects.

#### 4.6.2 Reasons for affirming Stakeholder Engagement

Table 4.15 indicates the reasons attributed by the 78.26% of the respondents (in Table 4.14) who believed that stakeholders were involved during road implementation while Table 4.16 indicates the reasons attributed by the 21.74% of the respondents (in Table 4.14) who were of the opinion that stakeholders were not involved.

**Table 4.15 Reasons cited as evidence of stakeholder engagement**

<b>Reason for Yes</b>	<b>Frequency</b>	<b>Percentage</b>
Because the community is always aware of the road projects before implementation	31	86.11%
Because .county and national government officials often work together and assist each other in road projects to avoid duplication of work If yes, specify other reason	5	13.89%
<b>Total</b>	<b>36</b>	<b>100%</b>

From the 36 respondents who affirmed that stakeholders were involved in implementation of road projects, majority (86.11%) attributed it to the community being aware of the road projects before implementation while a minority 13.89% believed that it was because national and county government officials work together to avoid duplication of work.

**Table 4.16 Reasons Cited for Lack of Stakeholder Engagement**

<b>Reason for No</b>	<b>Frequency</b>	<b>Percentage</b>
Because the community is never aware of the road projects before implementation	7	70
Because .county and national government officials never work together and assist each other in road projects to avoid duplication of work If No, specify other reason	3	30
<b>Total</b>	<b>10</b>	<b>100</b>

From the 10 respondents that confirmed roads implemented in Machakos County did not involve stakeholders, majority (70.00%) believed that it was because the community was not aware, while 30.00% cited failure of county and national government officers to work together in avoiding duplication.

#### 4.6.3 Stakeholder Engagement and its Influence on Implementation of Infrastructural Projects

The questions asked on stakeholder engagement and its influence on implementation of road infrastructure projects were responded as follows.

**Table 4.17 Stakeholder Engagement and its Influence in Implementation of Infrastructural Projects**

The questionnaire was ranked as follows 1-Strongly Disagree 2-Disagree 3-Neutral 4-Agree 5- Strongly Agree	1		2		3		4		5	
	F	%	F	%	F	%	F	%	F	%
Involving the community makes them own the project and appreciate it as beneficiaries	1	2.17%	1	2.17%	8	17.39%	18	39.13%	18	39.13%
Community participation makes the project relevant by meeting user satisfaction requirements	1	2.17%	2	4.35%	10	21.74%	12	26.09%	21	45.65%
It is important to have stakeholders engaged prior to implementation of road projects so as to increase transparency	1	2.17%	1	2.17%	11	23.91%	20	43.48%	13	28.26%
Construction of minor roads (D, E, and feeder roads) should be left to county government in consultation with national government state corporations like Kenya Rural Roads Authority	1	2.17%	4	8.70%	7	15.22%	25	54.35%	9	19.57%
Roads implemented in Machakos County often have liaison with national road authorities like Kenya Rural Roads Authority and Kenya Urban Roads Authority to	3	6.52%	2	4.35%	11	23.91%	19	41.30%	11	23.91%

avoid duplication

Road budget often takes into consideration work to be implemented by national authorities to avoid replication	4	8.70%	6	13.04%	14	30.43%	15	32.61%	7	15.22%
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Majority (78.26%) of the respondents agreed to the question that involving the community makes them own the project as immediate beneficiaries, 17.39% were not sure and a minority 4.34% believed otherwise. Most (71.74%) of the respondents were of the opinion that community participation assists in making the road project meet end user satisfaction while 21.74% were uncertain and a minority 2.17% strongly disagreed. Similarly, 45.65% and 26.09% of the respondents cited increased transparency due to stakeholder engagement, a minority 2.17% strongly disagreed and 23.91% remained uncertain. The findings indicated that stakeholder engagement contributed to transparency, user satisfaction of completed roads, and making the community own the projects.

Most (73.92%) of the respondents opted for the lower classified roads, which include D, E and feeder roads to be completed by the county government working in consultation with state corporations like Kenya Rural Roads Authority. A minority 2.17% strongly disagreed while 15.22% were uncertain. The result indicated that there was a significant need for stakeholder engagement between national road agencies and county governments during implementation of road projects as indicated by the 65.21% of the respondents who affirmed the same. However, a minority 10.87% preferred autonomous working of the county and national government while 23.91% were uncertain. Despite the evidence for harmonized working between county and national stakeholders, 47.83% still believed that road budgets often avoids duplication of roads to be implemented while a minority 8.70% opined otherwise.

#### **4.7 Monitoring and Evaluation**

The following section indicated the influence of monitoring and evaluation in implementation of road infrastructural projects.

##### **4.7.1 Monitoring and Evaluation and Implementation of Infrastructure Projects**

Monitoring and evaluation indicates the checks and balances introduced to ensure that the project is within the required period, cost limits and quality required. Table 4.18 indicates the

level of influence of monitoring and evaluation in implementation of road infrastructural projects.

**Table 4.18 Models for checking project status, milestones, time, and cost**

<b>Models for checking project status, milestones, time, and cost</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	9	19.57
No	37	80.43
<b>Total</b>	<b>46</b>	<b>100</b>

The findings in Table 4.18 show that majority 80.43% of the respondents occurred that road implemented in Machakos County did not have models for checking project status, milestones, cost and checking whether the project was within the required time frame. Minority (19.57%) of the respondents were of the opinion that the models were available and used by road implementing agencies.

**Table 4.19 Availability of management and maintenance system**

<b>Management and Maintenance System</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	10	21.74
No	36	78.26
<b>Total</b>	<b>46</b>	<b>100</b>

The results in Table 4.19 indicate that most (78.26%) of the respondents affirmed that there were management and maintenance system for roads implemented in Machakos County while few (21.74%) of the respondents thought that the systems were available.

#### **4.7.2 Monitoring and evaluation and its Influence on Implementation of Infrastructural Projects**

The questions asked on monitoring and evaluation and its influence on implementation of road infrastructure projects were responded as follows.

**Table 4.20 Monitoring and Evaluation Implementation of Infrastructural Projects**

The questionnaire was ranked as follows 1-Strongly Disagree 2-Disagree 3-Neutral 4-Agree 5-Strongly Agree	1		2		3		4		5	
	F	%	F	%	F	%	F	%	F	%
There is a road inventory which identifies condition of roads, required remedy on an as and when basis, materials used for construction	13	28.26	18	39.13	8	17.39	6	13.04	1	2.17
All new projects are often included in the Road management and Maintenance system with data on design, stakeholders, pavement structure, and design life	12	26.09	17	36.96	6	13.04	7	15.22	4	8.70
There is a specific schedule, planned in advance for maintenance of roads which takes into consideration funding and indicates cash flow projects	16	34.78	13	28.26	9	19.57	6	13.04	2	4.35
Roads to be implemented in Machakos County often have assigned ratings based on functional road class, traffic volume, and community demand	15	32.61	19	41.30	5	10.87	4	8.70	3	6.52
Prior to implementation of roads, there is adequate inventory definition, pavement inspections, condition assessment, analysis, and work planning to aid in monitoring & evaluation	16	34.78	13	28.26	7	15.22	7	15.22	3	6.52

Most (67.73%) of the respondents indicated that roads implemented in Machakos County lacked an inventory record, while 15.21% of the respondents thought it was available and 17.39% were uncertain. 63.05% of the respondents were of the opinion that new road project were not included in the road management and maintenance system while 23.92% thought otherwise. However, 13.04% were uncertain. Further, 63.04% of the respondents believed that roads implemented did not have a specific schedule that would indicate funding of the

project during implementation while 17.39% thought a schedule was present and 19.57% were uncertain. The findings indicate that majority of the respondents (67.73%) opined that a road inventory was absent implying that it was difficult to carry out monitoring and evaluation since there was no benchmark to be used as a reference. Similarly, a road management and maintenance system was absent in Machakos County as indicated by majority (63.05%) of the respondents, which meant that data on design, stakeholders, material requirements was not specified from the beginning of road projects; hence making it intricate to carry out effective monitoring and evaluation. The absence of a specific schedule for funding and cash flow as indicated by most (63.04%) of the respondents implies that it was difficult to establish whether the road projects were within the required cost limits; hence affecting the process of monitoring and evaluation.

Majority (73.91%) of the respondents thought that roads in Machakos County lacked an assigned rating based on functional class, traffic volume and community demand while 15.22% thought otherwise. However, 10.87% were uncertain. The findings imply that monitoring and evaluation was not possible during project implementation as capacity requirements to check whether roads were able to meet the required traffic demand was not available; hence making meaningful changes that would improve the road capacity was impossible during project implementation. Majority (63.04%) of the respondents were of the opinion that adequate inventory definition, pavement inspections, condition assessment, analysis, and work planning that could aid in monitoring & evaluation was not available, 21.74% thought that it was present while 15.22% were uncertain.

#### **4.8 Post Review Systems**

The following section indicated the influence of post review system in implementation of road infrastructural projects.

##### **4.8.1 Post Review System and Implementation of Infrastructure Projects**

Table 4.21 indicates the level of influence of post review systems in implementation of road infrastructural projects.

**Table 4.21 Post review Systems**

<b>Availability of post review systems</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	9	19.57
No	37	80.43
<b>Total</b>	<b>46</b>	<b>100</b>

The findings in Table 4.21 indicate that majority (80.43%) negated the availability of post review systems being used after project implementation while a minority 19.57% believed a post review system was used on completed roads. The findings indicate that benchmarks for implementing future roads was not informed on past projects, which implies that implementing agencies did not benefit from past lessons and experiences as they were not carried out.

**Table 4.22 Availability of short and long-term appraisals**

<b>Short and Long-term Appraisals</b>	<b>Frequency</b>	<b>Percentage</b>
Yes	10	21.74
No	36	78.26
<b>Total</b>	<b>46</b>	<b>100</b>

Table 4.22 indicates that majority (78.26%) of the respondents were of the opinion that short and long-term appraisal were not performed on road projects while 21.74% thought otherwise. The results reiterate the initial findings in Table 4.21 by affirming that short and long-term appraisals were neglected; hence there was no benchmark for learning from past experiences and completed road projects.

#### **4.8.2 Post review Systems and its Influence on Implementation of Infrastructural Projects**

The questions asked on post review systems and its influence on implementation of road infrastructure projects were responded as follows.

**Table 4.23 Post Review Systems and Implementation of Infrastructural Projects**

The questionnaire was ranked as follows 1-Strongly Disagree 2-Disagree 3-Neutral 4-Agree 5- Strongly Agree	1		2		3		4		5	
	F	%	F	%	F	%	F	%	F	%
Roads in Machakos County have contributed to economic growth	1	2.17	1	2.17	9	19.57	20	43.48	15	32.61
There is an increase in access to public and social amenities due to implementation of road projects	1	2.17	1	2.17	11	23.91	18	39.13	15	32.61
Short-term appraisals like evaluation of contractor performance is often conducted by county officials	4	8.70	9	19.57	10	21.74	17	36.96	6	13.04
Short-term appraisals like evaluation of contractor performance is often conducted by residents through (un)structured interviews or other data collection method	4	8.70	14	30.43	17	36.96	8	17.39	3	6.52
Long-term appraisals often form part of road infrastructure projects in Machakos County	8	17.39	8	17.39	18	39.13	9	19.57	3	6.52

Majority (76.09%) of the respondent believed that that roads constructed in Machakos County contributed to an increase in economic growth, a minority 4.34% strongly disagreed while 19.57% were uncertain. Similarly, 71.74% believed that access to public and social amenities became possible due to roads completed in Machakos County, a minority 4.34% thought otherwise while 23.91% remained uncertain. The findings show that roads were linked to economic growth and access to public and social amenities; hence reiterating the need for carrying out post review system to ensure that they meet the perceived goals. Majority (50.00%) of the respondents believed the county officials conducted short-term appraisals on contractors while 28.27% opined otherwise and 21.74% were not sure. The

respondents linked the short-term appraisals to the mandatory inspection and acceptance checks carried out before payment of contractors. However, 39.13% of the respondents strongly disagreed carrying out short-term appraisals through (un)structured interviews while 36.96% were not certain while 23.91% affirmed carrying out short-term appraisals. The results indicate that most (39.13%) respondents were certain of the resident's non-involvement in carrying out project appraisal a significant number (36.96%) were uncertain, which implies that short-term appraisals was not fully executed by the residents. The findings are reiterated with the fact that most (39.13%) of the respondent were not certain of carrying out long-term while 34.78% believed that they never executed project appraisals. A minority 6.52% strongly agreed that they conducted long-term project appraisals.

#### 4.9 Implementation of Road Infrastructure Projects

The questions asked on implementation of road infrastructure projects were responded as follows.

**Table 4.24 Implementation of Road Infrastructure Projects**

The questionnaire was ranked as follows 1-Strongly Disagree 2-Disagree 3-Neutral 4-Agree 5-Strongly Agree	1		2		3		4		5	
	F	%	F	%	F	%	F	%	F	%
Completed road projects reduced travel time, thereby promoting business and economic growth	1	2.17	2	4.35	4	8.70	16	34.78	23	50.00
Successfully implemented road projects in Machakos County can lead to new trade routes	1	2.17	1	2.17	5	10.87	21	45.65	18	39.13
Both short and long-term impact of completed roads ought to be weighed to access the benefit of implemented road projects	1	2.17	5	10.87	11	23.91	15	32.61	14	30.43
Implementation of road projects requires adequate financial, technical, and human resource support.	2	4.35	2	4.35	11	23.91	15	32.61	16	34.78
Roads should last for more than 10 years so that they can realize socio-economic growth	2	4.35	4	8.70	8	17.39	18	39.13	14	30.43

Most of the respondents who were about 84.78% agreed that road projects had contributed to a reduction in the travel time which led to promotion of business and, ultimately, economic growth while a few (6.52%) of the respondents were of a different opinion and 8.70% were uncertain. Most (84.78%) of the respondents concurred that implemented road projects could lead to the opening of new trade routes, while a minority 4.34% thought it could not and 10.87% were not sure. The results indicate that increased business and economic growth was also associated with the opening up of new trade routes following the successful implementation of road projects. To realize the perceived economic growth, 63.04% of the respondents that that short and long-term impact of completed road projects ought to be determined, while 13.04% believed otherwise and 23.91% were uncertain. In terms of adequate human resource, technical and financial capacity, most (67.39%) of the respondents thought that it was a necessary requirement for the successful implementation of road projects while 23.91% were uncertain and a minority 8.70% thought it was not important. The durability of the road projects was considered by most (69.56%) of the respondents to be more than ten years so that economic growth could be realized while 13.05% of the respondents thought it could be realized in less than ten years and 17.39% were not certain of the durability of a road that could ensure economic growth.

#### **4.9.1 Macro-Environmental Factors and Implementation of Road Infrastructure Projects**

The study sought to seek there was a relationship between ethnographic, psychographic, payment delay and the county's policy on infrastructure on implementation of infrastructure projects

The questions asked on macro-environmental factors were responded as follows.

**Table 4.25 Macro-Environmental factors**

The questionnaire was ranked as follows 1- Strongly Disagree 2- Disagree 3-Neutral 4- Agree 5- Strongly Agree	1		2		3		4		5	
	F	%	F	%	F	%	F	%	F	%
Lifestyle, attitude and cultural belief will influence implementation of infrastructure projects	3	6.52	9	19.57	23	50.00	5	10.87	6	13.04
Culture, lifestyle, attitude and belief will influence implementation of road infrastructure projects	2	4.35	10	21.74	18	39.13	9	19.57	7	15.22
It is vital to pay contractors promptly and on-time so as to ensure effective implementation and delivery of the project	2	4.35	7	15.22	4	8.70	11	23.91	22	47.83
Delayed payments affects implementation of road infrastructure projects within the required time frame and perceived cost	4	8.70	4	8.70	3	6.52	16	34.78	19	41.30
Delaying payments makes the road project stall leading to unnecessary overheads	3	6.52	2	4.35	5	10.87	11	23.91	25	54.35

The view of infrastructure in general was that, ethnographic and psychographic factors, which included lifestyle, culture, and attitude belief, half (50%) of the respondents thought it was not an element that affected implementation of infrastructure while 26.09% thought it did not and 23.91% were of the opinion that ethnographic and psychographic factors had a relationship with implementation of infrastructure projects. Narrowing down to road infrastructure projects most (39.13%) of the respondents thought it was not an element that affected the implementation process while 34.79% thought it did and 26.09% believed otherwise. The results indicate that ethnographic and psychographic factors were not considered as a major factor influencing implementation of infrastructure projects, but rather as an element that either supported or led to its objection. Similarly, payment to contractors

was not considered to be a vital factor in the implementation of road infrastructure projects, but it could either support or create an objection to implementation. For instance, prompt payment was vital for cash flow, but it did not guarantee successful implementation of projects. Consequently, delayed payments could affect cash flow, but it did not affect successful implementation of project. Implemented road projects were completed under the guide of signed contracts, which stipulated the modalities of payment and the interest rates that could accrue due to late payments. Therefore, payment was guaranteed in the end and it could not warrant as a reason for affecting project implementation.

#### **4.10 Inferential statistics on Implementation of Road Infrastructural projects**

Inferential statistics were used to deduce the correlation of variables and to determine whether differences between observed and expected outcomes were dependable or because of chance. A chi-square analysis was carried out to determine the independence and association of variables at the 95% confidence limit with  $\alpha = 0.05$ .

The inferential statistic used chi-square analysis to determine the independence and association of variables. There was an association between the variable project needs assessment and implementation of infrastructural projects based on the calculated statistic  $X^2 = 46.47$  which was less than the value of 14.07, an indication that  $p < 0.00001$ , implying that the results were significant at  $P < 0.05$ .

Design methodology was significantly associated to implementation of the road infrastructure projects because the calculated chi-square statistic of  $X^2 = 106.84$  which was less than the tabulated value of 14.07, an indication that  $P < 0.00001$ , implying that the result of association were significant at  $p < 0.05$ .

Chi-square analysis on stakeholder engagement and implementation of infrastructure presented a calculated statistic of  $X^2 = 106.84$  against the tabulated 14.07 at five degrees of freedom and  $\alpha = 0.05$ , an indication that P-value is  $< 0.00001$ . The result suggests that stakeholder engagement is significantly associated to implementation of infrastructure projects at  $p < 0.05$ .

An analysis on the association of the variable monitoring and evaluation with implementation of infrastructure projects yielded a statistic of  $X^2 = 34.64$  which was less than the tabulated value of 9.49 at four degrees of freedom and  $\alpha = 0.05$ , an indication that  $P < 0.00001$ ,

implying that monitoring and association was significantly associated with implementation of infrastructure projects at  $p < 0.05$ .

Similarly, a chi-square analysis on the association between post review systems and implementation of infrastructure projects indicated that there were closely associated because the calculated  $X^2 = 43.51$  which was less than the tabulated value of 9.49 at four degrees of freedom and  $\alpha = 0.05$ , an indication that  $P < 0.00001$ . The results were significant at  $p < 0.05$ .

The chi-square analysis indicated that there was close association between, project needs assessment, design methodology, stakeholder engagement, monitoring and evaluation, post review systems and implementation of road infrastructural projects. The summary of the analysis is indicated in Table 4.26

**Table 4.26 Summary of Chi-square analysis**

<b>Factors Influencing Implementation of Road Infrastructural Projects</b>	<b>Degrees of Freedom</b>	<b>X<sup>2</sup></b>	<b>CHI-Square</b>	<b>P-Value</b>	<b>Significant at</b>
Project needs assessment	7	46.47	14.07	< 0.00001	p < 0.05
Design methodology	7	106.84	14.07	< 0.00001	p < 0.05
Stakeholder engagement	5	190.91	11.07	< 0.00001	p < 0.05
Monitoring and evaluation	4	34.64	9.49	< 0.00001	p < 0.05
Post review systems	4	43.51	9.49	< 0.00001	p < 0.05

#### **4.11 Summary**

The chapter presented the findings obtained from respondents, analysis, and interpretation of the data, which was done in line with the study objectives. Inferential statistics were included to determine whether there was independence or association of variables.

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION, AND RECOMMENDATIONS**

#### **5.1 Introduction**

The chapter gives a presentation of the summary of findings, discussion, conclusions, recommendations, and offers suggestions for future research.

#### **5.2 Summary of Findings**

The findings of the study are based on implementation of road infrastructure project in Machakos County for each study objective.

Project needs assessment was vital for the successful implementation of road project as indicated by most (63.04%) of the respondents. The respondents associated project needs assessment with the fact that the community was involved in prioritization of the roads. Therefore, most of the completed roads served the community members because they gave access to major trade centres.

Design methodology was not carried out prior to implementation of road projects as indicated by majority (67.39%) of the respondents. The fact that most roads did not last more than five years reiterated the absence of a design methodology, which indicates an absence in criteria for implementing road projects. Flooding of roads after heavy rainfall and making them impassable was cited as a factor indicating that design methodology was not considered in implementation of road projects.

Different stakeholders including the community, public and private bodies were included during prioritization of roads as evidenced by majority (78.26%) of the respondents. Evidence of stakeholder engagement was attributed to the community's awareness of projects to be implemented, which implies that there was adequate sensitization of the community from the road implementing bodies in Machakos County.

Monitoring and evaluation was not considered in implementation of road projects in Machakos County as evidenced by majority (80.43%) of the respondents. Failure to carry out monitoring and evaluation was attributed to the absence of management and maintenance system by most (78.26%) of the respondents.

A significant number of about 80.43% cited absence of post review systems on roads implemented in Machakos County with most (78.26%) attributing it to the absence of short and long-term appraisals being conducted after project completion. Most people acknowledged that residents did not contribute to the appraisal of projects after completion to check the conformity on requirements agreed prior to implementation.

Ethnographic and psychographic factor did not count as factor influencing implementation of road projects, but it was considered essential during community participation because of its ability to discern the different requirements of the residents based on ethnographic and psychographic aspects. Delayed payments was not a direct factor influencing road project implementation because prompt release of monies was not a guarantee for ensuring quality and completion within required time frame.

### **5.3 Discussion of Findings**

Majority (78.26%) of the respondents considered a work plan as being essential during project needs assessment. This is in concurrence with Barasa (2014) who argued that successful road projects had a needs assessment as evidenced by the inclusion in the procurement plan. This was because 76.08% of the respondents believed that it would be used as a basis for generating the procurement plan that would inform ministerial budgets on road implementation. However, most (47.83%) of the respondents could not confirm with certainty whether road projects were included in the approved county assembly budgets while 39.13% were positive that roads were not in the approved budgets. Despite affirming the importance of project needs assessment, most (58.7%) respondents believed that the roads implemented lacked technical feasibility. Not only did 43.48% of the respondents indicate that human resource capacity was not considered but 39.13% were not aware, which is an indication that the personnel to design, supervise, monitor and evaluate roads projects was not sufficient. Failure to carry out an effective project needs assessment meant that financial, technical, and human resource capacity that would work on the road projects was not ascertained, which implies that successful implementation of the project would be impossible.

Material investigation, traffic survey, engineering survey, and hydrological survey were not considered as the design stage, which implies that there were no preliminary and as-built drawings released during and after implementation of road projects. The absence of design

meant that the road projects did not have reference point upon which the location, route, capacity and materials for use could be assessed. Without designs, the road projects would either stall or fail to meet the required standards, which would negatively affect their implementation because there would be no criteria to guide the project as indicated by Coogan (2010).

The community was always aware of projects to be implemented in Machakos County beforehand, an indication that stakeholders were involved. Adelback and Johnson (2013) pointed out that increased transparency was attributed to stakeholder engagement, which meant that the possibility of cost overruns were minimal. The involvement of county and national government officials working together also served to eliminate cost overruns through duplication of roads to be implemented.

The absence of models that would check project status, time and ensure minimal cost overruns meant that monitoring and evaluation was not conducted during implementation of road projects. The results concur with Mubila et al (2014) who mentioned that cost, quality, and time are checked using monitoring and evaluation tools to avoid time related cost overruns. Therefore, the implementing bodies could spend more time during implementation.

Without short and long-term appraisal on completed road projects, it was impossible to learn from experiences. This implies that mistakes on previous projects were not determined to avoid replication and best practises were not identified for possible use in the future. Muhia (2010) also noted that past mistakes could affect implementation of road project negatively while adopting best practises from completed roads would assist in successful road implementation.

#### **5.4 Conclusions**

From the findings in the study, it was evident that project needs assessment is vital prior to implementation of road infrastructural projects. The road projects that successfully carried out project needs assessment were deemed to meet user satisfaction including but not limited to passing through major trade centres and lasting more than five years without major repairs. Despite the importance of project needs assessment, road projects implemented in Machakos County did not carry out human resource capacity, technical and financial feasibility prior to implementation. The aspects influenced project implementation midway when the need arose

for sufficient personnel, adequate financial support and technical personnel. The ultimate effect was that road projects did not meet minimum standards.

Design methodology was generally not carried out prior to implementation of road projects, because there was a lack of material investigation report, traffic survey, engineering survey, and hydrological survey. Roads implemented did not have preliminary and as-built drawings certified by a highways engineer registered by the relevant professional bodies, which made it difficult to benchmark the construction process to a known reference point.

Stakeholder engagement was performed in Machakos County because community members were aware of project prior to implementation. This was an indication that sensitization of projects prior to implementation was successful from the road implementing agencies. However, the residents were only informed of the projects, but did not have actual input in terms of opinions and involvement. Further, stakeholder engagement was noted to serve as a measure that can increase community ownership of implemented road projects, hence preventing vandalism and ensuring sustainability.

Monitoring and evaluation tools that could check project status, time and cost were not used during implementation of road projects. There was a lack of specific schedules outlining the maintenance requirement of roads, making it difficult to monitor or evaluate on-going projects. The resulting effect was that cost overruns were inevitable with most road projects staling.

Bodies implementing road projects did not carry out post review systems that could be sued to determine best practises and act as a benchmark or learning from past mistakes. Therefore, most mistakes were repeated in new construction projects leading to stalling of projects. Further, the nest practices could not be replicated because they were not captioned after road project completion.

#### **5.4 Recommendations**

From the study findings, the researcher arrived at the following recommendations to be considered in implementation of road infrastructure projects;

1. Human resource capacity, technical and financial feasibility be carried out prior to implementation of road projects to avoid project from stalling midway by ensuring there is adequate funds and sufficient personnel.
2. Material investigation, traffic survey, engineering survey, and hydrological be carried out by separate teams who will consolidate their report and offer a preliminary design that can be used as a benchmark for implementation.
3. The community, public, and private sectors should be involved beyond sensitization point to include their preferences and requirements on the deliverables hoped for upon road project completion.
4. Models for checking out project status, time and cost with an effective management and maintenance system be instituted to develop specific schedules that will assist in carrying out checks and balances during implementation.
5. Short and long-term appraisal to be carried out with economic indicators to show that implemented road projects have achieved the perceived socio-economic goals.

### **5.5 Suggestions for Further Research**

1. A detailed study to be carried out on the use of human resource, technical and financial feasibility in the prioritization of road projects.
2. An in-depth research to be carried on the approach to be used for carrying out design of low volume seal roads with the aim of shortening the design process but maintaining quality and standards.
3. A study can be carried out to investigate the level of influence private, public stakeholders have, and whether conflicting community interest should be used to limit resident participation to the prioritization stage.
4. A study to determine ways monitoring and evaluation can be used as a tool to remedy mistakes or omissions made during the prioritization stage.
5. A study can be carried out that includes socio-economic indicators that reflect whether completed road projects have contributed to development and to what extent.

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## APPENDICES

### Appendix 1: Letter of Transmittal

Kevin Mwendwa Kimanthi

P.O Box 226-90128

Mtito-Andei, Makueni

KENYA

21/07/2015

Dear Sir/Madam

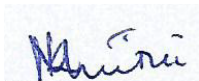
**RE: FACTORS INFLUENCING IMPLEMENTATION OF INFRASTRUCTURAL PROJECTS: A CASE OF ROAD CONSTRUCTION IN MACHAKOS COUNTY**

I am a Master of Arts student in my final year of study at the University of Nairobi. I am pursuing a degree in Masters of Arts I Project Planning & Management. As part of the requirement of fulfilment for the award of the degree, I am carrying out research study on the aforementioned topic.

I request your support and honesty as you spare time and answer the attached questionnaire. Kindly note that clear, sincere and precise responses will go a long way in ensuring the research objectives are achieved. All information and data acquired will be treated with utter privacy and confidentiality.

Thank you for investing time towards this noble study.

Yours Faithfully



Kevin Mwendwa Kimanthi

University of Nairobi

## Appendix II: Questionnaire

### FACTORS INFLUENCING IMPLEMENTATION OF INFRASTRUCTURAL PROJECTS: A CASE OF ROAD CONSTRUCTION IN MACHAKOS COUNTY

All information retrieved is purely for academic purposes only. The data will be treated with privacy and confidentiality. Kindly tick in the appropriate box and gaps.

#### Introduction: Background Information

- i. What is your gender?  
 A) Male  B) Female
- ii. What is your Category?  
 A) Engineer  B) Ward Rep  C) Contractor
- iii. What is your Age?  
 A) 20-29  B) 30-39  C) 40-49  D) 50 and above
- iv. What is your Highest Education Level?  
 A) Primary  B) Secondary  C) College  D) University

### Factors Influencing implementation of Infrastructural Projects: A Case of Road Construction in Machakos County

#### Section 1: Project Needs Assessment

- i) Do you believe roads constructed in Machakos County have a Project Needs Assessment carried out prior to construction?  
 A) Yes  B) No
- ii) Kindly give reason for the above choice by ticking the appropriate box below

Reason	Tick
Because roads constructed in Machakos County often involve the community to participate during prioritization and choosing of roads to be constructed	
Because roads pass through major trade centres	
Because the roads are used all year round	
If yes, specify any other reason	
Because roads constructed in Machakos County <b>DO NOT</b> involve the community to participate during prioritization	

Because roads <b><u>DO NOT</u></b> pass through major trade centres	
Because the roads <b><u>ARE NOT</u></b> used all year round	
If No, specify any other reason	

iii) The table shows the different aspects of project needs assessment, which include procurement plan system, technical feasibility, financial feasibility, human resource capacity. Kindly indicate your perceived level of importance along each statement in a scale of 1 to 5 with the meaning being as follows:

**1:** Strongly Disagree **2:** Disagree **3:** Indifferent (Neutral) **4:** Agree **5:** Strongly Agree

Statement	1	2	3	4	5
A work plan is important because it informs the procurement plan for the coming financial year					
All items in the procurement plan should be part of the workplan					
The procurement plan assists in making ministerial budgets for road infrastructural projects					
Road projects completed within Machakos County are usually in the procurement plan?					
Are all road infrastructural projects included in the approved County Assembly itemized budgets					
Road projects in Machakos County usually have a technical feasibility carried out? (Technical feasibility involves comparing road pavement structure with the cost of construction.)					
Road projects in Machakos County usually have a financial feasibility carried out.					
Road projects completed in Machakos County are implemented with personnel that has the capacity to design, supervise, monitor & evaluate road projects without professional negligence					

**Section 2: Design methodology**

i) Do you believe road projects executed in Machakos County have designs?

A) Yes

B) No

ii) Kindly give reason for the above choice by ticking the appropriate box below

Reason	Tick
Because roads constructed in Machakos County last more than five years without	

repairs	
Because roads often flood after heavy rainfall	
If yes, specify any other reason	
Because roads constructed in Machakos County <b>DO NOT</b> last for more than five years without repairs	
Because roads <b>DO NOT</b> flood after rainfall	
If No, specify any other reason	

iii) The table shows the different aspects of design methodology, which include traffic survey, material investigation, engineering survey, hydrological survey, and preliminary drawings. Kindly indicate your perceived level of importance along each statement in a scale of 1 to 5 with the meaning being as follows:

**1:** Strongly Disagree **2:** Disagree **3:** Indifferent (Neutral) **4:** Agree **5:** Strongly Agree

Statement	1	2	3	4	5
Material investigation is carried out prior to implementation of all road projects in Machakos County					
Traffic Survey is carried out prior to implementation of all road projects in Machakos County					
Engineering survey is carried out prior to implementation of all road projects in Machakos County					
Hydrological survey is carried out prior to implementation of all road projects in Machakos County					
Design assists in cutting down the cost of implementing road projects					
A road project implemented without design will, in the long run, become expensive					
Design ensures value for money because it informs the methodology of construction and road pavement layers					
All roads implemented in Machakos County have preliminary and As-built drawings certified by a Highways Engineer from relevant parliamentary boards					

### Section III: Stakeholder Engagement

- i) Do you believe road projects executed in Machakos County usually involve the community, county officials, national government officials, external donors, and private sector in a forum prior to implementation?

A) Yes  B) No

- ii) Kindly give reason for the above choice by ticking the appropriate box below

Reason	Tick
Because the community is always aware of the road projects before implementation	
Because .county and national government officials often work together and assist each other in road projects to avoid duplication of work	
If yes, specify other reason	
Because the community <b>IS NEVER</b> aware of the road projects before implementation	
Because .county and national government officials <b>NEVER</b> work together and assist each other in road projects to avoid duplication of work	
If No, specify other reason	

- iii) The table shows the different aspects of stakeholder engagement, which include community participation, national government involvement, county government involvement, and private sector involvement. Kindly indicate your perceived level of importance along each statement in a scale of 1 to 5 with the meaning being as follows:

**1:** Strongly Disagree **2:** Disagree **3:** Indifferent (Neutral) **4:** Agree **5:** Strongly Agree

Statement	1	2	3	4	5
Involving the community makes them own the project and appreciate it as beneficiaries					
Community participation makes the project relevant by meeting user satisfaction requirements					
It is important to have stakeholders engaged prior to implementation of road projects so as to increase transparency					
Construction of minor roads (D, E, and feeder roads) should be left to county government in consultation with national government state corporations like Kenya Rural Roads Authority					
Roads implemented in Machakos County often have					

liaison with national road authorities like Kenya Rural Roads Authority and Kenya Urban Roads Authority to avoid duplication					
Road budget often takes into consideration work to be implemented by national authorities to avoid replication					

**Section 1V: Monitoring & Evaluation**

i) Do you believe road projects implemented in Machakos County usually have models for checking project status, milestones, time, and cost during the life cycle of the project in order to avoid overruns?

A) Yes  B) No

B) Do you believe road projects implemented in Machakos County have a Management and Maintenance System?

A) Yes  B) No

ii) The table shows the different aspects of Monitoring & Evaluation, which include project status, time, and cost. Kindly indicate your perceived level of importance along each statement in a scale of 1 to 5 with the meaning being as follows:

**1:** Strongly Disagree **2:** Disagree **3:** Indifferent (Neutral) **4:** Agree **5:** Strongly Agree

Statement	1	2	3	4	5
There is a road inventory which identifies condition of roads, required remedy on an as and when basis, materials used for construction					
All new projects are often included in the Road management and Maintenance system with data on design, stakeholders, pavement structure, and design life					
There is a specific schedule, planned in advance for maintenance of roads which takes into consideration funding and indicates cash flow projects					
Roads to be implemented in Machakos County often have assigned ratings based on road functional class, traffic volume, and community demand					
Prior to implementation of roads, there is adequate inventory definition, pavement inspections, condition assessment, analysis, and work planning to aid in monitoring & evaluation					

**Section V: Post Review Systems**

i) Do you believe road projects implemented in Machakos County usually have post review systems, which assists in determination of lessons learned and improvement of practices in future?

A) Yes  B) No

ii) Do the roads implemented in Machakos have short and long-term appraisals to weigh the economic impact and social growth after completion?

A) Yes  B) No

iii) The table shows the different aspects of Post Review Systems, which include short & long-term appraisals and socio-economic growth. Kindly indicate your perceived level of importance along each statement in a scale of 1 to 5 with the meaning being as follows:

**1:** Strongly Disagree **2:** Disagree **3:** Indifferent (Neutral) **4:** Agree **5:** Strongly Agree

Statement	1	2	3	4	5
Roads in Machakos County Have contributed to economic growth					
There is an increase in access to public and social amenities due to implementation of road projects					
Short-term appraisals like evaluation of contractor performance is often conducted by county officials					
Short-term appraisals like evaluation of contractor performance is often conducted by residents through (un)structured interviews or other data collection method					
Long-term appraisals often form part of road infrastructure projects in Machakos County					

**Section VI: Moderating Variables; Psychographic, Ethnographic, Delayed Payments & Policy on Infrastructure**

i) The table shows the different aspects of Moderating Variables; Psychographic, Ethnographic, Delayed Payments & Policy on Infrastructure. Kindly indicate your perceived level of importance along each statement in a scale of 1 to 5 with the meaning being as follows:

**1:** Strongly Disagree **2:** Disagree **3:** Indifferent (Neutral) **4:** Agree **5:** Strongly Agree

<b>Statement</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Lifestyle, attitude and cultural belief will influence implementation of infrastructure projects					
Culture, lifestyle, attitude and belief will influence implementation of road infrastructure projects					
It is vital to pay contractors promptly and on-time so as to ensure effective implementation and delivery of the project					
Delayed payments affects implementation of road infrastructure projects within the required time frame and perceived cost					
Delaying payments makes the road project stall leading to unnecessary overheads					

### **Section VII: Implementation of road infrastructure projects**

- i) The table shows the different aspects of Implementation of road infrastructure projects. Kindly indicate your perceived level of importance along each statement which uses a scale of 1 to 5 with the meaning being as follows:  
**1: Strongly Disagree 2: Disagree 3: Indifferent (Neutral) 4: Agree 5: Strongly Agree**

<b>Statement</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Completed road projects reduced travel time, thereby promoting business and economic growth					
Successfully implemented road projects in Machakos County can lead to new trade routes					
Both short and long-term impact of completed roads ought to be weighed to access the benefit of implemented road projects					
Implementation of road projects require adequate financial, technical, and human resource support.					
Roads should last for more than 10 years so that they can realize socio-economic growth					

### **Appendix III: Interview Guide**

#### **FACTORS INFLUENCING IMPLEMENTATION OF INFRASTRUCTURAL PROJECTS: A CASE OF ROAD CONSTRUCTION IN MACHAKOS COUNTY**

All information retrieved is purely for academic purposes only. The data will be treated with privacy and confidentiality.

- i) What is your professional occupation?
- ii) What is your view on carrying out project needs assessment?
- iii) Can you associate Project needs assessment with bodies that implement road projects in Machakos County?
- iv) What type of gaps on road infrastructure do you think are of key importance in the implementation of road projects?
- v) Do you think procurement plan is a necessary component of substantiating project needs assessment?
- vi) What is your opinion on budgeting for roads and supplementary budgets?
- vii) For a completed road what is the most important aspect that will give credibility to the implementing agencies?
- viii) What aspects/elements should be considered in Machakos County prior to implementation of road projects? Kindly give details
- ix) What activities should be done in Machakos County during implementation of road projects? Kindly give details
- x) What activities should be done in Machakos County after implementation of road projects? Kindly give details
- xi) Do Machakos County resident get value for money on completed road projects. kindly explain in detail

#### Appendix 1V: Makutano-Kithimani Contract Data

<b>Project Title:</b>	Upgrading of Makutano-Kithimani C100 road
<b>Financier</b>	Government of Machakos County
<b>Overall Supervision</b>	Chief Officer, Ministry of Transport, Roads, Public Works & Housing Machakos Highway, P.O Box 986-90100, Machakos, Kenya
<b>Engineer:</b>	Chief County Engineer, Ministry of Transport, Roads, Public Works & Housing Machakos Highway, P.O box 986-90100, Machakos, Kenya
<b>Date of Award</b>	6 <sup>th</sup> FEB 2014
<b>Unconditional Acceptance</b>	11 <sup>th</sup> FEB 2014
<b>Date of contract Agreement</b>	17 <sup>th</sup> FEB 2014
<b>Date of Order to Commence</b>	25 <sup>TH</sup> February 2014
<b>Total Contract sum (11 contractors &amp; Road Furniture)</b>	Kshs 598,700,010.97
<b>Possession of Site</b>	20 <sup>th</sup> February 2014
<b>Defects Liability Period</b>	3(THREE) Month
<b>Supervision</b>	Chief County Engineer
<b>Date of Commencement</b>	3 <sup>RD</sup> March 2014
<b>Contract Period</b>	Four months
<b>Completion Date</b>	24 <sup>th</sup> June 2014

**Appendix V: Actual Contract Cost of Makutano-Kithimani Road**

<b>Lot No.</b>	<b>Report On Contract Costs for Makutano-Kithimani Road</b>	
	<b>CONTRACTOR</b>	<b>CONTRACT SUM(Kshs)</b>
1	LIRONA GENERAL CONTRACTORS	48,805,613.22
2	WELLDAN CONTRACTORS LIMITED	49,941,398.00
3	ZOAR GENERAL CONTRACTORS LIMITED	48,222,532.00
4	MATTAN CONTRACTORS LIMITED	55,622,125.30
5	SALAN CONSTRUCTIN LIMITED	51,438,770.00
6	WAK CONSTRUCTION LIMITED	49,978,223.25
7	GRAGAB AGENCIES LIMITED	48,706,285.32
8	SINOE CONSTRUCTION LIMITED	56,360,124.24
9	SIVAD CONSTRUCTION LIMITED	56,850,783.36
10	NDAISI GENERAL MERCHANTS	51,837,165.28
11	KATSRAN LIMITED	50,936,991.00
	ROAD FURNITURE	30,000,000.00
	<b>TOTAL SUM</b>	<b>598,700,010.97</b>