



Addis Ababa University

College of Business and Economics

Department of Project Management

Road Construction Projects Identification and Major Selection Challenges

The Case of Ethiopian Roads Authority

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Letter of Certificate

ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

This is to certify the Project work prepared by Sisay Markos, Entitled: **Road Construction Projects Identification and Major Selection Challenges on Ethiopian Roads Construction** and submitted in partial fulfillment for the requirements of the degree of master of Arts in Project Management, complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

Signed by Examining Committee:

_____ Advisor	_____ Signature	_____ Date
_____ Internal Examiner	_____ Signature	_____ Date
_____ External Examiner	_____ Signature	_____ Date

Statement of Declaration

I, the undersigned, declare that this project Work entitled **Road Construction Projects Identification and Major Selection Challenges** is my original work and has not been presented for a degree in any other university. All sources of materials used for the project work have been duly acknowledged.

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DEPARTMENT OF PROJECT MANAGEMENT

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Abstract

Road is one of the infrastructures that has a significant impact on the rapid expansion of socioeconomic development and improve the quality of life in a society. In economically depressed areas, construction of roads boosts the economy. It is allows for efficient movement of people, commodities and to a wide range of business and social activities. Hence, Road projects should be identified and selected based on acceptable identification and selection criteria to improve inhabitants' socioeconomic conditions and improve quality of life. The major aim of this research is to assess the challenges of the identification and selection process of road projects. The research is designed in a way that responses are acquired through both open and closed ended questionnaire. Data collected using closed ended questionnaire is analyzed using quantitative research approach, whereas the data collected through open ended questionnaires is analyzed using a qualitative approach. In this research a total of 103 questionnaires were distributed to respondents as per the sample size and 97 responses were completed and collected for analysis. Primary and secondary data gathering approaches are used to achieve the research goals. To address the issue, the staffs of ERA project planning and program management Directorate, ERA design Management Directorate, contractors, and consultants were given a questionnaire with 14 primary parameters that influence project identification and selection process. A desk study on the existing Ethiopian Roads Authority project identification and selection methods was done to augment the questionnaire. Respondents from the project planning and program management Directorate were approached in person for additional in-depth discussion of the issue because the directorate directly involve in the process of finding and selecting road projects throughout the country and have firsthand experience with the challenges that arise thereafter. Descriptive statistic data analysis method is used for both quantitative and qualitative data collected using the SPSS. It is concluded that political intervention, public demand through chaotic protest and proposals made by regional governments influence the process of project identification and selection process. For the goal of improving citizens' livelihoods, a multi-criteria approach to identify and select road projects should be implemented strictly without any preconceived interference.

Keywords: Project Identification, project selection, Multi-criteria analysis, ERA

Acronyms and Abbreviations

ERA	Ethiopian Roads Authority
Class A	Design classification for Trunk Roads
Class B	Design classification for Link Roads
Class C	Design classification for Main access Roads
Class D	Design classification for Collector Roads
Class E	Design classification for Feeder Roads
DC1	Design Class 1
DC2	Design Class 2
RSDP	Road Sector Development Program
HDM	Highway Development Management tool
MCI	Multi Criteria Approach
DBST	Double Bituminous Surface treatment
AC	Asphalt Concrete
MC	Main Criteria
AADT	Annual Average Daily Traffic
ERCC	Ethiopian Road Construction Corporation

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Infrastructure Construction is a massive, sophisticated, and dynamic enterprise that devotes a significant amount of resources to overcoming problems given by nature or humans. It entails the construction of structures such as buildings, roads, railways, airports, tunnels, bridges, and so forth. It also entails infrastructure replacement, expansion, and upkeep. It promotes economic development and strengthens social ties (Radosavljevic & Bennett, 2012).

Road construction is one of the most important infrastructures for fostering strong socioeconomic development by facilitating the efficient movement of people, goods, and services to their desired destinations, as well as providing access to a wide range of commercial and social activities to improve citizens' livelihoods. The work entails the construction of new roadways, as well as the restoration, reconstruction, and upgrade of existing highways. The construction process is difficult due to a unique characteristic of road building including large investments, superior knowledge, vast experience, and advanced machinery deployment. (Blum, Haynes & Karlsson, 1997).

The process of assessing individual projects or groups of projects and then selecting the best ones to meet the organization's goals is known as project identification (Meredith & Mantel, 2003). Because there is a lot of uncertainty about how most projects will be carried out, what resources will be needed, and how long it will take to finish the project, the project selection process should include risk analysis. Following that the Project Portfolio Process, which is the process of selecting the set of projects that best meets the organization's strategic goals.

Projects should be linked to the right goals and impact at least one of the major stakeholder issues, such as growth acceleration, cost reduction, social impact, or cash flow improvement (Kumar, Saranga, Nowicki, and Ramirez Ma'rquez, 2007). Good project identification is a process in and of itself, and if done well, the potential advantages to recipients can be significant (Pande, Neuman, & Cavanagh, 2000).

Project identification is also linked to project implementation, as it contributes to project success as well as the effectiveness of project processes, and it encourages the establishment of project culture in the company as well as in post-project operations. Project selection process models, tools, and important aspects in six-sigma project selection have been offered in studies, resulting in a range of models (Pyzdek, 2003). Because the realities of the business environment force us to manage business operations as projects, it is common to have multiple projects running at the same time.

1.1.1 Background of the Organization

Ethiopian roads construction and development scheme began in 1951 GC and continued until 1990 GC under seven distinct organizational identities. The Ethiopian Roads Authority is in charge of roads, according to article 55/1 of the federal democratic republic of Ethiopia's constitution and proclamation number 80/1997. The Authority is in charge of developing and administering high ways, as well as ensuring construction quality and creating conducive environment for the coordinated promotion of the road network.

The organization has the authority and responsibility to: establish policies and regulations relating to roads and the Authority, establish road design standards, and implement those policies and laws. Classify and identify the national road network, develop short and long-term plans and strategies, and put them into action after they have been approved. Prepare the design required for highway works through certified consultants, prepare the design required

for study and emergency works, and conduct and cause the conduct of highway feasibility studies. Where contracting out is not possible, construct or improve roadways using outsourcing or its own force. Maintain roadways on your own or hire contractors to do it for you. Prepare and award works for consultation contracts, direct supervision to ensure that works are completed in accordance with the conditions of the contracts, and supervise the same. Determine the criteria for selecting consultants for highway design, supervision, and other related projects. Determine the many options for carrying out work, including using its own force, as well as domestic and international tenders. Design highway traffic control posts and devices and place them on roadways. On the highways, enforce vehicle weight and size restrictions. Conduct material research on roadways and put the findings to good use. Train the people who will be responsible for the construction and upkeep of roads.

Ethiopia's current functional road classification dates from 1997 and ERA's responsibilities are laid out in Proclamation 80/1997. The classification is based on the socio-economic importance of roads linking Traffic Generating areas as recommended in the road functional classification study (ERA Route selection manual, 2013)

Identifying and selecting the appropriate projects for implementation in the context of the country is another problem. According to the Route Selection Manual 2013, ERA and regional road authorities are confronted with a variety of interconnected concerns and obstacles in developing the national strategic road network (ERA route selection manual 2013, page 2-2):

- The size of the country (1.1 million km²)
- The considerable diversity of terrain and altitude with a significant proportion of Land area classified as mountainous/escarpment
- Low levels of disposable income and vehicle ownership

- Road network density and accessibility, which are low by international standard

Identifying and selecting the correct road projects is a tremendous responsibility in determining the future development of a country that spends a significant amount of money on road building and maintenance. It is critical to thoroughly analyze all relevant factors and methodologies when finding and selecting projects to carry out construction work.

Ethiopian Roads Authority /ERA/ is headed by a Director General who reports to the Board of Directors. The ERA is a legally autonomous organization established on January 26, 1951. Ever since its establishment, the Authority has gone through a series of structural changes, the most recent one being in July 2011 by the Council of Ministers Regulation No. 247/2011. This regulation corroborates the split of the operational and regulatory wings as two independent entities, leaving ERA to focus on road network development and asset management rather than construction and maintenance of same. Consequently, ERA's planning and program management directorate along with engineering procurement under deputy directorate general is responsible for carrying out identification and selection of road projects. Despite several reestablishments, the authority's main responsibility is road development and management, has never been changed significantly.

1.2 Statement of the problem

Selection and subsequent prioritization of identified feasible road project possibilities based on a standard indicator of their socioeconomic value to the country is required for road infrastructure investment planning. One of the first and most significant phases in evaluating the type of roads identified and selected for future implementation is to identify and choose the right road projects with respect to the criteria in use. In terms of decision-making, new, rehabilitated, and upgraded roads must be identified, selected, and implemented. There are

crucial four steps according to the Ethiopian roads authority route selection Manual 2013(page 1):

- I. Project identification
- II. Corridor selection
- III. Route possibilities within the corridor identification
- IV. IV. Preferred route option selection

ERA route selection handbook (Table 1-1, page 3) states that the decision to build a new, rehabilitate or upgrade an existing road is based on strategic, economic, and/or social/rural mobility considerations. Because the need is undeniably great and the expenditure is enormous, serious criteria should be utilized to assess the relevance of projects among the applicants.

Although the identification and selection procedure is a key step in the assessment process, No clear way to understand why some road projects are identified, selected and prioritized over others. Road projects are promised on occasions in public meetings, and officials lay foundation stone for a variety of reasons in public without the consent approval of the Ethiopian Roads Authority. Prior to conducting proper identification and selection processes within the ERA, political motives arise in the name of fair development of regional states in general and road infrastructure development specifically that force political delegates to lay the foundation stones without the knowledge of the respective Authority. Ambiguity to understand why a project is recognized, prioritized, and picked seemingly out of nowhere leads to misunderstanding of the road project identification and selection process currently under use within the ERA. In many occasions, the public misunderstands the Ethiopian Roads Authority's stance on the identification and selection process, and attempts to compel the authorities in the hierarchy, from Federal to Woreda, to act on behalf of the public, or risk

causing public unrest and end-users conflict, further degrading the credibility of the Ethiopian Roads Authority's project identification and selection criteria at use.

It is arguable that a substantial number of completed road projects have been questioned as to whether or not they were subjected to proper identification and selection criteria before being completed. For a country with limited resources, sensitive politics, unmet needs, and skewed comparisons of infrastructure development among regional states, a comprehensive grasp of criteria and procedures for identifying and selecting road projects for further evaluation and implementation is crucial. (Bueno, Vassallo & Cheung, 2015).

End user satisfaction with road project identification and selection is severely comparative and politically motivated, according to debates at seminars, publications, news sources, institution lectures, journals, and so on. ERA should clearly follow unambiguous and intelligible evaluation of project identification and selection in order to legitimate the judgments taken in identifying and selecting substantial road projects across the country.

1.3. Research Questions

- What project identification and selection criteria's are currently at use in Ethiopian Roads Authority?
- To what extent do the public interest and request though chaotic protest of road infrastructure building influence the identification and selection criteria of Ethiopian Roads Authority?
- To what extent does the proposals made by the regional governments influence the outcome of Ethiopian Roads Authority project identification and selection evaluation criteria?

1.4. Objective of the study

1.4.1. General Objective

The general objective of this research is

- To study the current Road project identification and selection experiences of the Ethiopian Roads Authority and improve the evaluation criteria of project identification and selection challenges.

1.4.2. Specific Objective

The specific objectives of this research are:

1. To identify and assess the current practices of project identification and selection criteria's of the Ethiopian Roads Authority
2. To identify the extent of influence of public interest on the outcome of project identification and selection of Ethiopia Roads Authority
3. To identify the extent of influence of political decisions on project identification and selection of Ethiopia Roads Authority

1.5 Significance of the Study

The findings of this study looked at the Ethiopian Roads Authority's current project identification and selection practices, the challenges posed by public interest, the interference of political decisions, and the creation of a framework of criteria to be used in identifying and selecting appropriate road projects to improve citizens' livelihoods and boost Ethiopia's socioeconomic growth.

1.6. Scope of the study

The study specifically focuses on the project identification and major selection challenges of the Ethiopian Roads Authority. Hence, conceptually the scope of this study focuses on the identification and major selection challenges throughout the country which undergoes at the Ethiopian Roads Authority. Methodologically, Questionnaire is used to gather primary data and desk study as secondary data source is used.

1.8. Limitation of the Study

Because of its tight association with other infrastructure projects, assessing road project identification and selection issues is a sensitive issue. It's nearly impossible to consider other infrastructure development before a road project. Hence road construction is focused with mobility and the safe delivery of critical project materials. The goal of this study is to demonstrate the gap between the identification and selection of road improvements.

However, this research work is limited by lack of knowledge among most professionals about the subject matter being processed at ERA, lack of transparency while filling out the questionnaire, political biases toward filling out the questionnaire, and the inaccessibility of senior management members who have vast experience to discuss such issues with higher executives from governing bodies.

Another significant limitation of the study is the inaccessibility of most letters or other important documents related to the identification and selection process from regional governments, different organizations, zones and woreda.

Incapability of incorporating the views of regional governments and their respective road Authorities towards the subject for so many different reasons is the other significant limitation of the study.

1.9. Organization of the Study

The study will be organized in five chapters as shown below:

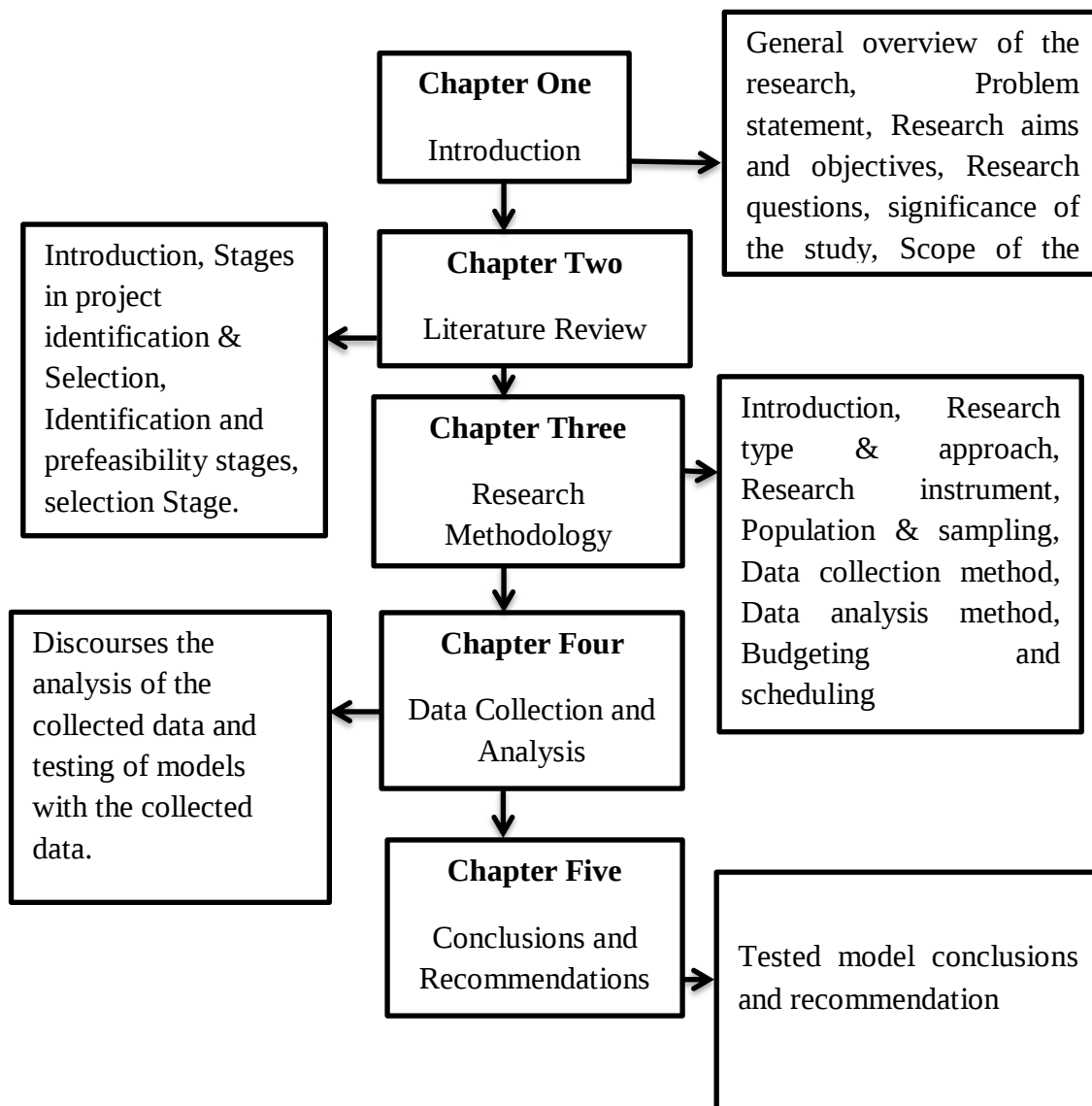


Figure 1: Research methodology and Structure

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Introduction

In this chapter the researcher present a review of related literature that focuses on project identification and selection. To begin with, the researcher examines definition of concepts and terms, concept of identification and selection in construction industry, as well as the topic's significance and implications for the construction industry. The researcher examine the existing practice and challenges of road project identification and selection. Additionally other relevant literature is also assessed and recognized as a source of evidence and for assuring the accuracy of the research findings.

2.2 Definition of concept and terms

The Ethiopian Roads Authority is the client in this study, and it is responsible for the building of new road infrastructure as well as the maintenance of current road infrastructure from trunk to link and feeder roads.

Stakeholders who use the road infrastructure in the end are known as end users. The public is the end user in the Ethiopian Roads Authority's framework.

A contractor is a company that fulfills the project's objectives according to the terms of the contract it signed with the Ethiopian Roads Authority.

“Highway” means a road designated as highway by the Ethiopian Roads Authority

"Road" refers to any highway or other road that is categorized and designated as part of the national road network, as well as any bridges on those roads.

"Works" refers to actions such as construction, maintenance, and improvement.

RSDP means Road Sector Development Program which was formulated in 1997 EC as part of the wider strategic development.

Road projects entail the construction of new roads, bridges, the routine maintenance of existing roads, the maintenance of existing drainage systems, including bridges, the maintenance of retaining structures, emergency road and drainage structure repair, and so on.

DC stands for Design Class, which is a classification of roads based on its ability to serve annual average daily traffic, AADT, of a given standard.

According to the ERA manual:

Rehabilitation of existing project means completely removing the existing structural components of the road and replacing it with the new structural components to improve the service providing capacity and life span of the road.

Road upgrading means improving the road by providing extra width, better alignment, and reduced operational cost.

2.3 Theoretical Review

A project's life cycle is a set of stages that a project goes through from start to finish. These stages are usually in order. The phases can be broken down by functional or partial objectives, intermediate results or deliverables, specific milestones within the overall scope of work, or funding availability. Phases are usually timed and have a beginning and an end. A methodology can be used to document a life cycle. While every project has a clear beginning and end, the specific deliverables and activities that occur in between will vary greatly

depending on the project. Regardless of the exact activity performed, the life cycle offers the basic structure for project management. (Sanchez, 2005).

2.3.1 Project identification

Before moving on to the detailed planning stage of a project, it is necessary to conduct project identification. Project identification is in the initiation phase, according to the PMBOK (2012).

A project cycle, according to Kerziner (2003), is a set of logically related project activities that leads to the completion of one or more deliverables.

According to the PMBOK (2012) the phases of project are:



Figure 1 Project Phases

As per Larson (2006) project identification and selection process comprises of three steps:

- I. Scanning the external environment for issues
 - II. Undertaking preliminary research on the issue
 - III. Making a selection decision
- I. Scanning the external environment for issues**

Scanning is an important aspect of project planning, and it can assist in identifying areas where organizations are most suited to complete the task. It's a stage where a thorough examination isn't required. It can be carried out by internal or external participants.

Scanning can be done in a variety of situations, including:

- Inter-organization forums
- Conducting contextual analyses, including political, economic, social, and historical factors

- analysis of major government policies that have an impact on an issue
- Lobbying by external stakeholders
- Lobbying by internal stakeholders, such as staff, volunteers, or funders
- Project design, evaluation, and learning exercises (from previous discussions)

II. Undertaking preliminary research on an issue

The goal of research at this stage is to assist organizations in deciding whether or not to take on the project. Because further research will be done throughout the design stage, preliminary research should not be exhaustive. Some of the steps below may be included in the research:

- Review of current literature/information on the relevant subject
- Exploring a new geographical region of work
- External stakeholders, individuals, or organizations with experience working on the issue should be consulted.

The data is compiled so that organizations can make an informed decision about whether or not to proceed to the next stage..

III. Making a decision

This summarized information will be used by relevant employees or responsible parties to determine whether the project should proceed to the next stage.

2.3.2 Stages of project identification and selection

Project concepts, according to Richardson (2015), do not take shape right away. Proposals go through multiple rounds of evaluation and scrutiny to ensure that they are sound. An idea is first conceived; it is then incubated for a period of time before beginning to take shape. The

development of project ideas follows a very same path. The process of identifying a project is separated into four parts.

Conceptual Stage: A number of project ideas may be created by a group of stakeholders who are familiar with the area, either individually or collectively. In this context, one must consider development potential as well as societal challenges, needs, and aspirations in the area of interest.

Screening Stage: In a preliminary exercise, project concepts are evaluated to clear out the obvious unviable ones. The screening test would rule out all project proposals. Some project ideas may be too fantastical to be taken seriously.

2.3.3 Identification and pre-feasibility stages

Investment opportunity study refers to the steps of identification and prefeasibility. This study is unavoidably preliminary, broad, and limited in scope, with the goal of providing planners with a range of projects from which to choose. Prefeasibility studies are distinguished from opportunity studies and detailed feasibility studies primarily by the information needed at each step.

2.3.3 Selection stage

According to Ghasemzadeh, F. (2004), selection is the process of reviewing proposed projects or groups of projects and then deciding which ones to implement in order to meet the parent organization's goals. Each project's costs, benefits, and dangers will vary. These are only known with certainty in a few cases. It's difficult to pick one project out of a collection when there are so many variances.

2.4 Empirical Review

Road construction, whether new or upgraded, is thought to have a variety of effects on the population, urban shape, economic condition, and environment (Mackett, R. L., & Edwards, M. (1998). Since they have been used to generate economic development through transportation of goods and services from one area to another, road infrastructure projects have received significant investments (Jedwab, R., & Moradi, A. (2016). It is also assumed that new roads improve the living conditions of persons who live near such projects by providing opportunity for social development, economic opportunities, and community welfare. Roads are also considered as having the ability to stimulate interactions among inhabitants, particularly among those involved in business (Doan, P., & Oduro, C. Y. (2012). In many global cities, road infrastructure improvements also tend to lead to active land-use changes, notably the breaking up of the urban environment into smaller zones with minimal or no contact between them, and no relationship that allows cohesiveness and coherence (Khanani, R. S., Adugbila, E. J., Martinez, J. A., & Pfeffer, K. (2021).

In Sub-Saharan Africa, road infrastructure is still the primary mode of transport for about 75% of freight and passengers (Beuran et al. 2015). Given that roughly half of the roads in Sub-Saharan Africa have yet to be built, road infrastructure development is likely to remain at the top of the list of physical infrastructure developments in such cities, potentially affecting the socio-economic and physical environments of the cities and their peri-urban areas (Gachassin et al. 2010; Cobbinah et al. 2015).

Increased access to output markets leads to an increase in income due to increased sales opportunities or better prices. There is a simple correlation between access to roads and the prices that farmers obtain for their crops: for each additional hour spent traveling to the nearest transportation facility, the rate of price fall is roughly 7% (Gibson, J., & Rozelle, S.

(2002). Road construction, according to Khandker et al. (2009), leads to increased agricultural productivity, higher wages, and higher output prices. On the basis of cross-sectional data obtained in a small part of Madagascar, Jacoby and Minten (2008) estimate the willingness-to-pay for a reduction in transportation costs. The problem of non-random road placement is handled but experiences large variances in transportation costs to the same market. "A road that basically eliminated transport costs in the study area would roughly double the incomes of the remotest households—those facing transport costs of around \$75/ton—mostly by rising non-farm earnings," they discovered.

Depending on the social, spatial, economic, and environmental context, the effects might be both favorable and detrimental. Rural areas, especially in developing countries, are enormous geographical regions where a significant population faces rising challenges due to a lack of infrastructure (Mihai, F. C., & Iatu, C. (2020). Rural road networks are crucial for economic and social well-being in low- and middle-income nations, but they are generally unpaved (Burrow, M. P. N., Evdorides, H., Ghataora, G. S., Petts, R., & Snaith, M. S. (2016, December). Infrastructure quality issues in emerging countries limit mobility and total network connectivity (Muzira, S., de Díaz, D. H., & Mota, B. F. J. (2015). Rural roads account for 69 percent of Colombia's total road network, with a total length of 143,000 kilometers. Only 6% of Colombia's roads under 281 municipalities are paved, according to estimates. The lack of roads restricts regional opportunities and development, increasing poverty (Paz, F. (2017). Because of the importance of rural roads, it is critical to design them well in order to ensure a successful project, which is defined as one that meets its technical objectives while staying on schedule and within budget.

According to the Road sector development program of 23 years assessment report of Ethiopian Roads Authority in 2021, a total of 159,218.4 km of significant physical road

works were completed, excluding normal maintenance, with 45,794 km of Federal Roads, 33,618 km of Regional Roads construction, and 79,806.9 km of URRAP Roads. Overall, physical accomplishment was 65.2 percent of the plan, and total distribution was around ETB 414.7 billion, or 80 percent of the plan. In terms of Federal Roads, the program included 4,105.2 km of trunk road restoration, 12,171 km of trunk and link road upgrades, 11,091 km of new link road construction, and 185.4 km of expressway road construction. Heavy work of 18,241 kilometers of Federal Road was also carried out at the same time.

2.4.1 Challenges of using delivery method selection criteria

Based on the criterion identification capacity and adaptation trend, the use of PDM selection criteria varies from one client to the next. Some of the obstacles in applying the criterion, according to (SMEC, 2018), are:

- ❖ Lack of understanding of selection criteria and their possible benefits in determining the best delivery method
- ❖ a reluctance to modify the current delivery method and trend in project delivery
- ❖ a lack of understanding of the potential consequences of poor delivery method selection
- ❖ a lack of frameworks that regulate how criteria will be applied and what options will be available

Outcomes In the road infrastructure construction sector, selecting the proper delivery method of projects using delivery method selection criteria will play a critical role because it contributes significantly to the development of the construction industry.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter discusses the best methodological approach and research design to apply for the research. It will include a description and justification of the methodological approach, as well as an examination of the research questions, clarification of the data collection method, and procedure of analysis.

Kothari (2004) defines research methodology as A set of methodically arranged studies used to solve a research topic is referred. It is a method that involves the selection of various procedures in order to arrive at a logical, reasonable, organized, and regression-based solution to a problem utilizing the best data collection and analysis methods to arrive at a legitimate conclusion. According to Abiy Zegeye et al., (2009) Methodology is defined as "the theory of how inquiry should proceed" that "involves consideration of the principles and methods in a particular field of research," It is concerned with the researchers' expectations about the nature of reality as well as the nature of knowing and knowledge.

3.2 Research Design and Approach

In this study, the findings of the collected data are presented using a descriptive design. Descriptive statistics is used to characterize the data from the research sample. In addition to questionnaire surveys, desk studies are utilized as a source of secondary data, allowing the researcher to learn more than just what is in the literature. The data acquired through closed ended questionnaires is analyzed using a quantitative research approach, whereas data collected through open ended questionnaires is analyzed using a qualitative approach, as Qualitative research is employed to comprehend the underlying causes, viewpoints, and

motivations. It offers understanding of the issue in formulating concepts or theories for possible quantitative studies. In order to delve more into the issue and identify trends in attitudes and cognition, qualitative research is employed. There are many different ways to acquire qualitative data utilizing semi- or unstructured methodologies. Individual interviews, focus groups (group talks), participation/observations and open ended interviews are a few typical ways. Typically, only a tiny sample size is used, and responses are chosen to meet an open ended questionnaire.

3.3. Population and Sampling

3.3.1 Target Population

The major stakeholders in identifying and selection of road projects are Mainly ERA, Some licensed consultants and contractors. Hence, the target population for this study is workers in road construction areas both from consultant and contractor, members of ERA planning and program management directorate as well as project development directorate.

3.3.2 Sample Design

This study employed a random sample of respondents from contractors, consultants and ERA staff members that were convenient for the researcher sampling approach.

3.3.3 Sampling Size

To determine the minimum sample size, Kumasi Metropolis, Kish (1965) formula will be used to calculating minimum sample size.

$$n = K / (1 + (k/N))$$

Where: n = Sample Size, N = Population Size, S = Maximum standard deviation in the population element (total error = 0.1 at a confidence level of 95%)

$$K = S^2 / V^2 \text{ Where}$$

V = Standard error of sampling distribution which is equal to 0.05

P = the population elements.

$$S^2 = P (1-P) = 0.5(1-0.5) = 0.25$$

Therefore, the minimum sample size of Client staffs, Contractors, and consultants that works with ERA for the past 5 years will be collected from ERA regardless of their grade.

Table 1: From the last 5 years data of Ethiopian Roads Authority:

Organization	Population Number	Sample size
Contractor (Local & Foreign)	82	45
Consultant (Local & Foreign)	62	38
ERA staffs	25	20

Accordingly the minimum sample size for the total population is,

$$K=s^2/v^2$$

$$K=0.25/0.05^2=100$$

$$n = K/ (1+ (k/N))$$

$$n=100/ (1+ (100/ N))$$

$$n=45+38+20=103$$

Therefore, n=103

3.4. Research Instrument

This study's data collection strategy involves both primary and secondary sources. The primary data will come from a self-created and literature based questionnaire, while

secondary data will come from renowned civil engineering journals, particularly those in the Ethiopian Roads Authority Library, ERA manuals, internet sources, and reviewing related archival documents from ERA.

3.4.1. Questionnaire

As it is focused on issues, a questionnaire gives first-hand information for the subject matter of a study, and it also functions as a survey to comprehend the primary concerns and attitudes of respondents regarding the problems (Kasim, 2008). The challenges in connection with project identification and selection from respondents' responses is assessed using open-ended and closed-ended questions using questionnaire developed by the researcher. The questionnaire prepared to collect the data from the respondents is both qualitative which need description and quantitative from the scales assigned to each case.

3.4.2. Desk Study

To explore and assess the problem, archival documents, letters, and claim letters linked to project identification and selection from various sources to the ERA are analyzed in addition to books, journals, and internet sources. These secondary sources serve to augment additional specialized information gathered from primary data sources by providing a basic overview of the subject area.

3.6. Data Collection Method

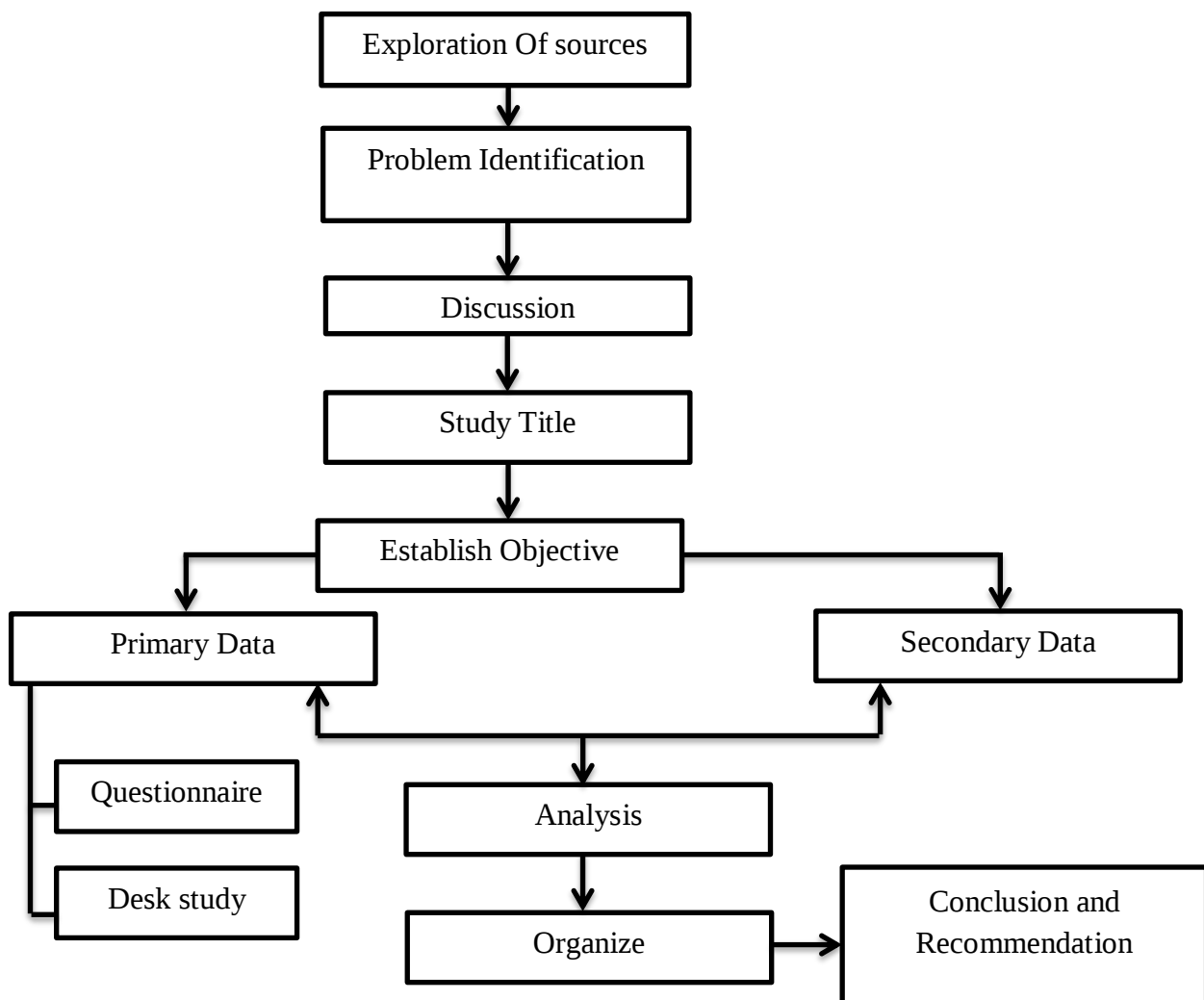
The researcher intends to gather data for the study in a variety of ways, including visiting sites and handing out forms for respondents to fill out and return. The other is collection of desk study documents from Clients, contractors, consultants, project managers & interested stakeholders. Contract documents, project award reports, and correspondence letters from road infrastructure seeking regional and zonal administration will be the majority of archival documents from completed and ongoing projects.

3.7. Data Analysis Method

After collecting questionnaires from several contractors, consultant and respective ERA workers construction firm, the researcher decoded the gathered data into SPSS and evaluated the data using various data analyzing methodologies such as statistical and verbal description. Because the study methodology is descriptive, the results of the questionnaire will be examined using descriptive statistics, such as the frequency and mean of each factor. To evaluate the data, the researcher used SPSS STATISTICS 20.

The detailed technique to be used in preparing this project work is depicted in the chart below:

Figure 2: Methodology chart



3.8. Validity

According to Taherdoost, H. (2016), instrument validity is the extent to which an instrument actually measures what it was intended to measure. Validity is described as the degree to which a notion is reliably measured in a quantitative investigation by Heale, R., & Twycross, A. (2015). There are several factors to consider and evaluation methods for validity. Instrument validity, which includes concept validity and criteria validity, is assessed using statistical validity. Statistical tests are used to make sure the questionnaire is legitimate. The first test is called the Criterion-related validity test (Pearson test), which calculates the correlation coefficient between each paragraph in a field and the entire field that was used to evaluate the validity of the questionnaire.

My advisor and a few top ERA experts assessed the questionnaire. They were asked to assess the questionnaire suitability for use as a tool in achieving the objectives and aims of the study.

3.9. Reliability

The consistency with which an instrument assesses the characteristic that it is intended to measure determines how reliable it is (Mohajan, 2017). When an instrument is used repeatedly under the same conditions with the same people, it will measure in a consistent manner, which is known as reliability. It is comparable to the consistency, dependability, or stability of a measurement device ((Roberta Heale, 2015). The reliability coefficient's value can theoretically fall between -1.00 and +1.00. Reliability coefficients above 0.7 are regarded as good for the majority of purposes (Taherdoost, 2016). With the use of the SPSS software, Cronbach's alpha was used to determine the scale's reliability coefficient. The inter-item

correlation average, r , and the scale's items (variables), k , are used in a straightforward method to calculate alpha.

$$\alpha = \frac{kr}{1+(k-1)r}$$

Each field on the questionnaire had its Cronbach's coefficient alpha computed. The most similar alpha values show that the mean and variances of the original scales do not differ significantly, and standardization does not significantly alter alpha. The values of Cronbach's Alpha for each questionnaire factor and the full questionnaire are shown in table 2 Cronbach's Alpha values for the fields ranged between 0.84 and 0.88.

Table 2: Reliability Statistic

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.861	0.841	14

		Sum of Squares	df	Mean Square	F	Sig
Between People		276.215	96	2.877		
	Between Items	250.504	13	19.270	20.977	.000
Within People	Residual	1146.424	1248	0.919		
	Total	1396.929	1261	1.108		
Total		1673.144	1357	1.233		

Grand Mean = 3.48

The Cronbach alpha value, which is > 0.7 based on the results, is considered acceptable. The outcome of this statistical research demonstrates that each selection criterion can be relied upon when used to determine factors influencing road Construction Projects Identification and Major Selection Challenges.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRTATON

4.1 Introduction

In order to meet the research's objectives, this chapter compiles, analyzes, and explores the data collected from respondents. The questionnaire findings will be interpreted as well. The response rate, general information about the contractor and the study participants, and a summary of the collected data will be presented using data presentation methods like frequency, mean, and percentages. Tables and charts are also utilized to present organized data since they make it easier to interpret and evaluate the data.

4.2 Response Rate of Respondents

The focus of this study is the identification and selection experiences of road projects in Ethiopian Roads Authority. In order to know the result questionnaire was distributed to all project stakeholders I.e. Contractors, consultants and ERA workers. The sample size was determined in the methodology section and it was found to be 100 people, and the researcher distributed 103 questionnaires and received 97 responses. This is a response rate of over 94 percent.

Table 3: Questionnaire survey response rate

No	Respondents	population	Number of sample size	Response	Response Rate (percentage)
1	Contractors, ERA workers & Consultants	169	103	97	94.2 %

Source: Own Survey, 2022

The surveys were reviewed for completeness and reliability before beginning the data encoding process. All of them were confirmed to be complete, so the data would be analyzed using all 97 questionnaires from respondents.

4.3 General Information of the Respondent

The organization (Work Place), educational background, field of Specialization and years of experience in Road and construction sector are all covered in the first portion of the study questionnaire.

Table 4: Information about the respondents

Items		Frequency	Percent (%)
Organization (Work Place)	Contractor	50	51.5
	Consultant	25	25.8
	Private	1	1.0
	ERA	21	21.6
	Total	97	100.0
Educational Background	Masters	32	33.0
	Bachelor	58	59.8
	Diploma	7	7.2
	Total	97	100.0
Field of Specialization	Construction Technology and Management	18	18.6
	Transport Engineering	10	10.3
	Civil Engineering	43	44.3
	Highway Engineering	10	10.3
	Urban Planning	2	2.1
	Other (please specify)	14	14.4

To get better result from the questionnaire, the researcher distributed the questionnaire to stakeholders who are involved in road construction under Ethiopia Road Authority. Hence, 51.5% of the respondents are from the contractor side and 25.8% from the consultant side were given the questionnaire to fill.

Most respondents have at list first degree of education level (59.8%). Other respondents hold a range of educational qualifications from diploma to masters and most of the respondents are civil engineers who are working in road construction projects (44.3%). The rest

remaining respondents are from streams but works under engineering firms and are mostly accountants and economists at offices level in Road constructing firms.

Table 5: Work Experience

Items		Frequency	Percent (%)
Work Experience in the construction Sector	0-5 Years	24	24.7
	6-10 Years	31	32.0
	11-15 Years	23	23.7
	above 16 Years	19	19.6
	Total	97	100.0
Work Experience in Road construction Sector	0-5 Years	40	41.2
	6-10 Years	35	36.1
	11-15 Years	14	14.4
	above 16 Years	8	8.2
	Total	97	100.0

It can be seen from the above table that the majority of the respondents have an experience of 6-10 years in the construction Sector and 1-5 Years specifically in Road construction Sector. This vast experience could help the researcher to gather reliable data.

4.4 Practices on project identification and selection criteria

This section provides details on Ethiopian Roads Authority, ERA, led road project identification and selection process. The data was gathered via the questionnaire and thoroughly examined. The results were illustrated and presented visually in tables and figures.

4.4.1 Doubts on the Identification and selection criteria

Table 6: Doubts on the Identification and selection criteria

		Frequency	Percent
Valid	Yes	43	44.3
	No	54	55.7
	Total	97	100.0

The number of respondents who doubted the Identification and selection criteria of road projects isn't negligible because, at times selection is influenced by political promotion and promise, the selection process is not clear and it's biased. In many occasions the selection criteria doesn't consider the community living around the road corridor, biased budget allocation for regional road projects, and important factors for project identification and selection are not integrated to come up with the final decision at ERA level.

4.4.2 Influence on road project identification and selection process

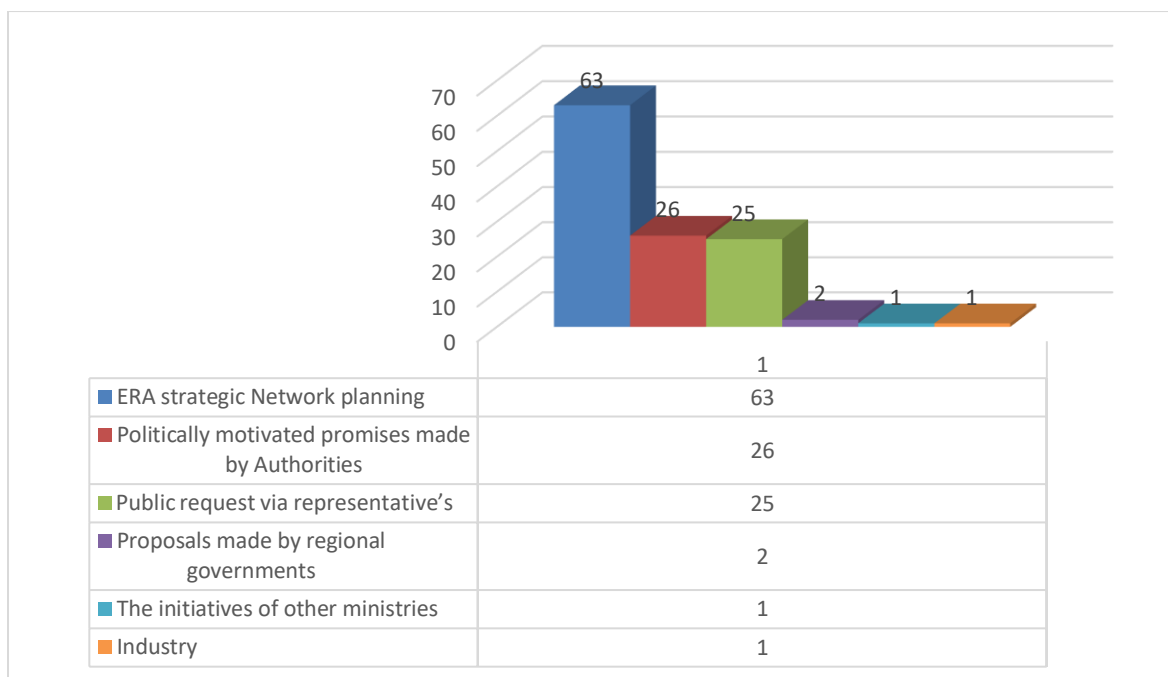
Table 7: Influence on road project identification and selection

Ethiopian Roads Authority, ERA, is entitled to do road project identification and selection process without any influence based on criteria and legally confirm the selection for further appraisal and execution			
Response		Frequency	Percent
	Yes	59	60.8
	No	30	30.9
	I don't know	8	8.2
	Total	97	100.0

Most respondents 60.8% think that ERA is entitled to do road project identification and selection process without any influence based on criteria and legally confirms the selection for further appraisal and execution.

4.4.3 Influential factor in road project identification and selection process

Figure 3: factor in road project identification and selection



From the figure shown above the response of the respondents shows that influential criteria or factor in road project identification and selection process is ERA strategic Network planning and it has the highest frequency relative to other factors. Following ERA strategic Network planning, politically motivated promises made by Authorities and Public request via representatives of the people considerably influence the road project identification and selection process. Relatively the other important consideration by the road authority have less influence on in road project identification and selection process which further degrade the credibility of the process.

4.4.4 Road identification and selection criteria

The table shown below contains the response on the 14 factors that can possibly affect/ influence the identification and selection of different road projects. From those factors it is found that ERA strategic Network planning of Road Sector Development Program has the highest mean of (4.38) which means its influence id between high and Very high. After that Politically motivated public request via public protest (4.10), High Traffic Level (3.89), Public request via representatives of elected members of the community (3.88) has high influence in the identification and selection process.

The least factors for identification and selection process are Missing links between towns to reduce costs and time of travel by constructing link or short access roads between towns

(3.10), Emerging Regions/Isolated areas to bring about balanced and equitable development of road infrastructure amongst the regions in the country (3.10), Roads which access high mining and natural resource potentials (3.08), Surplus food crops and cash crops growing areas to improve supply of food crops to urban and rural markets and increase the volume of exportable crops, construction of new roads linking to these areas are vital (3.07), New access to Population Centers which are totally isolated from the rest of the country because of the absence of roads(3.03) and finally Roads for accessing tourist attraction areas and provide better access (3.02).

Table 8: Road identification and selection criteria mean table

Descriptive Statistics			
	Road identification and selection criteria under the influence of	Mean	Std. Deviation
1	ERA strategic Network planning of Road Sector Development Program	4.38	.859
2	Politically motivated public request via public protest	4.10	.941
3	High Traffic Level	3.89	.978
4	Public request via representatives of elected members of the community	3.88	.857
5	Proposals made by Regional Governments	3.65	.867
6	Poor road Condition for traffic movement	3.55	1.000
7	Import/Export Corridor and Regional Integration Roads	3.51	1.138
8	Economic development via potential area's providing access to unexploited natural resources	3.41	1.048
9	Missing links between towns to reduce costs and time of travel by constructing link or short access roads between towns	3.10	1.104
10	Emerging Regions/Isolated areas to bring about balanced and equitable development of road infrastructure amongst the regions in the country	3.10	.963
11	Roads which access high mining and natural resource potentials	3.08	1.170
12	Surplus food crops and cash crops growing areas to improve supply of food crops to urban and rural markets and increase the volume of exportable crops, construction of new roads linking to these areas are vital	3.07	1.218
13	New Access to Population Centers which are totally isolated from the rest of the country because of the absence of roads	3.03	1.065
14	Roads for accessing tourist attraction areas and provide better access	3.02	1.108

From the figure shown below the response of politically motivated public request via public protest and Public request via representatives of elected members of the community was taken separately to see the effect of public request on the identification process, Individually **both of the factors have high influence with the mean value of 4.1 and 3.88.**

Figure 4: Road identification and selection criteria mean figure

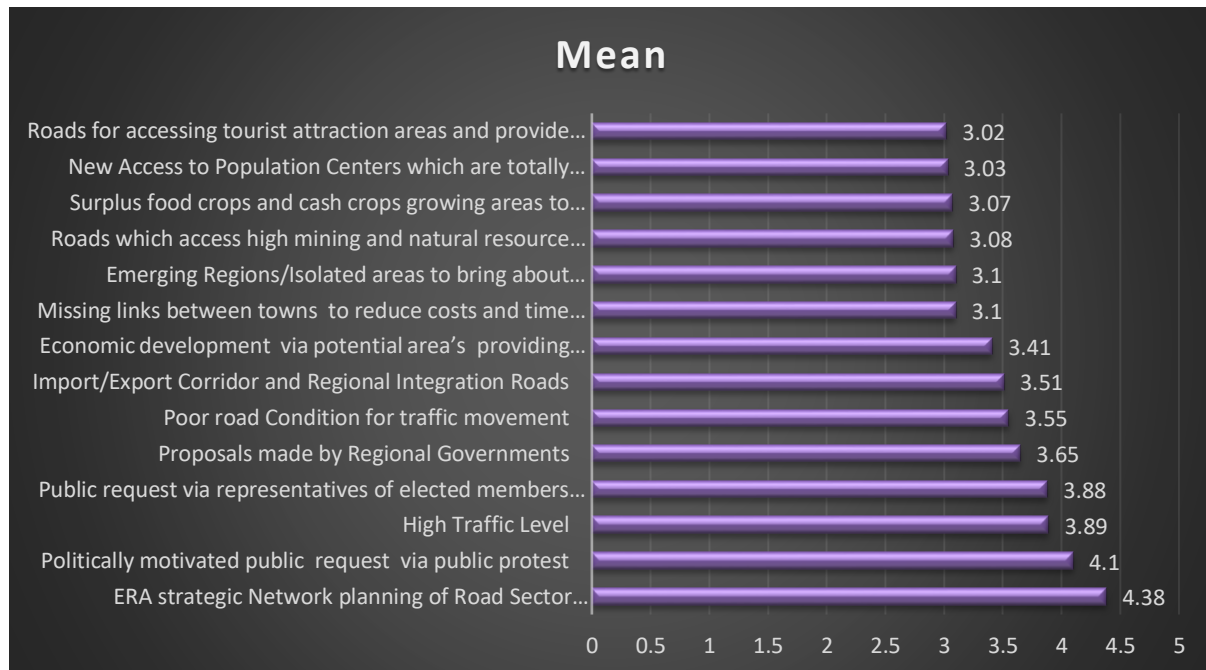


Table 9: Public request

	Minimum	Maximum	Mean	Std. Deviation
Public request	1.00	5.00	3.9897	.75684

The above table reveals that the influence of public interest either political motivated or through elected representatives has high influence in the identification and selection criteria of road projects where both criteria's were not in the MCA process of ERA. The above mean is found by taking the average value of politically motivated public request via public protest and Public request via representatives of elected members of the community. From the Likert scale 3.98 is High Influence on the identification and selection criteria.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

The study's final chapter summarizes the conclusions gleaned from the responses to the research questionnaire. The research question's conclusion based on the data, as well as recommendations for challenges of road project identification and selection criteria are provided, along with future study suggestions.

5.2 Summary of findings

For the reason that selection is sometimes primarily focused on political marketing and promise, a sizable proportion of respondents expressed uncertainty about the identification and selection criteria of road projects. Although the points on the selection process are clear and based on points given on the MCA process, the selection criteria isn't applied as per the points shown on the multi-criteria approach. The reasons behind these are biased government delegates toward the ownership of the process of road identification process, having less knowledge about the decisive factors in road identification and selection and the assumption of considering the public as a way to peruse the government to see the request via the people as the best way to a wrong conclusion.

Following ERA's strategic network planning of roads sector development program, politically motivated public request via public protest and Public request through representatives of elected members of the community highly influence the road project identification and selection process. Public request via public protest (4.10) and Public request via representatives of elected members of the community (3.88) have high influence in the identification and selection process. Looking at the mean value of 3.98 from the Likert

scale of the two factors, they have High Influence on the identification and selection criteria way above the basic criteria's of ERA. Despite having high Score point from the respondents analysis, these factors are not even considered in the MCA's of ERA.

Despite having high score point in the MCA's of ERA, the others have less influence on in road project identification and selection process relative to politically motivated requests as of now.

5.3. Conclusions

Based on the discussion of findings, the findings of this research, and a review of related literature, the level of road project identification and selection criteria was investigated. The questionnaire assisted in answering each research question and achieving the study's general and specific objectives, which are described in section 1.4.

From the analysis of the respondents, rightly ERA strategic Network planning of Road Sector Development Program has the highest score relative to other factors. It is found that ERA strategic Network planning of Road Sector Development Program has the highest mean of (4.38) which means its influence id between high and Very high.

Following ERA's strategic network planning of roads sector development program, politically motivated public request via public protest and Public request via representatives of elected members of the community highly influence the road project identification and selection process. Public request via public protest (4.10) and Public request via representatives of elected members of the community (3.88) has high influence in the identification and selection process. Looking at the mean value of 3.98 from the Likert scale of the two factors, they have High Influence on the identification and selection criteria.

Despite having high Score point from the respondents analysis, these factors are not even in the Multi-criteria approach analysis of ERA.

From the study and findings of the study, the current project identification and selection process of ERA is affected by unjustified interest of the public and highly susceptible to political interventions. Many issues and challenges were raised by the respondents during the project selection process. The issue stems from the fact that projects were chosen without strict implementation of the MCA's, Lack of experts' involvement, lack of knowledge of political delegates about the process of project identification and selection and less participation of respective stakeholder to manage the public demand in a way that nationwide development strategy is considered during identification and selection at ERA.

It is essential to include all the factors, analyze the situations in each of the cases, involve regional states in the programs to take responsibility & corporate in the implementation of the outcome. The main obstacles cited by the respondents were the presence of unnecessary political influence and intervention of the hierarchy to implement against the multi-criteria approach which is best if applied strictly to the requirements.

5.4. Recommendation

The study forwarded the following recommendations to stakeholders for consideration in order to maximize the benefits of proper identification and selection processes of road projects and overcome the challenges thereafter.

- ❖ It's important to exercise Multi criteria approach project identification and selection criteria for road projects nationwide considering the wide range of development opportunities, resource utilization, market availability, labor availability... etc.,

considering that the development of one neighborhood mean development of the whole nation as well.

- ❖ The politically elected public delegates should know that the identification and selection of roads for construction implementation is solely the responsibility of the Ethiopian Roads Authority thinking that the process has a multi criteria approach and the core value behind this is the development of the country as a whole.
- ❖ Limit the influence of political intervention in the process of identification and selection. As budget is a great deal for the construction of road projects, identification and selection of projects is highly influenced by law making individuals and authorities there for law shall be passed to limit the involvement of politicians in the sector.
- ❖ Many consultants' feasibility studies are still unable to present realistic images of the projects. Therefore a detail follow-up and monitoring method should be implemented by the ERA under no influence from the higher executives of the government.
- ❖ On job training and knowledge transfer: Since ERA is the primary responsible body for the identification and selection of road project, it shall have proper project management knowledge even to persuade some politicians in feasibility study. Upgrading the knowledge of ERA workers on projects identification and major selection criteria shall be encouraged.

5.5 Suggestion for further study

- ❖ Since some of the devastating and chaotic problems faced recently in Ethiopia are the consequences of lack of the right distribution to build public infrastructures, other researches can carry out in more advanced detail to show the gap in Projects Identification and Major Selection Challenges in Ethiopia.

- ❖ Hence the resource involving in the construction of road infrastructure is huge, it is important to study the amount of resource committed without return in investment and prevail the damage made after every wrong decisions of identification and selection of projects.

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Appendix I



ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

DEPARTMENT OF PROJECT MANAGEMENT

Dear Sir/Madam/Participant,

This questionnaire is prepared to obtain information from key informants to assess the practice of “**Road Construction Projects Identification and Major Selection Challenges**” for only academic research purpose as partial fulfillment of Master of Arts in Project management.

The researcher believes that this study will aid in the development of Ethiopia's road building industry, and hence the participants' construction expertise and knowledge will greatly contribute to the study's success. The Information obtained through this questioner will remain strictly confidential.

Accordingly, your open and prompt response is highly essential to fulfill the objective of this research and to address the problem.

Best Regards,

Sisay Markos

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Section A: Personal and organizational profile of respondent

Instruction: Please put a tick (x) in the box next to the answer of your choice or write in the space provided as the case may be

1. Organization (Work Place)

☐ ERA ☐ Contractor ☐ Consultant ☐ private

2. Educational Background

☐ PhD ☐ Masters ☐ Bachelor ☐ Diploma

Other (please specify) _____

3. Field of Specialization

☐ Construction Technology and Management ☐ Transport Engineering ☐ Civil

Engineering ☐ Highway Engineering ☐ Transport Engineering ☐ Urban Planning

Other (please specify) _____

4. Work Experience in the construction Sector:

☐ 0-5 Years ☐ 6-10 Years ☐ 11-15 Years ☐ above 16 Years

5. Work Experience in Road construction Sector:

☐ 0-5 Years ☐ 6-10 Years ☐ 11-15 Years ☐ above 16 Years

Section B - General Questions

1. Have you ever doubted the Identification and selection criteria of road projects for implementation?

☐ Yes ☐ No

2. If the answer for the above question is yes, then how do you felt toward the selection _____

3. Do you think the Ethiopian Roads Authority, ERA, is entitled to do road project identification and selection process without any influence based on criteria and legally confirm the selection for further appraisal and execution?

☐ Yes ☐ No ☐ I don't know

4. If the answer to the above question is No, then who do you think is responsible for identifying and selecting projects for execution?

☐ FDRE Transport Minister ☐ Regional State Gov'ts ☐ the public ☐ Elected political delegates' ☐ Regional State Road Authorities ☐ I don't know

Other (please specify if any other) _____

5. In your opinion, what do you consider is the most influential factor in road project identification and selection process?

☐ Public request via representative's ☐ politically motivated promises made by Authorities
☐ ERA strategic Network planning ☐ the initiatives of other ministries ☐ proposals made by regional governments' ☐ proposals made by regional governments' ☐ NGO'S ☐ Industry

Section C- Road project identification and major selection challenges

Instruction: You are kindly required to respond to each item in subsequent sections using the following scale by ticking the appropriate option. The table below consists of a list of possible project identification and selection influencing factors or criteria's. Based on your experience and understanding what is the likely occurrence and influence of these factors in the project identification and selection?

Level of Influence	Score
Very High	5
High	4
Medium	3
Low	2
Very Low	1

NO	Road identification and selection criteria under the influence of	Level of Influence				
		Very High (5)	High (4)	Medium (3)	Low (2)	Very Low (1)
1	Politically motivated public request via public protest					
2	Public request via representatives of elected members of the community					
3	ERA strategic Network planning of Road Sector Development Program					
4	Proposals made by Regional Governments					
5	Economic development via potential area's providing access to unexploited natural resources					
6	Surplus food crops and cash crops growing areas to improve supply of food crops to urban and rural markets and increase the volume of exportable crops, construction of new roads linking to these areas are vital					
7	Missing links between towns to reduce costs and time of travel by constructing link or short access roads between towns					
8	New Access to Population Centers which are totally isolated from the rest of the country because of the absence of roads					
9	Emerging Regions/Isolated areas to bring about balanced and equitable development of road infrastructure amongst the regions in the country					
10	Roads for accessing tourist attraction areas and provide better access					
11	Roads which access high mining and natural resource potentials					
12	High Traffic Level					
13	Poor road Condition for traffic movement					
14	Import/Export Corridor and Regional Integration Roads					

Thank you for your cooperation, Devotion and precious time taken!

Appendix II

ERA Project Selection Framework

A. Project selection and prioritization framework in RSDP I to–V

Selection of projects that have been implemented under the **RSDP I to V** over the past 23 years had passed through different stages of preparation. The early stages of project selection and preliminary prioritization were based on a **Multi-Criteria Approach (MCA)**, described in the sections below. After preliminary selection, using the MCA approach, the project preparation moved to feasibility studies where a detailed economic and environmental analysis is carried out.

1. Preliminary Selection of Road Upgrading Projects

Five criteria were used for preliminary selection of road upgrading projects. These criteria were traffic level of the proposed road; network connectivity; road condition; investment potential and import-export road.

- I. **Traffic Level:** Roads are built with a design capacity to accommodate a given volume of traffic per day. When traffic levels exceed the design capacity, roads reach to the point where maintaining them is no longer economical. Roads with high traffic were given priority for upgrading or rehabilitation - 30% weight.
- II. **Network Connectivity:** Existing roads, particularly main roads, are connected with other roads that collect and feed in traffic. Roads which improve the efficiency of the road network connectivity were given priority for upgrading - 20% weight.
- III. **Road Condition:** Some gravel and asphalt roads had passed their initial design life and had deteriorated to the point where maintaining them is no longer economical. In such cases, it was impossible to restore them to their original condition by heavy maintenance

and reconstruction and/or upgrading was necessary to bring them back to a serviceable standard. Priority was given to roads or sections of road that were in a poor condition - 20% weight.

- IV. **Investment Potential:** The number of medium and large-scale industries under a licensing phase or under implementation in emerging towns of the country was accelerating. Absence of road infrastructure was frequently cited as the main impediment to existing industries and this was also an investment restraint to attract new industries. Lack of adequate road infrastructure also hampered growth of the economy at the national level and priority was given to upgrading roads, connecting with these towns - 10% weight.

- V. **Import/Export Corridor and Regional Integration Roads:** Ethiopia imports and exports goods through the port of Djibouti and to some extent through ports of Barbara in Somali Land and the port of Sudan. Ethiopia is also planning to use the port Mombasa in Kenya as an alternative outlet. Upgrading roads linking to ports of neighboring countries was important as they provide alternatives and promotes competitiveness. Ethiopia also needs to ensure links with neighboring countries to improve trade and promote regional integration. Priority was given to upgrading import/export and regional integration corridors - 20% weight.

2. Preliminary Selection of New Roads

Five criteria were applied for preliminary selection of new roads. These criteria were roads leading to economic development potential areas; roads leading to surplus food crop and cash crop growing areas; missing links between main roads or shortcuts; new access to large population centers and roads in emerging regions.

- I. **Economic Development Potential:** Ethiopia is endowed with natural resources in different parts of the country, mainly irrigable potential agricultural land and minerals, which were not exploited. Priority was given to the construction of new roads providing access to areas with unexploited natural resources - 20% weight.
- II. **Surplus Food Crops and Cash Crops Growing Areas:** Some areas grow and supply surplus food crops to urban and rural markets and food deficit areas. In addition, there are areas producing exportable crops. Not all of these surplus food crops and cash crops growing areas were connected by roads. To improve supply of food crops to urban and rural markets and increase the volume of exportable crops, construction of new roads linking to these areas was vital. Priority was given to the construction of new roads creating access to these areas - 20%.
- III. **Missing links:** Several towns in the country are linked to each other by circuitous roads and connectivity of the road network was not optimized. Consequently, transportation cost and travel times were high between these towns. Costs and time of travelling could be reduced significantly by constructing link or short access roads between some towns in the country and priority was given to the construction of link roads - 20% weight.
- IV. **New Access to Population Centers:** There were large rural communities in different parts of the country which were totally isolated from the rest of the country because of the absence of roads. These communities needed to become socially and economically integrated with the rest of the country. By the virtue of this, priority was given to the construction of new roads providing access to large isolated rural communities in the country - 30% weight.

- V. **Emerging Regions/Isolated Areas:** There are four emerging regions in the country namely Gambella, Benishangul - Gumuz, Afar and Somali. Due to neglect in the past, distribution of main roads in these regions and some pastoral areas of the country are minimal. To bring about balanced development amongst the regions in the country, roads provision should be equitable. Priority was given to construction of new roads in these emerging regions - 10% weight.

Final Prioritization and Selection

It was during the feasibility stage that final project selection was made on the basis of economic viability. All new construction and upgrading projects used a conventional producer surplus or HDM project level model approach to compare the total costs with the total benefits of the project discounted at 10.23%. Total project costs included the construction and the maintenance cost of the road during the service period of the road. Benefits took into account vehicle operating cost and travel time savings. Each project was assessed on its Economic Internal Rate of Return (EIRR) and Net Present Value.

Feasibility studies for most of the roads ear-marked for upgrading or new construction were well underway or well advanced. Finalization of procurement for civil works and consultancy for those projects scheduled to start in the early years of the program was well advanced.

The Roads Economic Decision Model (RED), developed by the World Bank, was used to improve the decision-making process for the development and maintenance of low-volume regional roads. The model performs an economic evaluation of road investment options using the

- VII. Building road projects that target to provide access to large-scale potential farming areas in low lands of Ethiopia. The projects shall facilitate the import and export of agricultural inputs and products,
- VIII. Constructing upgrading and rehabilitation projects which give access to Woreda Capitals, high economic centers and potentials
- IX. Constructing road projects which cross major transport corridors, import and export routes, borders and customs posts and alternative routes.

Identification and Prioritization of Upgrading and Rehabilitation Projects

Accordingly, a number of existing roads for upgrading and rehabilitation and missing link roads for new construction were identified. The prioritization of existing roads was performed using the Highway Development and Management (HDM-4) Tool that was developed by the World Bank and have been underutilization for more than twenty years. In this respect, the required data were acquired from pertinent organizations and sources. These data included road construction and maintenance costs as well as vehicle related costs. The data were analyzed using HDM-4 and the presumed parameters were generated and then the projects were prioritized. The main criteria of prioritization were net present value (NPV), benefit-cost ratio (B-CR) and internal rate of return (IRR).

Strategic analyses were performed by considering the following three options:

- i. Upgrading of the existing gravel roads to Asphalt concrete;
- ii. Rehabilitation of existing asphalt roads; and
- iii. Upgrading existing asphalt roads to a better standard.

3.3.2 Identification and Prioritization of New Missing Link Road Projects

The ERA utilizing MCA in the case of the missing links, the following were dealt with Main Criteria (MC), Sub Criteria, Criteria Range, and marks (points) with respect to specifics and overall. Overall, there were eight (8) main criteria, eleven (11) sub criteria, and thirty (30) criteria ranges. These are succinctly described below:

MC 1: Population and Urban Center

This main criterion comprises of two sub criteria which are: populations served by road crossing Woredas with criteria ranges from least population per kilometer to highest population per km. In allocating points for roads, the roads get marks based on proportion of their population to the maximum population of road crossing Woredas. A road which crosses highest population per km gets 10 points. Therefore, the maximum point/mark allocated in this case is 10.

MC 2: Surplus Crops Production

In this case, there are two sub criteria that are surplus crops for domestic consumption and surplus crops for export.

MC 2.1: Surplus Crops for Domestic Market

Similar with population the allocation of the mark used in the case of roads crossing surplus producing Woredas is the size of surplus production. The maximum mark is determined by the maximum total surplus producing Woredas crossed by the proposed roads. And the maximum mark in the case of surplus crop production is 10 marks.

MC 2.2: Surplus Crops for Export (Cash crops)

Under these multi criteria follow the same procedure with the above multi criteria for surplus production. The maximum point allocated is 8 and the remaining roads get proportionally with the total.

MC 2.3: Arable land

Arable land is land which is capable of being ploughed and used to grow crops but not currently cultivated. Under this multi criterion, measured size of arable land found in the Woredas crossed by newly identified missing links is used for comparison. The maximum mark/point assigned for road crossing high size of arable land is 7 marks.

MC 3: Livestock

Livestock in Ethiopia are domesticated animals commonly raised to produce labor and commodities such as meat, eggs, milk, leather, and wool. Under this criterion, the total number of livestock (in Tropical Livestock Unit) is the measurement of comparisons between roads crossing livestock potential areas. The total marks/points allocated for road having high livestock population is 10 marks.

MC 4: Mining

There are two sub criteria under mining and these are metallic and placer gold; and industrial mineral. The total allocated mark/points for mining is 8 mark/points.

MC 4.1: Metallic and Gold

Under this multi criteria the consultant has evaluated the volume of metallic and placer gold crossed by the identified missing links. The total mark/point allocated for metallic and gold is 5 marks.

MC 4.2: Industrial Mineral

Under these multi criteria the consultant has evaluated the volume of industrial mineral crossed by the identified missing links. The total mark/point allocated for industrial mineral is 3 marks.

MC 5: Industries

This multi criterion is evaluated with the number of Medium scale, large scale and agro-industries found in the Woredas crossed by newly identified missing links. The maximum mark/point allocated for road crossing high industrial Woredas is 10 marks.

MC 6: Tourism

Under these multi criteria, the total number of major tourist attraction sites crossed by the future missing link is considered. The total mark allocated for road crosses high number of tourist attraction Woredas is 6 marks.

MC 7: Federal Road Density

The Federal Road Density is measured in km per 1,000 sq. km. The maximum mark is allocated for road crossing very low federal road density Woredas which is 6km per 1000 sq km. This is to privilege future missing links crossing less federal road density Woredas. Roads crossing very low density Woredas which is 6 km per 1000 sq km or less get 10 marks. Roads crossing high

density Woredas get less mark. The remaining roads get proportionally by dividing 6 to the density of the Woredas crossed by the roads multiplied by 10.

MC 8: Network Connectivity

There are two sub criteria in this case and these are: Transport Corridor and Regional Integration.

MC 8.1: Transport Corridor

There are four criteria ranges under the Transport Corridor. The first one is corridor road that connect feeder or unclassified road; the second one is corridor road that connect collector roads; the third one is corridor road that connect main access roads; and lastly, corridor road that connect trunk or link roads. Correspondingly, the allocated points/marks are 1.25, 2.50, 3.75 and 5 respectively.

MC 8.2: Regional Integration

Under this sub criterion, there are four criteria ranges and these are: roads connecting Woredas within one zone; roads connecting two zones within one region; roads connecting two regions; and lastly roads connecting two Borders and Posts. The corresponding allocated points/marks are: 2.5, 5.0, 7.5 and 10.0.

It can be concluded that, the identified missing links have been evaluated for prioritization purposes using the above criteria, sub criteria and criteria ranges after thorough professional exercise and sufficient discussions with the clients and other stakeholders. The Consultant feels that the exercise was iterative and can be revised at point of time.