ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

KEY SUCCESS FACTORS INFLUENCING THE PERFORMANCEOF ROAD CONSTRUCTION PROJECTS UNDER ETHIOPIAN ROADS AUTHORITY: THE CASE OF NORTHERN REGION

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A PROJCT WORK SUBMITTED TO GRADUATE STUDIES, SCHOOL OF COMMERCE, ADDISABABAUNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF MASTERS OF ARTS IN PROJECT MANAGEMENT

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APROVED BY BOARD OF EXAMINERS

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ABSTRACT

The main objective of this research was to investigate key success factors influencing the performance of road construction projects and determine their relative importance in the northern region of Ethiopia. Many studies attempt to explore key success factors believed to influence project performance. However, this particular area of key success factors remains unclear and there are limitations in investigating on the area. Literature review was deployed to generate set of key success factors. And then a questionnaire survey was, based on 80 identified key success factors, grouped into eight major factor categories, and was conducted to collect data from three groups of respondents: client representatives, contractors and consultants. Out of 25 questionnaires distributed, 19 were returned. Using the mean score, relative importance index, and weighted average method, the top ten key success factors for each category were identified. Spearman's rank correlation was used to analyze the agreement of survey respondents on those categorized factors. A one –way analysis of variance was then performed to determine whether the mean scores among the various groups of respondents were statistically significant. The survey findings indicate that the most key success factors in each category are as follows: Competence of project participant (time),relationship among project participants(cost),management leadership in promoting high process quality (quality),effective monitoring and feedback (human resource management),ability to meet the client's deadline (client satisfaction),careful positioning and maintenance of road project site (environment),interrelation between the employee and supervisor (safety) and quality of works to match standards (risk management).An understanding of these key success factors would help all interested parties in the road construction industry to improve project performance. Moreover, the results of this study would help road construction professionals and practitioners take proactive measures for effective project management.

Key words: road construction projects, performance, key success factor

ACRONYMS AND ABBREVIATIONS

ERCC Ethiopian Road Construction and Consultancy

ERA Ethiopian Roads Authority

ERTG Ethiopian Roads Technology Group

IHA Imperial Highway Authority

WBS Work Breakdown Structure

EVM Earned Value Management

EPDRF Ethiopian People's Revolutionary Democratic Front

RII Relative Importance Index

KPI Key Performance Indicators

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Project is a complex, non-routine, one-time effort limited by time, budget and resource, and performance specifications designed to meet customer needs. A construction project is completed through a combination of many events and interactions, planned or unplanned, over the life of a facility, with changing participants and processes in a constantly changing environment. Since the outcomes of the capital projects have strategic implications on the success and profitability of an organization, the ability to deliver based on pre-determined objectives should be critical to the company's success. Project success can be defined as meeting the required expectation of the stakeholders and achieving its intended purpose. Success criteria or a person's definition of success as it relates to construction often changes from project to project depending on participants, scope of services, project size, sophistication of the owner related to the design of facilities, technological implications, and a variety of other factors (Susil, 2016).

In the competitive construction world where companies compete with the successful completion of projects with a given budget, cost and the allotted time, construction projects are an important instrument for most of the governments, users and communities to achieve developmental aspirations. However, in modern construction projects there are significant challenges for both the client and contractors to deliver the project successfully due to increasing complexity in design and the involvement of stakeholders and other related issues construction delivery related factors. According to Sumesh (2015) in today’s world of intense competition, the key to sustainable competitive advantage lies in delivering successfully completed projects on time budget, quality and other parameters of project success, and satisfying client and the contactor in the predefined sets of criteria. Satisfying the client, customer or the target group in which the project has been built for is the primary concern in construction projects. In this regard, researchers support in their findings that there is relationship between project success factors and project performance indicators influencing each other. Prathamesh (2015) states that success factors determine the performance of projects, pointing out

that research on project success factors improves the success of project strategies, goals and business profits.

In developing countries construction projects encounter failures time to time. This is mainly exacerbated by poor quality and commitment, lack of time and poor know how to the area. Among the developing countries Ethiopia also faces these challenges. The country has embarked on a long-term development strategy which aims at achieving sustainable human development with all pre-requisites for a middle income country by the year 2025. This envisages creation of a strong, diversified, resilient and competitive economy that can effectively cope with the challenges of development and that can easily adapt to the changing market and technological conditions in the regional and global economy. The priorities identified as the essential catalyst for the attainment of the Vision 2025 objective include development of infrastructure as an important ingredient towards attainment of faster economic growth through building cost and time effective, accessible and diversified roads across the country.

Road sector construction projects in Ethiopia are way through which development strategies are achieved. Development strategies which are fulfilled through successful road projects to import accessibility of rural areas, lower costs associated with transport maintenance and open more areas for development activities. Road projects, involving large amount of capital, also contribute to the total economy through job creation and in a ripple effect to other business

The country's road construction is a fundamental economic sector which permeates most of the other sectors as it transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development. It embraces the process by which the physical infrastructure are planned, designed, procured, constructed or produced, altered, repaired, maintained, and demolished Siraw (2016). The industry has also important contributions to the Ethiopian economy, being the largest job creators next to agriculture and as demonstrated by its share in the GDP. Thus, the realization of Vision 2025 partly depends on the existence of a reliable and competitive local construction industry that is capable of delivering quality services and value for money in the development and maintenance of the physical infrastructure. Since 2005 there have been a number of initiatives geared towards fostering the local construction industry especially road construction. Despite such interventions, the state of the local construction industry has remained poor. Performance constraints include inadequate

capacity of local contractors and consultants, inadequate public sector delivery capacity, corruption, erratic work opportunities, use of outdated technologies and practices, lack of effective supporting policies and poor state of the economy which are the exhibited challenges in the road construction sector. Furthermore, the development of a strong construction industry should be supported by sect oral and macroeconomic policies geared towards stimulating growth and competitive position of the local actors. Experience has shown that development of the construction industry requires government commitment, many years of sustained effort and the right operating environment. A good economy is equally important as it creates demand for its services.

1.2 Background of the Organization

Historical chronicles of the 17th and 18th centuries show that there were a number of small road trails and foot paths, in addition to the traditional shoulder porter age, animals like mules, donkeys, horses and camels were used as a means of transportation in Ethiopia. In the 18th century, especially during the reign of Emperor Tewodros, although the technology was primitive it was believed that planned road construction efforts were made. It is also believed that Emperor Yohannnes IV, who succeeded Tewodros, was engaged in road building.

However, due to the danger of invasion by Egyptians, Sudanese and Turkish the Emperor was not able to achieve his desires (Organizational back ground of ERA, 2007). It was prior to the second Italian occupation i.e. between the years 1896 and 1936 that a great success was made in road construction. Emperor Menilik was said to be a successful road builder participating himself in the construction. In 1903 the road from Eritrea to Addis Ababa and the road from Addis Ababa to Addis Alem were built. In addition it was during this time that the first Asphalt roads appeared in Addis Ababa (Organizational back ground of ERA, 2007). During the Italian occupation roads were built by them and they were established to meet the requirements of the military control rather than to promote the overall development of the country's economy. In addition, the roads lacked most of the modern design and construction features desirable for present day high speed traffic. The roads and trails built and improved during the 5 year Italian occupation were about 6000km.approximately 2500 km of them were given a single asphalt surface treatment, drainage structures were usually of stone masonry and at least three tunnels were built. However, when Ethiopia regained its independence, the Italians in their fleeing

attempt almost undid what they created by blasting bridges and dynamiting roads (Organizational back ground of ERA, 2007).

After the Italian occupation, it was a period of stagnation for the construction and maintenance of the road system. Significant magnitude of Italian built road network was deteriorated within a period of 10 years. In 1951 only 1000kms of road was traffic worthy of the total stock of about 6000 kms. In 1951, the Government established a strong and specialized road agency, the Imperial Highway Authority (currently called Ethiopian Roads Authority). The immediate responsibilities entrusted to the newly formed Authority were, first to rehabilitate the already deteriorated road network and second to construct additional road network. From its year of establishment in 1951, the Organization managed to undertake various physical and policy issue assignments. A program development of road started in 1951 with establishment of IHA. The road constructed during this time include: - Addis –Assab (860km), Addis-Jimma (355km) and Addis- Nekempt (331km). Moreover, road maintenance was carried out on Addis-Adigrat, Addis –BlueNile and Addis-Shasemene trunk roads.

ERA was established in 1967 by proclamation No 256/67 to provide for the control and regulation of travel and transport on the road. The ERA is responsible for the use of all roads within Ethiopia, vehicles using these roads, and to all matters relating to road transport activities of the country. In 1980, the military government that took power in 1974 reformed the agency into Ethiopian Transport Construction Authority and became answerable to the newly formed Ministry of Construction. After the downfall of the military government, ERA restructured its obligations with a vision to ensure the provision of a modern, integrated, and safe road transport service to meet the needs of all the communities of a strong and unitary economic and political system in Ethiopia. In particular, the current government, the Federal Democratic Republic of Ethiopia, has placed increased emphasis on improving the quality and size of the road infrastructure. To address the constraints in the road sector, related to restricted road network coverage and low standards, the Government formulated the road sector development program in 1997.ERA, which is one of the organizations under the Ministry of Works and Urban Development and accountable to the Board, is responsible for planning, design, maintenance of trunk and major link roads, as well as for administration of contractors.

In 1997, the road network had grown to 26,550 km, of which 3,708 km were paved. And since 1997, total length of network has increased to 110,414 km across the nation. Currently total 70% network road is in good condition, 21% are registered as being in fair condition and the remaining 9% is considered to be poor.

ERA has envisioned assuring the at most economic and social benefits of customers by joining Ethiopia roads networks to middle income countries by 2023.Its mission emanates from the purpose it was established in the proclamation No.247/2011.The mission reads as "by sustainably, expanding, improving the road networks with timely with quality, and less cost provide quality road to Ethiopians to contribute meaningful support for the universal development of the country. The values ,which are collective conscience of the authority are: assuring effective cost and time allocations, quality and safety road designs, proper utilization of resources, protecting the environment, commitment to the construction, introducing new technologies and learning ,transparency and accountability ,maintaining a transparent relationship between customers, employees and other agencies.

ERA has been organized by council of Ministries Regulation No.247/2011 with responsible to plan, design, and manage the road network and supervise road works, and is accountable to Ministry of Transport. The highest authority of ERA is laid on the Board of Directors.ERA is directed by Chief Executive Office called the Director General. Under the Director General there are three Deputy Director Generals. These are: Deputy Director General of planning and Information Communication Technology, Engineering Operations Deputy General, and Human Resource and Finance Deputy Director General. ERA has been running diversified and huge mega and micro road projects throughout the country with total capital budget of 47 billion birr.

1.3 Statement of the Problem

There are triggering factors that motivated me to do my thesis on key success factors of road projects in Ethiopia. Firstly, today's construction world that operate in the current dynamic competitive business environment aspire to be at the apex of the competition by creating more values to clients and construction contractors through their successful well performing projects. Construction industry is now at frontline so long as it facilitates life easy with fulfilling the demands and desires of its customers. In contrast, construction industry, especially road project (which is believed to be the heart artery of the development of a nation), mingled with several

failures to meet the utmost desires of its customers, clients, contractors and the entire society at large by creating dissatisfaction of clients and lagging the completion of the project and with poor quality. Identifying success factors that would minimize failures and maximize success factors has become a considerable attention in the sector.

Secondly, different researchers have attempted to explore the key success factors believed to influence project performance. However, this particular area of key success factors remains unclear, and efforts to reach an agreement on the key success factors have been rather limited (Samart and Wutthipong, 2016). In such areas, it is paramount to study, exploring controversies and in bringing desired solutions in the fast growing and business oriented globally competitive world. Interestingly Samart and Wutthipong (2016) argue that focusing on cost, time and scope of a certain project is an old way of doing, suggesting that there is several project performance indicators appear today. Investigating key success factors on the newly emerged performance indicators is just a paradigm shift to the measuring and identifying success factors and project performance indicators. Furthermore, project key success factors and key performance indicators are considered to be a mean for improving the effectiveness of project. Performance can be assured by identifying and eliminating the factors that cause poor project outcomes. Thus, project managers need better understanding of key success factors and how to measure them.

Thirdly, Ethiopia faces sever project failures accounting to 95% of the total number of projects the country possess Siraw (2016). This makes worse when we come to infrastructural projects, roads which are key factors for existence and sustainable life of its people. Cost and time overruns, poor quality and delivery services, and corruption are some of the major challenges. The performance of many road projects is below the expectations. However, recently there are a few road projects in some parts of the country, completed within time, budget and scope boundary. Investigation is therefore required on such road projects to take advantage of lessons from the success stories for other failure projects while identifying the key success factors that made those projects successful. The construction industry is one of the largest job creators in developing countries with failures in many instances. The high number of project failures in these countries suggests the existence of underlying major success factors which have not been identified well so far (Alias, 2014). Improving project success and performance has been the major concern of organizations in any industry for many years.

Fourthly, consensus exists among researchers in project management that most reasons for project success can be attributed to the presence or absence of certain project characteristics, referred to as key success factors. Key success factors require special attention from management owing to their impact on project performance (Alias, 2014). A project, irrespective of its size or magnitude, must be completed under three constraints "Cost, Time and Scope" often referred to as the "Triple Constraints of Project Management" (Nader, 2011). Completion of construction projects within the specified triple constraints and quality are signs of successful project management. It has been generally observed that in most of the public sector projects in developing countries, objectives and deliverables are not clearly defined which adversely affect the project planning, designing and execution, as a result, projects over run the triple constraints cost, time and scope. The degree of success of any project is therefore measured with reference to triple constraints of the projects (Andhra, 2015).Identifying key success is important as it allows firms to focus their efforts on building their capabilities to meet key success factors, or even allow firms to decide if they have the capability to build the requirements necessary to meet key success factors.

Fifthly, the road construction industry is dynamic in nature due to the increasing uncertainties in technology, budgets, and development processes. Nowadays, road projects are becoming much more complex and difficult. The project team is facing unprecedented changes. The study of key project success factors is considered to be a means to improve the effectiveness of road project defending technological obsolescence, avoiding cost, time and budget overruns, and delivering quality outputs (Shamble, 2018).Consequently, this research is conducted in order to make an attempt to identify key success factors that affect the performance of construction road projects selected for analysis in the northern region of Ethiopia under Ethiopian Roads Authority since 2009-2018.

1.4 Research Questions

This study was designed as exploratory in nature. As a result, the student researcher sought to answer the following research questions:

1) What are significant key success factors for the performance of road construction projects in northern region of Ethiopia?

2) What are the performance groups for road construction projects in northern region of Ethiopia from the perspective of their categories?
3) What are challenges that affect the road construction projects?

1.5 Objectives of the Study

1.5.1 General Objective

The general objective of this research was to investigate key success factors influencing the performance of road construction projects in northern region of Ethiopia.

1.5.2 Specific Objectives

In addition to the above general objective, the study comprises of the following specific objectives. These are:

- To identify key success factors that affect the performance of road construction projects in northern region of Ethiopia;
- To find performance groups and rank them based on their relative importance and;
- To identify the challenges of road construction projects in northern region of Ethiopia.

1.6 Significance of the Study

This research can bring various outcomes. Firstly, since there are limitations in the study of key success factors with performance indicators in the construction industry (especially road construction) of Ethiopia compared to its fast growing, this research work can serve as a policy documentation and planning to the execution of road projects that are being implemented and to be implemented throughout the country. Secondly, the study investigates key success factors influencing the performance of road construction projects in northern region of Ethiopia. Thus, the subject matter of the research and the resulting lessons drawn from the analysis are likely to benefit different road construction companies. Hence, the study contributes to the body of knowledge on the subject of road construction projects' key success factors in Ethiopia by profoundly engaging students of project management and professionals in subject area.

Thirdly, the study's findings and recommendations are highly important to the management of the road construction industry because they will draw their attention to some of the points where corrective actions are necessary and enable them to make such corrections. The research, therefore, could be used to establish a framework for subsequent studies that can work with more comprehensive data sets. Fourthly, the research can serve as stimulating further researches in the area by providing comprehensive data sets on the study area. Finally, the findings and recommendations of the study can be highly important to policy makers by providing important insights for policy formulations inputs because it can be used as a benchmark to take measures in road policy implementations in the country.

1.7 Scope of the Study

This research study focuses on investigating key success factors influencing the performances of road construction projects in northern region of Ethiopia. All roads selected for scrutiny are successfully completed (in terms of time, cost and scope) road construction projects in northern region of Ethiopia from 2009-2018.All roads selected for the study are asphalt based roads constructed by domestic contractors and consultants. From the five regions of road project divisions under Ethiopian Roads Authority and the two city administrations in Ethiopia, only northern region was selected as there was no successfully completed road construction project in south, east, west, and central regions and Addis Ababa and Dire Dewa city administrations. And data were collected from consultants, contractors and clients' representatives of these successfully completed road construction projects in the northern region of Ethiopia.

1.8 Limitation of the Study

One of the limitations of this study is that data were collected from a few number of survey respondents as sample road construction projects were also a few in number on the study and as a result of this, it was difficult to administer more questionnaires that might weaken the validity and the reliability of the study.

1.9 Ethical Considerations

Ethical considerations are fundamental issues in research in general and social sciences and behavioral studies in particular. Based on this ethical principle set by researchers and social scientists, this research has considered all respondents right, respect them, gather data on time

and correctly and present the data without any debugging. Analysis, as much as possible, was interpreted free of data redundancy and frauds. Participants were informed about the purpose of the study and willingness was appreciated. Letter of informal consent was offered so that all respondents were allowed to freely response to each questionnaire and interview.

1.10 Organization of the Research Report

Structurally, this research paper is composed of five chapters. The first chapter which is introductory by its nature presents background of the study, statement of the problem, research objective, research questions, significances of the study and the scope of the study, limitations of the study, and ethical considerations. Chapter two is dealt with the related literatures reviewed during the study including theoretical and empirical reviews that are related to the present study. The third chapter demonstrates the methodology of the research work, including the data collection tools, instruments, design and analysis and interpretation procedures. The fourth chapter presents analysis, interpretations and findings of the study. Finally, the fifth chapter deals with conclusions, and recommendations forwarded based on the major findings of the study.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

2.1 Theoretical Review

In the contemporary construction world successfully completion of project in terms of cost, and time/schedule is taken as serious considerations. Understanding how projects successfully completed is becoming a necessity, and the care of successful completion is being an indispensable condition in order to be competitive in the construction world.

The construction industry is a sector of the economy that transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development. It embraces the process by which the said physical infrastructure is planned, designed, procured, constructed or produced, altered, repaired, maintained, and demolished. The constructed infrastructures include:

- Buildings
- Transportation systems and facilities which are airports, harbors, highways, subways, bridges, railroads, transit systems, pipelines and transmission and power lines.
- Structures for fluid containment, control and distribution such as water treatment and distribution, sewage collection and treatment distribution systems, sedimentation lagoons, dams, and irrigation and canal systems. Underground structures, such as tunnels and mines.

The industry comprises of organizations and persons who include companies, firms and individuals working as consultants, main contractors and sub-contractors, material and component producers, plant and equipment suppliers, builders and merchants. The industry has a close relationship with clients and financiers. The government is involved in the industry as purchaser (client), financier, regulator and operator of the construction projects.

The infrastructure of a country or region refers to the vast network that makes possible the movements of goods, people, and information over time and space. The term generally includes roads, streets, and highways see ports and airports; the telephone and communication lines; hydro electronic dams and power generation plants, natural gas pipelines; and aqueducts, sewers, and weather controlling facilities.

2.1 .2 Defining Key Success Factors

Key success factor is a skill or resource that a business can invest in, which on the market the business is operating on, explains a major part of the observable differences in perceived value/or relative costs. Key success factors support the attainment of company's long goals. Goals represent the end points that a company hopes to reach. And good performance is the reflection area of key success factors, which are necessary to ensure attainment of these goals.

The concept of key success factors was first recognized by Rockart (1979, as cited in Prathamesh,2015) as "critical success factors" meaning " the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization". He indicated that a critical success factor is a useful approach for identifying management's information requirements because it can focus attention on areas where "things must go right". Based on Rockart's theory, Grunert et al., (1993) as cited in Amade1 et al. (2015)) give the term on "key success factors" which implies the following characteristics:

1) Key success factor implies a causal relationship between a skill/resource and perceived values and/or relative cost. It expresses a relationship between the competitive advantage business enjoys in a market, in terms of perceived value and relative costs, and the causes of that competitive advantage ,in terms of certain skills and resources;
2) Since key success factor is a skill or resource of the business it is always actionable

3) Key success factors are market specific, but they are transcend strategic groups in a market
4) Key success factors are small in number. By definition, only a small number of factors can explain "a major part" of the variance
5) Key success factors are actual determinants of differences in performance
6) Key success factors are statements about a causal relationships, namely between success and some causes of success, the way the key success factors concept is used varies between the various schools of thought as well.

Amade1 et al. (2015) state that key success factors are the few key variables or factors that the manager should prioritize in other to achieve his/her goals for current or future areas of activity. According to Alias et al. (2014) key success factors are inputs to project management practice which can lead directly or indirectly to project success. Effective and efficient management of these success factors is the basic requirement of project success Iramand Sherani(2016). According to Zakari (2016) the increment of the chances for a project, succeeding it is necessary for the organization to have an understanding of what are the key success factors, to systematically and quantitatively assess these success factors, anticipating possible effects, and then choose appropriate methods of dealing with them. One of the challenges in analyzing the effect of project success factors on the performance of projects is the fact that key success factors have their own distinguishing characteristics which make them difficult to measure.

Key success factors include all supervision, effectiveness of cost control system, extent (involvement) of subcontracting, speed of information flow, project manager related factors, leadership skills of project manager ,project manager's commitment to meet quality, cost and time, project manager's early and continued involvement in project, coordinating ability and rapport of project manager with contractors/,subcontractors, project manager's authority to take, financial decision, selecting key team members, organizing skills of project manager, project manager's authority to take day-to-day decisions, project manager's experience, project manager's competence etc. All these are intangible, not physically apparent like products, which

provide value to the client Mamaru (2016). This makes a study to be conducted on success factors of paramount importance. Project managers would have a clear understanding of which aspects of projects might be key for their successful completions of projects. For a project to be successful, it is essential to understand the project requirements right from the start and go for project planning which provides the right direction to project managers and their teams and execute the project accordingly.

Key success factors are those key elements which are required for an organization to accomplish or exceed their desired goals. It is imperative that these factors be given proper attention and are adhered so as to attain the desired objective Zakari (2016). Any lax in these factors may lead the organization other way i.e. the organization will not attain their desired goals. The definition of key success factors does not only restrict to organizations but may encompass personal attainment of goals as well i.e. they can be viewed from an individual perspective as well.

Keeping our scope of discussions to organization we can categorize the key success factors into four: people, process, goals, and resources. People are the most critical resource of an organization. Hence, it is imperative on organization's part to manage their people effectively. People can be divided into customers and employees. Customer needs must be catered to properly. Processes are about how an organization has its things in place to carry out the needed work. It includes processes adopted for manufacturing, paying salaries etc. In order to keep the organization successful the company must invest heavily in order to optimize its processes. The goals of an organization must be formed at an early stage so that the people, process and resources can be put to use in that line. Resources are limited in any organization. Hence, its management plays a critical role in the successful completion of projects.

Identifying key success factors would assist in taking proactive measures for successful project management of construction projects. The identification and study of key success factors would also be useful for effective management for all type of construction projects, thus helping to raise overall level of productivity in construction industry. The use and management of projects has risen to a new prominence, with projects seen as critical to economic in both the private and public sectors due challenging and dynamic business environment. However, failure in managing project is encountered regularly, which cause the waste of company resources. The impacts of

projects that failed to meet stakeholder's expectations have left behind long lasting negative consequences in organization. Key success factors (also known as competitive emphasis or strategic posture) state the important elements required for company to compete in its target markets. In effect, it articulates what the company must do, and do well, to achieve the goals outlined in its strategic plan. Examples include agility, reliability, diversity and emotional connection with clients.

2.1.3 Key Performance Indicators

Key performance indicators are one of the factors that constitute construction project success criteria which is the reason while performance measurement on construction projects are usually carried out by establishing key performance indicators which offer objective criteria to measure project success. An assumption is made that if a project is completed on time, within the agreed budget and set quality, also referred to as the 'golden/iron triangle', then the project is deemed successful.

Key success factors are a collection of events or action that play an important role in the success of organizations of today and tomorrow. A key success factor indicator is a clear-cut instrument to quantify and qualify the tactical goals of an institute depending on its priorities. Indicators are actually the ways to judge or access the performance or measure the success of a company but they do not show how to improve or don't provide the ways to achieve success. They are as the name says 'indicators' which only indicate. A key success factor is used to measure performance, but critical success factors help us find the areas which are to be improved so that the success is ensured.

With current economy situation, in many organizations, the focus is on doing more with fewer resources, i.e. shorter deadlines, tighter budgets, reduced human resources and general uncertainty in the organization. Many companies are facing with increasingly complex and competitive situations. Companies cannot longer afford to spend too long time in responding to the changing or dynamic market situation, time to market is important and other key success factors. Failure in capitalizing the quick and competitive opportunities or market demands will lead to poor business result and loss of market share. Project management is even considered as a strategic tool in helping the organization to move forward Zakari (2016).

There are various and different techniques and models used to measure the performance of projects, for instance, Work Breakdown Structure (WBS) and Earned Value Management. These tools provide the cost and schedule performance measurement. Work Breakdown Structure (WBS) is useful for a complex project, whereby it breakdown the works into the smaller task. The main purpose is to define and organize the scope of the total project more accurately and specifically. With that, the project manager will be able to assign responsibilities, allocate resources, monitor and control the project more effectively as WBS makes the project's objective or deliverables more precise and concrete. At the same time, the project team will be clear of the expected deliverables. Importantly project manager is able to counter check all the deliverables' specifics with the stakeholders and make sure there is nothing missing or overlapping. Whereas EVM is, project planning and control approach, which provides cost, and schedule performance measurement, by comparing the actual accomplished of schedule work and associated cost against planned schedule and budgeted cost. With the visibility of actual progress of project work, schedule and cost trends, project manager will be able to take timely corrective actions if there are any variances Andraetl (2015).

Traditionally, the definition of good project performance was defined by the project team's meeting cost, time and product quality related criteria, in which researchers like Alias (2014) described as Iron Triangle of project management. Until now, this Iron Triangle still regarded as the measurement for team performance on all types of projects. Various researchers and industrial practitioners have developed other measures of project performance beyond the Iron Triangle. Researchers and practitioners also suggest that in order to accurately measure project performance, the measurement must incorporate criteria may include meeting the long term financial objectives of clients, customer or client's objectives such as their requirements for functionality and operability. Other measurements include project's satisfying psychosocial criteria, like gauging the client's satisfaction with the way the project was managed. Project success is a topic that is frequently discussed by various researchers and yet rarely agreed upon Susil (2016). Different individual has different definition and no mutual agreement can be obtained for the meaning of success. It is hard and difficult to define.

2.2 Performance Constraints

There are several factors cause for poor performance of projects in various disciplines and sever consequences. The inefficient and deteriorated state of the construction industry with poor

performance has, for example detrimental effects to the development of the industry. Weaknesses, problems and constraints hampering the performance and development of the industry include:

- Low capacity and capability of the local contractors and consultants due to weak resource Base and inadequate experience.
- Inadequate and erratic work opportunities, inappropriate contract packaging of works which
- favor foreign firms in donor funded projects, low public investment in infrastructure
- Projects and over dependence on donor funding.
- Inefficient and non - transparent procurement Systems Corruption and financial
- Mismanagement in public/private sectors.
- Lack of supportive institutional mechanisms in terms of financial credit facilities, equipment for hire and professional development.
- Unfavorable donor conditionality which tend to marginalize local construction enterprises.
- Poor working environment, including low standards of safety and occupational hazards on construction sites
- Weak and non-facilitative policies and regulatory framework
- Low productivity and quality Low technological base.

2.3 Construction Projects Performance Constraints in Ethiopian construction industry

The inefficient and deteriorated state of the construction industry with poor performance has detrimental effects to the development of the industry. Weaknesses, problems and constraints hampering the performance and development of the industry include:

- Low capacity and capability of the local contractors and consultants due to weak resource base and inadequate experience.
- Inadequate and erratic work opportunities, inappropriate contract packaging of works which favor foreign firms in donor funded projects, low public investment in infrastructure projects and over dependence on donor funding.

- Inefficient and non - transparent procurement Systems Corruption and financial
- Mismanagement in public/private sectors.
- Lack of supportive institutional mechanisms in terms of financial credit facilities, equipment hire and professional development.
- Unfavorable donor conditionality which tend to marginalize local construction enterprises.
- Poor working environment, including low standards of safety and occupational hazards on construction sites
- Weak and non-facilitative policies and regulatory framework
- Low productivity and quality Low technological base.

Remedies to Performance Constraints construction industry

Some of the issues which need to be pursued to curb some of the constraints above include:

- Improvement of capacity and performance of the local contractors and consultants
- Improvement of public sector delivery capacity
- Improvement of the performance of the informal construction sector
- Promoting export of goods and services
- Improvement of quality and productivity
- Application of appropriate building regulations and standards
- Promoting technological development
- Promoting sustainable construction practices
- Mobilization of adequate financial resources
- Human resources development
- Enhancing availability of construction equipment
- Supporting human settlement development
- Supporting poverty eradication.

2.4 Empirical review

Many articles and studies have been conducted to explore the influence of critical success factors on the performance projects internationally. The term key success factors in the context of

project management were first used in 1982 (as cited in Samart and Wutthipong, 2016) and has received much attention by different researchers and construction practitioners in decades. Zakari (2016) conducted a research to define key success factors in construction projects. The study concluded that there are significant key success factors leading to project success, for example, a well organizes, cohesive facility team, to manage, plan, design, construct, and operate the facility; and experience in the management, planning, design, construction, and operations of similar services.

There has been increasing interest and attempts to explore key success factors in the context of project management. Susil(2016) conducted a survey to investigate factors influencing project performance across the project life cycle. The study results showed that clarity of contract, fixed construction, precise project estimate, material quality, mutual/trusting relationships, leadership/team management, and management of work safety are most key success factors.

The term "performance" has received much attention in the construction industry in decades, although its interpretation varies among researchers Zakari (2014). The performance of an organization is multidimensional and a function of the performance of the members of the group Srimathi (2017). Critical to measure project performance may imply various dimensions (Susil, 2016). Measuring project performance in terms of time, cost, and quality has attracted the interests of researchers and practitioners. Because of the increasing complexity and dynamics of construction projects Zakari (2014) investigated how project performance is affected numerous factors across the while life of a constructed asset. The major criteria proposed to evaluate project performance are project scope, time, cost, quality, contract/administration, human resources, risk, and health and safety. Clearly, the above examples demonstrate that the focus on the criteria to measure project performance has changed. More recent evidence has proposed a large number of performance indicators to measure project success. These performance indicators could be related to many dimensions, such as health, safety, environment, human resource development, client satisfaction, productivity, risk, contract and administration, profitability, and business efficiency. The above research findings and scholastic arguments suggest that construction road projects play a role in finding key success factors that affect the performance of road construction projects. This entails that the present research on Ethiopian road construction projects is in line of research study.

2.5 Conceptual and Theoretical Framework

Understanding the significance and importance of each success factor facilitates the formulation of key success factors in the road construction sector. Therefore, a consolidated framework of key success factors has been suggested based on the analysis of the review. After a review of the relevant literature and the formulation of the conceptual research framework, the conceptual model was developed which shows the relationships among the variables. The model of hypothesized relationships between the key success factors and performance indicators is presented diagrammatically in Figure 1 below. The 10 sample key successes factors appear in the model depict the independent variables, while the performance is the dependent variable. In each of the relationships, a line has been drawn with a single arrowhead starting from each of the factors pointing towards the performance, which indicates a direct positive association. The effect of each group with common interest is estimated by the parameters linking a key success factor and performance indicators.

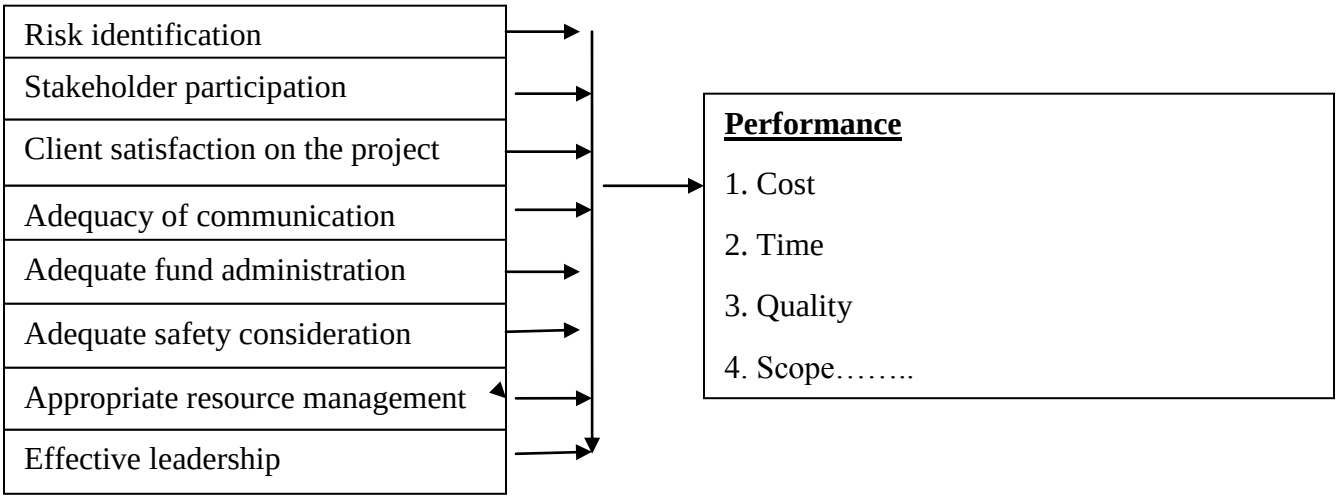

Figure 1: Conceptual Framework (Source: Gitau LM, 2015

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design and Approach

This research is a cross-sectional design in which data were collected at one time from respondents of the survey (consultants, client representatives, and contractors of the selected road projects) in northern region of Ethiopia using self-completion questionnaires in order to make study very objective. In this study, key performance indicators were measured from key success factors perspectives to identify the key success factors and their influence on the dependent variables, performance indicators. In doing so there were questionnaire and interview designed to collect appropriate data for the study. Interview questions were conducted with key informants of the selected road construction projects.

Questionnaire design: a questionnaire survey was used to identify and examine the degree of importance of each key success factors of the eight project performance indicators. There were three groups of stakeholders in the selected road construction projects participated in this research. These participants were:

1. Client representatives of the road projects

2. Consultants of the selected road projects and;

3. Constructors of the selected road projects.

A pilot study was conducted using preliminary questionnaire on one road construction project Dima-Fiyel Wuha-Hauzen which is completed in May, 2018. The objective of the pilot test was to test the accuracy and completeness of the questionnaire before distributing it to the respondents. Based on the input of these subjects, the questionnaire was organized, omitting some of the redundant variables, rearranging questions to provide a more consistent meaning, and adding expert's comments and suggestions to ensure the practicality of a questionnaire.

For this, Cronbach's alpha was used to test the reliability and accuracy of the questionnaire and then the main study went on ahead. Using SPSS version 20.0 the calculated Cronbach's alpha of the questionnaire was 0.995; this value indicates that instrument was internally consistent and was considered reliable. And the main study was conducted. The results of the pilot study are presents as follows:

Participants	Internal validity of the questionnaire	Alpha
Client Representatives	0.991	α>0.991
Consultants	0.983	α>0.983
Contractors	0.981	α>0.981

Pilot result for questionnaire validity

3.2 Population, Sample and Sampling Techniques

The relevant population is purposely selected client representatives, contractors and clients of selected road projects. Among the 18 total numbers of clients working in ERA for the four road projects 12 were randomly selected to fill the survey questionnaire and all contractors including two subcontractors and four clients of the selected road projects were sources of data. The snowball sampling method, which is non probability sampling technique, was applied for the referral network. The snowball method is used when there is difficulty of obtaining a response from a sample population selected at a random (Samart, and Wutthipong, 2016 in Sakaran,

2000). Data were collected through snowball by referring or indicating source for data one after theother. In this study, the study design adopted both quantitative and qualitative methods.

Quantitative data were collected using standard survey questionnaire. The road construction projects selected for this study are successfully completed road projects from 2009-2018. There are five regions and two city administration road authority divisions of road administration under ERA throughout the country. The five regions are: south, north, east, west, and central and the two city administrations (Addis Ababa and Dire Dawa). From all five regions and two city administrations, successfully completed road projects were found only in the northern region from 2009 -2018. Since the purpose of this research is identifying and ranking key success factors that affect the performance of road construction projects, the northern region, where successfully completed (at least in terms of time, cost, and scope) projects are found ,was purposely, and all successfully completed roads were taken for analysis.

3.3 Population and sample size determination

The total population for this study was 25.Among those. Since the population is below 100,all population was taken as sample for the study.15 were client representatives working for the selected projects,6were contractors, and 4 were consultants. From those whom questionnaire survey administered, 10 client representatives, 5 contractors and 4 consultants retrained the questionnaire. And data analysis and interpretation was made on 19 data gathered through the questionnaire.

3.4 Source and Tools/ Instruments of Data Collection

The type of data collection method used was interview and questionnaire survey. For the proper achievement of the objectives of the study; the researcher used both primary and secondary data source. The primary data were obtained from the three groups of respondents (client representatives, contractors, and clients) of the selected road projects and interviewing key informants. Secondary data, such as ,literature review which used to generate key success factors, journal articles, books and Ethiopian Roads Authority source documents and profiles were used. Both qualitative and quantitative data analysis were employed to triangulate data validity and reliability.

Quantitative data were in closed form and qualitative data were in the form of open ended form. Quantitative data was collected from the survey questionnaire distributed to the three stakeholders (i.e., contractors, consultants, and clients representatives) and the data was analyzed and interpreted using the five Likert scale type of data leveling (1=least important, 2=slightly important, 3=moderately important, 4=very important and 5=extremely important) and mean scores, relative importance and weighted average was analyzed using SPSS software version 20.0 to identify the key success factors that affect the performance of road projects and determine each key success factor of relative importance. In addition to quantitative method, qualitative data was collected from interview of three key informants.

3.5 Procedures of Data Collection

Data collection instrument were basically primary data which started after getting permission from the organization. Standard questions were prepared from literature review in identifying key success factors for the performance of road projects. Qualitative interview questions were prepared to key informants aimed at identifying the major challenges that are facing road construction projects for the selected projects during the execution phases of the projects. To approach it using semi structured interview, first consensus was made between the interviewee and interviewer and time for interview was set and interview was conducted accordingly. The responses of the three interviewees was ordered, coded and interpreted qualitatively. Questionnaires were distributed to respondents with brief orientation on how respondents use their perceptions and thoughts to answer questions. The survey pack included a copy of the cover letter with brief introduction on questions as shown below:

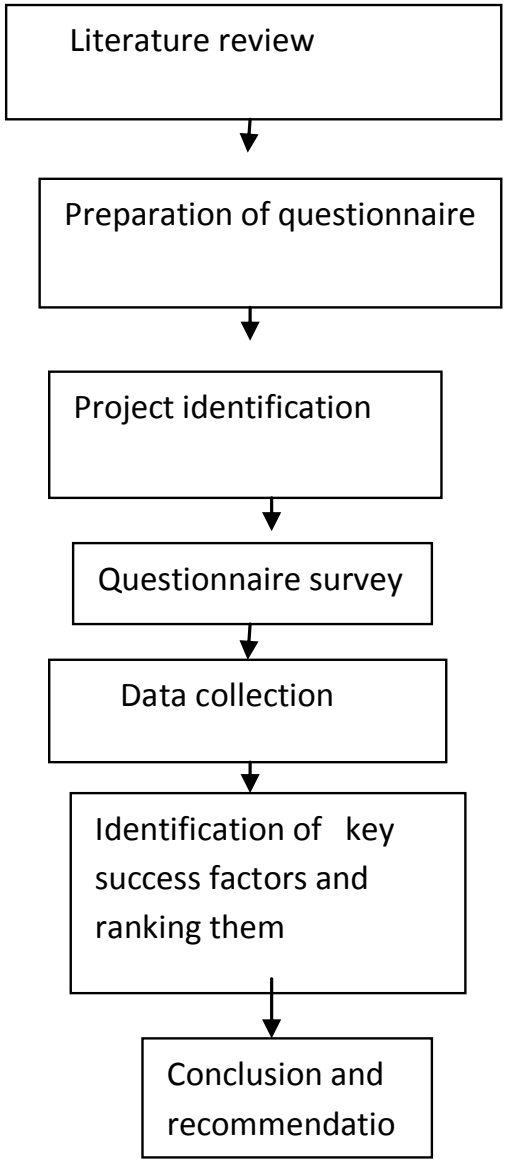

Figure 2: Research Methodology

3.5 Method of Data Analysis

The data gathered were analyzed through qualitatively and in descriptive statics. Mean scores, rank and relative importance index were used to calculate the impacts of key success factors on the performance of selected road construction projects. All the key success factors were identified and ranked in their order of importance in each eight major group performances. To strengthen the reliability of research data and supplement the information missing in the questioner survey, information was collected from other related researches, Journals, the

company procedure and policy and relevant corporate reports of Ethiopia Roads Authority and other relevant sources.

Relative Importance Index

The Relative Importance Index (RII) is a statistical method which is used to determine the ranking of different project success factors. The Relative Importance Index was used to rank the relative importance index of the different key success factors for the performance of the selected road construction projects. These ranking makes it possible to cross compare the relative importance of the key success factors as perceived by the group of respondents (that is clients, contractors and consultants). As, this survey is designed to investigate the relative importance of various key success factors, the method adopted in this study within various groups. The Relative Importance Index five-point scale, ranging from 1 (least important) to 5 (extremely important) was adopted and transformed the relative importance indices for each key success factors.

Calculating mean score method with the Likert scales rating to evaluate road construction performance. Mean score method was adopted in this study to analyze the data collected from the questionnaire survey. The respondents were asked to rate key success factors believed to influence the success of those road construction projects by responding on a scale from 1 to 5.The mean score for each factor is calculated using the following formula:

$MS= (\sum (f\times s))/N, (1<=MS>=5),$

Where f is the frequency of responses to a rating, s is the score given to each factor by the respondents and ranges from 1 to 5, and N is the total number of respondents concerning that factor.

In addition to the mean score the relative important index was used to determine the respondents' perception of ranking of factors. The important index is evaluated using the formula:

$Relative\ Important\ Index = (\sum W)/ (A\times N), (0<=Relative\ Important\ Index>=1)$

Where W is the weight given to each factor by the respondents and ranges from 1 to 5 , A is the highest weight =5, and N is the total number of respondents. To explore the most important key success factors, the weighted average of mean score, and rankings over the eight broad categories and top ten key success factors in each performance group was evaluated. The

combination of three mean score, or relative important index used to calculate the weighted average was obtained from the sum of the results of the proportion of the questionnaires received from each group associated with the total number of respondents.

The weighted average is computed using the following expression:

$WA = \sum [(n/N) \times MS \text{ (or RII)}$

Where n=5 for contractors, n=4 consultants, n=10 for client representatives and N=19, total number of respondents.

Hypothesis Testing

To test the rank of correlation coefficient, a t-test at 95% confidence interval of the null hypothesis, Ho, was used. Significant testing can be:

Ho: there is an insignificant degree of agreement among participants;

H1: there is a significant degree of agreement among participants

The t-test is defined by the following equation:

$t = rs\sqrt{((n-21-rs2))}$

To further investigate the data I used analysis of variance (ANOVA) to determine whether there is a significant difference between the mean of the three groups of respondents on the most important key success factors in each performance dimensions.

A summary of ANOVA test is as follows;

Ho: there is no difference between the three groups of respondents on the perceived key success factor

H1: there is difference between the three groups of respondents on the perceived key success factor

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This part of the research deals with the analysis and discussion of data gathered from survey questionnaire and key informant interviews. The investigation of questionnaire survey comprises key success factors that affect the performance of road construction projects in the northern region of Ethiopia. The following table presents the selected projects for the analysis of the study. These four road construction projects were successfully completed road projects in Ethiopia from 2009-2018. As the purpose of the study is identifying key success factors for the performance of road construction projects, the following four road asphalt based projects were selected in order to identify those key success factors and rank them in order of importance in the execution of the projects. The four road projects were almost similar in length (70.5-90 kms in distance) and were built in the northern region of Ethiopia in Amhara and Tigray regional states of Ethiopia. The detail tabular presentation of these four road projects is presented below as:

No	Name of road Project	Contractor	Consultant	Date of commencement	Planned completion period	Actual completion period	Planned cost	Actual cost
1	Zarima-Maytsebri	ERCC	Lidet consultancy	August,2009	August,2015	August,2015	912,631,312.54	912,631,312.54
2	Sarja-Keraker	ERTG	Net consultancy	23March,2014	23 March,2017	20 March,2017	786,796,666.46	786,796,666.46
3	Azezo-Gorgora	Gemshucon str.plc	Classic	27February,2013	13 April,2017	13 April,2017	736,706,949.39	736,706,949.39
4	Gashena-Bilbila	ERTG	Classic	February 2014	February 2018	February 2018	1,442,916,047.45	1,442,916,047.45

Source: Ethiopian roads authority contract administration office, Addis Ababa, May, 2018.

4.2 Analysis and Interpretations of Questionnaire Survey

In this part detail analysis and discussion of the data collected from respondents is presented as follows:

Table 1: Respondent Profile

		Frequency	Percent
Position	Project Manager	9	50.0
	Consultant	2	11.1
	Managing Director	2	11.1
	Load Engineer	1	5.6
	Chief Contractor	3	16.7
	Client Contractor	1	5.6
Gender	Male	16	88.9
	Female	2	11.1
Age	<30 years old	4	22.2
	31-35 years old	7	38.9
	36-40 years old	3	16.7
	41-45 years old	1	5.6
	46-50 years old	3	16.7
Job title	mechanical and electrical engineer	4	22.2
	Consultant	5	27.8
	Contractor	7	38.9
	client representative	2	11.1
Number of years working experience	<5 years	2	11.1
	5-10 years	3	16.7
	10-15 years	3	16.7
	15-20years	6	33.3
	20-25 years	1	5.6
	>25 years	3	16.7

Background of survey Respondents and characteristics of projects

Table 1 and 2 provide background of research respondents and characteristics of project. As shown in the table 1, 22% of the respondents were below 30 years of old, 38.9%, between the ages of 31-35 years old, 16.7% were between the ages of 36-40, 5.6 % were between41-45, and 16.7% were between 46-50 years old. Among the participants 88.9% were male and 11.1% were female.5% was chief consultant, 4% mechanical engineer, 7% chief contractor, and 2% were client chief representatives.

Regarding working experience of the respondents, 16.7 % of the respondents have 5-10 and 10-15 years working experience, 33.3% have 15-20 years, 5.6% have 20-25, and 16.7% had above 25 working experience. Among the participants of research, 50% were project manager, 11.1% were consultant and managing director, 5.6% were load engineer, 16.7% were chief contractor, and 5.6% were client contractor.

Table 2: Characteristics of Projects

		Frequency	Percent
Type of project delivery systems	Design-bid-build	9	50.0
	design-build	9	50.0
Type of contract	Lump sum contract	8	44.4
	unit price contract	10	55.6
Payment type	AC	6	33.3
	DBST	12	66.7

As shown in the above table, 50% of the selected road projects selected for analysis was Design-bid-build type of projects. And 50% of the road projects were designed-build delivery system and the rest were design-bid-built types of the project. 44.4% projects were lump sum contract and 55.5% were unit price contract. Among the payment, 33.3 % were AC payment type and 66.7% projects were DBST payment types.

Table 3: Summary of mean Score, Rank and Relative Important Index of Major Groups

Contractors				Clients			Consultants			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Time	4.17	0.833	2	4.13	0.825	2	4.00	0.800	2	4.11	0.822	2
Cost	3.00	0.600	3	3.75	0.750	3	3.50	0.700	3	3.44	0.689	3
Quality	2.50	0.500	5	3.75	0.750	3	3.50	0.700	3	3.28	0.656	4
Human resource	2.17	0.433	6	3.13	0.625	6	2.50	0.500	5	2.67	0.533	6
Client satisfaction	4.83	0.967	1	4.88	0.975	1	5.00	1.000	1	4.89	0.978	1
Environment	1.67	0.333	8	2.75	0.550	7	1.50	0.300	7	2.11	0.422	7
Safety	2.83	0.567	4	3.25	0.650	5	2.50	0.500	5	2.94	0.589	5
Risk management	1.83	0.367	7	2.75	0.550	7	1.25	0.250	8	2.11	0.422	7

Note:MS=Mean Scores, RII=Relative Importance Index, R=Rank

Table 3 summarizes the ranks, mean scores, and importance indices of eight major factor categories during the operation phase of those road projects, as responded by all groups of respondents. As seen in the table, it can be concluded that the agreement on the importance of project performance varies among all target groups, and some performance groups are more significant than other factors as mentioned in the table. Client satisfaction, time, cost and quality performance were of interest to survey respondents. These significant criteria were ranked as the top three most important performance groups, with a weighted average RII equal to 0.978, 0.822, 0.689 and 0.656, respectively. Different scholars suggest that performance groups play a role in the success of road construction projects.

Client satisfaction was ranked first by all survey respondents. The satisfaction criterion is important for all interested parties.

Table 4: Summary of mean Score, Rank and Relative Important Index of key success factors for Time Performance

	Contractors			Clients			Consultants			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Adequate experience of project participants	4.50	0.90	2	4.25	0.85	2	4.00	0.800	2	4.28	0.856	2
Commitment and involvement of all parties to the project	2.17	0.43	6	3.00	0.60	7	1.75	0.350	8	2.44	0.489	8
Effective road site management and supervision	3.33	0.67	3	3.75	0.75	3	2.50	0.500	6	3.33	0.667	3
Clear objectives	2.33	0.47	5	2.88	0.58	9	1.75	0.350	8	2.44	0.489	8
Top managements support	2.17	0.43	6	3.50	0.70	5	3.00	0.600	4	2.94	0.589	5
Contractual incentives	1.17	0.23	10	2.50	0.50	10	1.25	0.250	10	1.78	0.356	10
Competence of project participant	5.00	1.00	1	4.63	0.93	1	4.75	0.950	1	4.78	0.956	1
Adequacy of communication and coordination among parties	2.17	0.43	6	3.63	0.73	4	3.25	0.650	3	3.06	0.611	4
Effective change order management	1.50	0.30	9	3.25	0.65	6	3.00	0.600	4	2.61	0.522	7
Rapid decision making	2.67	0.53	4	3.00	0.60	7	2.50	0.500	6	2.78	0.556	6

Note:MS=Mean Scores, RII=Relative Importance Index, R=Rank

Table four shows the ranks, mean scores, and relative importance indices of the above top ten key success factors for time performance. As shown in the above table competence of project participants was ranked first by all groups of respondents, with a weighted average RII equal to 0.956.

This key success factor is observed as a key element because competent team members have different proficiency levels and the capability to deal with risk and uncertain environments in such kind of projects as a strategy.(source).This result has been frequently mentioned in research studies as such as ().

Adequate experience of project participants was ranked second for all respondents, with a weighted average RII equal to 0. 856. This factor is important because a successful project requires team members to have enough experience to execute those activities in the project execution phase of the project selected for the study.

Effective road site management and supervision in the project was ranked third by all survey respondents, with a weighted average RII equal to 0.667. A project is complex in its nature and involves many different parties. With a result of strong effective site management and continuous site material supervision, involved personnel tend to contribute the success of a project.

Table 5: Summary of mean Score, Rank and Relative Important Index of key success factors for Cost Performance

	Contractors			Clients			Consultants			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Eliminating wastage	3.67	0.733	4	3.50	0.700	2	3.25	0.650	2	3.50	0.700	2
Availability of adequate resources	2.33	0.467	7	3.38	0.675	3	1.75	0.350	5	2.67	0.533	6
Effective contract administration and management	1.50	0.300	10	2.50	0.500	8	1.75	0.350	5	2.00	0.400	9
Availability of adequate fund	1.67	0.333	8	2.63	0.525	5	1.50	0.300	8	2.06	0.411	8
Relationship among project participants	5.00	1.000	1	3.88	0.775	1	4.50	0.900	1	4.39	0.878	1
Effective road project site management and supervision	4.00	0.800	2	3.38	0.675	3	2.75	0.550	3	3.44	0.689	3
Adequate raw materials and equipment	1.67	0.333	8	2.38	0.475	9	1.50	0.300	8	1.94	0.389	10
Frequent progress meetings	3.00	0.600	6	2.25	0.450	10	1.50	0.300	8	2.33	0.467	7
Adequacy of communication and coordination among project parties	3.83	0.767	3	2.63	0.525	5	1.75	0.350	5	2.83	0.567	4
Rapid decision making	3.33	0.667	5	2.63	0.525	5	2.25	0.450	4	2.78	0.556	5

Note:MS=Mean Scores, RII=Relative Importance Index, R=Rank

In the above table ranks, mean scores, and relative importance indices of the top ten key success factors for cost performance. As shown in the above table, relationship among project participants was ranked first by all groups of respondents of the survey questionnaire, with a weighted average RII equal to 0.878.this finding suggests that this factor is more important to contractors than others because it plays a crucial role in preventing disputes, solving problems, and development project performance. In addition, this factor helps minimize the possibility of road construction delays caused by conflict of interests.

Eliminating wastage was ranked second by all respondents of the research participants, with weighted average RII equal to 0.700. Better waste elimination performance is associated with experience of project teams which reduces wastages which makes projects to be completed within the available resource minimizing loses of projects. Wastages make projects lag and failed by the end. One of the most important factors for the success of a certain project is utilizing resources and uses them efficiently and effectively.

The thirdly ranked factor by all respondents is Effective road project site management and supervision, with a weighted average RII equal to 0.689.Projects are successfully completed within the allotted time, budget, and scope if the project manager and stakeholders able to manage projects and supervise them properly. In such projects, such as roads which are higher complex and so needs site management.

Table 6: Summary of mean Score, Rank and Relative Important Index of key success factors for Quality Performance

	Contractors			Clients			Consultants			Weighted average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Quality of equipment and raw materials	2.00	0.400	9	2.75	0.550	8	1.50	0.300	9	2.22	0.444	8
Availability of competence staff	3.00	0.600	5	3.25	0.650	4	3.00	0.600	4	3.11	0.622	4
Favorable working condition	2.33	0.467	7	2.63	0.525	9	1.25	0.250	10	2.22	0.444	8
Effective cooperation between parties taking part in the project	2.33	0.467	7	3.13	0.625	5	2.75	0.550	5	2.78	0.556	7
Management commitment to continual quality improvement	3.67	0.733	2	4.00	0.800	2	3.25	0.650	2	3.72	0.744	2
Competency of project manager	3.00	0.600	5	3.50	0.700	3	3.25	0.650	2	3.28	0.656	3
Effective monitoring and feedback by project participants	3.17	0.633	4	3.13	0.625	5	2.00	0.400	7	2.89	0.578	5
Effective quality assurance system in the organization	3.50	0.700	3	2.88	0.575	7	1.75	0.350	8	2.83	0.567	6
Management leadership in promoting high process quality	5.00	1.000	1	4.38	0.875	1	4.50	0.900	1	4.61	0.922	1
Top management sponsorship of project team	1.50	0.300	10	2.63	0.525	9	2.25	0.450	6	2.17	0.433	10

Note:MS=Mean Scores, RII=Relative Importance Index, R=Rank

Table 6 presents ranks, mean scores, and relative importance indices of the top ten key success factors of quality performance. According to table six, management leadership in promoting high process quality during the projects execution phase was ranked first by all survey respondents, with a weighted average RII equal to 0.922.

This factor was ranked first at the same position by all as the first one. This factor is crucial because it plays a significant role in ensuring that management leadership in promoting high process quality as a critical factor for the success of the project. Management commitment to continual quality improvement was ranked as second by all survey respondents, with a weighted average RII equal to 0.744.A high level of management commitment to continual quality improvement is often identified as a driving force that leads an organization to success.

Researchers in project management that most reasons for project success can be attributed to the presence or absence of certain project characteristics, referred to as key success factors. Key success factors require special attention from management owing to their impact on project performance (Alias, 2014).

Therefore in quality management there should be emphasis on the timely completion of projects as they are ingredients of the project successful accomplishments.

Table 7: Summary of mean Score, Rank and Relative Important Index of key success factors for Human Resource Management Performance

	Contractors			Clients			Consultants			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Availability of skilled personnel	1.67	0.333	9	3.25	0.650	4	2.25	0.450	5	2.50	0.500	8
Stakeholder engagement to the project	2.83	0.567	5	2.75	0.550	7	1.75	0.350	8	2.56	0.511	7
Team sprit among employees of the project	3.83	0.767	3	3.00	0.600	5	2.25	0.450	5	3.11	0.622	4
Commitment of all parties to the project	2.50	0.500	7	3.63	0.725	2	3.50	0.700	2	3.22	0.644	3
Availability of internal promotion	1.33	0.267	10	2.13	0.425	10	1.25	0.250	10	1.67	0.333	10
Positive attitude of employees	2.83	0.567	5	3.00	0.600	5	2.25	0.450	5	2.78	0.556	6
adequacy of skill training and development for all employees	2.33	0.467	8	2.50	0.500	9	1.50	0.300	9	2.22	0.444	9
Effective monitoring and feedback	5.00	1.000	1	4.25	0.850	1	4.75	0.950	1	4.61	0.922	1
Adequate employees support from senior management	4.33	0.867	2	3.63	0.725	2	3.50	0.700	2	3.83	0.767	2
Effective conflict resolution mechanisms	3.17	0.633	4	2.75	0.550	7	2.50	0.500	4	2.83	0.567	5

Note's=Mean Scores, RII=Relative Importance Index, R=Rank

Table 7 above shows that ranks mean score, and relative, importance indices of the top ten key success factors of human resource management performance. Among all key success factors, effective monitoring and feedback was ranked first by all respondents ,with a weighted average RII equal to 0.922.Human resource management is one of the factors that play a significant role in the success of a project and monitoring and giving continuous feedbacks makes projects successfully completed. As many other research supports.

There has been increasing interest and attempts to explore key success factors in the context of project management. (Susil, 2016) conducted a survey to investigate factors influencing project performance across the project life cycle. The study results showed that clarity of contract, fixed construction, precise project estimate, material quality, mutual/trusting relationships, leadership/team management, and management of work safety are most key success factors.

Adequate employees support from senior management was ranked second by all respondents with a weighted average RII equal to 0.767.Continous support from the top management to the lower level workers and teams motivates them to react positively, contributing to the successful completion of a project. Commitment of all parties to project was ranked as a significant factor with weighted average RII equal to 0.644. Project is successfully completed if all stakeholders of the project involve in every activity of the project

Table 8: Summary of mean Score, Rank and Relative Important Index of key success factors for Client Satisfaction Performance

	Contractors			Clients			Consultants			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Client's emphasis on quick construction	2.50	0.500	6	2.63	0.525	6	2.25	0.450	5	2.50	0.500	5
Ability to meet the client's deadline	5.00	1.000	1	4.00	0.800	1	4.50	0.900	1	4.44	0.889	1
Client's emphasis on low construction cost	3.17	0.633	5	2.13	0.425	10	2.25	0.450	5	2.50	0.500	5
Durability of the completed work	4.00	0.800	3	3.38	0.675	2	2.75	0.550	3	3.44	0.689	3
Prompt response to legitimate complaints	1.33	0.267	9	2.25	0.450	9	1.00	0.200	9	1.67	0.333	10
Aesthetic of the completed work	1.17	0.233	10	2.75	0.550	5	1.75	0.350	7	2.00	0.400	8
Efficient functionality of the service	2.33	0.467	7	2.38	0.475	7	1.00	0.200	9	2.06	0.411	7
Effective coordination between client and project parties	4.67	0.933	2	3.38	0.675	2	3.75	0.750	2	3.89	0.778	2
Quality of the service to match the standard	3.50	0.700	4	3.38	0.675	2	2.75	0.550	3	3.28	0.656	4
Professionalism of services of project team	1.50	0.300	8	2.38	0.475	7	1.75	0.350	7	1.94	0.389	9

Note:MS=Mean Scores, RII=Relative Importance Index, R=Rank

Table 8 shows the ranks, means scores, and relative importance indices of the top ten key success factors of client satisfaction. From this, it can be concluded that ability to meet the client's deadline was ranked first by first for all survey respondents, with a weighted average RII equal to 0.889.Clients are always satisfied when their perceptions of the product or service is completed within the set time and qualifications. Completing projects within the allotted time cost and other predetermined criteria is one of the core elements in modern project management and individual projects success.

Effective coordination between client and project parties was ranked second with a weighted average RII equal to 0.778.Coordination among the different parties and team in the execution phase of projects makes projects to be completed successfully, by reducing time and cost, one of the factors clients set in the accomplishment of activities and success of projects. Durability of the completed work was ranked as third by the survey respondents with weighted average RII equal to 0.689.Clients are satisfied when the quality and durability of a project is respected.

Table 9: Summary of mean Score, Rank and Relative Important Index of key success factors for Environmental Performance

	Contractors			Clients			Consultants			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Sufficient provision of environmental management training to all staff	3.00	0.600	3	2.625	0.53	9	1.25	0.250	8	2.44	0.489	7
Careful positioning and maintenance of site environment	4.50	0.900	1	4.375	0.88	1	4.50	0.900	1	4.44	0.889	1
Environmentally friendly site planning	2.83	0.567	6	2.750	0.55	8	1.75	0.350	5	2.56	0.511	5
Use of environmentally friendly equipment, machines	3.33	0.667	2	3.000	0.60	4	2.00	0.400	4	2.89	0.578	4
Regular maintenance of equipment for the project	1.67	0.333	9	3.125	0.63	3	1.75	0.350	5	2.33	0.467	8
Effective waste pollution control	1.83	0.367	8	2.875	0.58	6	1.25	0.250	8	2.17	0.433	9
Use of eco-innovative technology	2.50	0.500	7	2.875	0.58	6	1.75	0.350	5	2.50	0.500	6
Continuous environmental auditing activities	3.00	0.600	3	4.125	0.83	2	3.75	0.750	2	3.67	0.733	2
Effective water pollution control	1.00	0.200	10	2.500	0.50	10	1.25	0.250	8	1.72	0.344	10
Proper monitoring of energy consumption	3.00	0.600	3	3.000	0.60	4	2.75	0.550	3	2.94	0.589	3

Note: MS=Mean Scores, RII=Relative Importance Index, R=Rank

Table nine shows ranks, mean scores, and relative importance indices for the top ten environmental performances. From this table we can understand that Careful positioning and maintenance of site environment is ranked first by the three respondents of the survey questionnaire with a weighted average RII equal to 0.889. Road projects are characterized complex road scenes as it involves with different physical features of a geographical landscapes. In doing so, land and road project activities require careful maintenance and position to minimize the complexities, cost, time and scope extensions. A continuous environmental auditing activity was ranked by all respondents of the survey questionnaire with a weighted average RII equal to 0.733. And proper monitoring of energy consumption was ranked with a weighted average RII equal to 0.589 .Energy efficient consumption is one of the factors that play a significant role in project success especially in the execution phases of a project.

Construction industry, especially road project (which is believed to be the heart artery of the development of a nation), mingled with several failures to meet the utmost desires of its customers, clients, contractors and the entire society at large by creating dissatisfaction of clients and lagging the completion of the project and with poor quality. Identifying success factors that would minimize failures and maximize success factors has become a considerable attention in the sector.

Research findings reveal that environment is one of the significant key success factors in the construction industry. Therefore project managers and the top management ate obliged to in include environmental factors as one element for the successful of a project

Table 10: Summary of mean Score, Rank and Relative Important Index of key success factors for Safety Performance

	Contractor			Client			Consultant			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
Provision and conduction of appropriate safety education and training to all parties	2.17	0.433	8	2.75	0.550	7	1.75	0.350	7	2.33	0.467	7
Adequate number of site safety representatives	1.67	0.333	9	3.00	0.600	6	2.00	0.400	6	2.33	0.467	7
Conduction of safety hazard identification and review involvement in safety awareness of project participants	2.50	0.500	5	2.63	0.525	9	1.75	0.350	7	2.39	0.478	6
Conducting regular safety meeting or talk on site	2.33	0.467	6	2.63	0.525	9	1.50	0.300	9	2.28	0.456	9
Frequent conduction of appropriate site safety	2.83	0.567	3	3.13	0.625	4	2.25	0.450	4	2.83	0.567	4
Inspection and supervision	1.17	0.233	10	2.75	0.550	7	1.25	0.250	10	1.89	0.378	10
Interrelation between the employee and supervisor	5.00	1.000	1	4.50	0.900	1	3.75	0.750	1	4.50	0.900	1
Effective coordination, control and management of sub-contractors	2.33	0.467	6	3.25	0.650	3	3.00	0.600	3	2.89	0.578	3
Positive personal	4.50	0.900	2	3.88	0.775	2	3.75	0.750	1	4.06	0.811	2

attitude of project participants towards safety management												
Implementation of safety management system in accordance with legislation	2.67	0.533	4	3.13	0.625	4	2.25	0.450	4	2.78	0.556	5

Note:MS=Mean Scores, RII=Relative Importance Index, R=Rank

Table ten shows rank, mean scores, and relative importance indices of for the top ten key success factors for safety performance. According to the table, interrelation between the employee and supervisor was ranked as first with weighted average RII equal to 0.900.Safety, as a critical factor in the construction industry, requires coordination and cooperation between or among participants of a project. Positive personal attitude of project participants towards safety management was ranked second with a weighted average RII equal to 0.811.Projects are complex involving various attitudes and beliefs, diversities and social divisions so that there should be a consideration in promoting positive personal attitudes of employees and the general stakeholders. It is this stand that makes projects successful. Effective coordination, control and management of sub-contractors was ranked third factor for safety performance in the projects selected for the analysis ,with a weighted average RII equal to 0.578.

Key success factors include all supervision, effectiveness of cost control system, extent (involvement) of subcontracting, speed of information flow, project manager related factors, leadership skills of project manager ,project manager's commitment to meet quality, cost and time, project manager's early and continued involvement in project, coordinating ability and rapport of project manager with contractors/,subcontractors, project manager's authority to take, financial decision, selecting key team members, organizing skills of project manager, project manager's authority to take day-to-day decisions, project manager's experience, project manager's competence

Table 11: Summary of mean Score, Rank and Relative Important Index of key success factors for Risk Management Performance

	Contractors			Clients			Consultants			Weighted Average		
	MS	RII	R	MS	RII	R	MS	RII	R	MS	RII	R
adequacy of risk management techniques	1.67	0.333	9	3.25	0.650	6	2.25	0.450	4	2.50	0.500	8
Quality of works to match standards	5.00	1.000	1	4.88	0.975	1	4.50	0.900	1	4.83	0.967	1
Timely payment on contract and extra work	2.33	0.467	5	3.88	0.775	3	2.75	0.550	3	3.11	0.622	3
Project participants' competence	4.33	0.867	2	4.13	0.825	2	3.75	0.750	2	4.11	0.822	2
Effective control of third – party delay	2.33	0.467	5	3.00	0.600	10	2.00	0.400	6	2.56	0.511	7
adequacy of communication and coordination among parties	2.67	0.533	4	3.25	0.650	6	2.00	0.400	6	2.78	0.556	5
Absence of defective materials	2.83	0.567	3	3.75	0.750	4	2.25	0.450	4	3.11	0.622	3
Availability of funds as planned throughout the project duration	2.17	0.433	7	3.25	0.650	6	2.00	0.400	6	2.61	0.522	6
Implementation of effective site safety management program	2.00	0.400	8	3.25	0.650	6	1.75	0.350	10	2.50	0.500	8
Certainty of cash flow of	1.17	0.233	10	3.50	0.700	5	2.00	0.400	6	2.39	0.478	10

the project												

Note:MS=Mean Scores, RII=Relative Importance Index, R=Rank

The above table presents the mean scores, ranks, and relative importance index of the top ten key success factors for the risk management performance .According to the table it has been shown that Quality of works to match standards was ranked first by all the three groups of respondents of the survey, with a weighted average RII equal to 0.967.Since quality is a factor of success of a project it has been critical for road construction projects. Matching the quality standards of activities along project performances is a determinant factor in success of the project. Matching standard qualities is a continuous monitoring and evaluation activity that reduces resources wastages. Project participants' competence was ranked second with a weighted average RII equal to 0.822.Quality is measured by the participant's competence. Poor competence affects project success and the vice versa is true. Research findings indicate that one of the causes of project failure is poor project competence. Timely payment on contract and extra work and absence of defective materials were ranked third with a weighted average RII equal to 0.622.These two factors are ranked same by all respondents of the survey questionnaire.

Table 12: Spearman Rank Correlation between Participants for Eight Major Performance Groups

Participant	rs	T	Reject HO?	Significance (2-tailed)
Client Representative and Consultants	0.452	1.928	Yes	0.048
Consultants and Contractors	0.328	1.364	No	0.202
Contractors and Client Representative	0.184	0.689	No	0.510

Note: rs=Spearman's rank correlation coefficient=t-statistics; Ho=null hypothesis;*correlation is at the 0.05 level (2-tailed)

The above table shows the degree of agreement among the three respondent groups in this study Spearman's rank correlation was used to determine whether there was a significant level of agreement among the three groups of participants.

As the table shows, the degree of agreement between any two groups of project participants with respect to the ranking of the eight major performance categories. The results of the computation of Spearman's rank correlation coefficients' indicate that there is appositive agreement between client representatives and consultants with coefficient of 0.452 (p=0.048).However there is discordant agreement between consultants and contractors and contractors and representatives.

Table 13: ANOVA test on the most important key success factors

Performance Group	Critical success factors	F	Sig.
Time	Competence of project participant	.305	.742
Cost	Relationship among project participants	2.244	.140
Quality	Management leadership in promoting high process quality	2.104	.156
Human resource	Effective monitoring and feedback	1.943	.178
Client satisfaction	Ability to meet the client's deadline	.305	.742
Environment	Careful positioning and maintenance of site environment	1.602	.234
Safety	Interrelation between the employee and supervisor	.906	.425
Risk management	Quality of works to match standards	2.939	.084

Analysis of variance

ANOVA was used to investigate the perception of survey participants on the most important key success factors. A one-way ANOVA test was performed to determine whether the mean scores among the various groups of respondents were statistically significant. As the table shows the results of the ANOVA, analyzed using SPSS, for the most key success factors in each performance group. At a 95 % confidence interval, the null hypothesis, Ho, is accepted because the significant level is greater than all groups of survey respondents (client representatives, contractors, and clients) share the same operation phase.

4.3 Analysis of Interview

In this research in addition to collecting data using quantitative approach, qualitative data were collected to mainly identify observable challenges exhibited during the execution process of road construction projects' successful accomplishments by interviewing key informants of the selected projects. The key informants were two client representatives of the projects from Ethiopian roads authority communication office and one contractor from selected projects. The purpose of the interview was to identify major challenges that faced the success of road construction projects in the northern region of Ethiopia. For the three key informants two main similar questions were asked. For the first question "What were the challenges of road projects?" Though slightly varied, the three key informants responded that the major challenges of road projects were financial shortage, boundary issues, seasonal occasions and administrative bureaucracies. Shortage of finance is a serious challenge according to the three respondents. This makes project contractors and consultants unable to access financial sources and the necessary equipment and machinery materials essential for the construction of road projects.

The second serious challenge according to all the three respondents was boundary issues which is one of the most challenging factor lagging projects in Ethiopia. Since road projects run crossing different social and natural landscapes and geographical zones, undoubtedly, the issue of boundary is critical and requires an extensive further study. Moreover, the issue is related to socio-cultural, environmental, and economical spheres of a certain society. On top of that land and natural resource claims and compensations among the rural villages were mentioned by all interviewees as frequently encountered challenges. Lengthy bureaucracy and corrupted practices are also factors for poor performance of projects. The contractor respondent argues that complex tender processes and registration procedures, procurement frauds, inefficient management practices, late feedback responses and poor controlling and monitoring mechanisms were some of challenges.

For the second question "What recommendations would you suggest to meet these challenges" all informants responded:

- Improve financial capacity and performance of the local contractors and consultants by accessing financial institutions with transparent and accountable manner.

- Introduce quality and technologically advanced construction equipment and materials which cut cost, time and other project related factors.
- Improvement of the performance of the informal construction sector to seize the number of local contractors and consultants.
- Promoting cost and time efficient technology and prioritize for competent contractors and consultants that can minimize wastage and maximize efficiency and productivity
- Improve machinery equipment to be produced in the country
- Improve the management of bureaucracy, employee competent workers ,fight corruption ,fair and transparent tender process, and building regulations and standards
- Promoting technological development
- Promoting sustainable construction practices
- Mobilization of adequate financial resources

4.4 Major Findings of the Study

The main objective of this research was to identify and rank key success factors that affect the performance of construction road projects in the northern region of Ethiopia. Using questionnaire survey and qualitative interview method data were collected from the target sources (three groups of stakeholders i.e., client representatives, contractors and consultants of the projects. Based on the data analysis and interpretation, therefore, the following major findings were discovered.

The first ranked key success factors for the performance of selected road construction projects from each eight group performance respectively were: competence of project participant (time),relationship among project participants (cost),management leadership in promoting high process quality (quality), effective monitoring and feedback (human resource management),ability to meet the client's deadline (client satisfaction), careful positioning and maintenance of road project site (environment), interrelation between the employee and supervisor (safety) and quality of works to match standards (risk management).

Among the major group performances the following factors were ranked as client satisfaction, time, cost, quality, safety, human resource management, and environment and risk management identified and ranked accordingly. Qualitative investigation reveals that boundary issues bureaucracy, lack of finance and seasonal variations were the major challenges of projects according to key informants.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations of this study

5.1 Conclusions

Road construction projects are means through which developmental activities are achieved. Various efforts have been made to the success of road construction projects in Ethiopia. Road network expansion and connecting various communities across the nation is one of the success factors in the last few decades in the country. Key success factors also involve large capital

investment and job creation opportunities. To improve performance and productivity of road construction projects it is important to investigate key success factors influencing the performance of road projects in Ethiopia. The resources, competences and abilities of a company that give it a competitive advantage on a given market are its key success factors, which decides about the possibility of achieving success in the present and future. They are dynamic; they change depending on the situation in which the company is. They influence the management's fields of activity (Kotas, 2015 as cited in Meibodi, 2010) and carrying out of the organization's mission. The problem with key success factors is well known in terms of theory and practice for the last four decades within the construction sector, but it is not researched well especially in Ethiopian road construction perspective of key success factors that influence the performance of road projects. From the pragmatic point of view this topic seems a particularly important field of study, since it allows to rate efficiency and productivity of road projects by ranking them in terms of their performance achievements.

The main objective of this research, therefore, was to identify key success factors, and rank them through relative importance index. By generating key success factors from the literature review, data were collected from three groups of respondents (client representatives, contractors and consultants). From the survey the findings were gained. Using the SPSS, mean score, rank and importance index has been calculated. From the discussion and analysis ten important key success factors, such as identified as competence of project participant ,relationship among project participants ,management leadership in promoting high process quality ,effective monitoring and feedback ,ability to meet the client's deadline, careful positioning and maintenance of road project site ,interrelation between the employee and supervisor and quality of works to match standards ,for time, cost, quality, human resource management, client satisfaction, environment, safety and risk management categories respectively, were found . Furthermore, from the interview of key informants project challenges were finance shortage, seasonal occasions, and boundary issues in the villages.

5.2 Recommendations for Action

Based on the discussion and major findings of the study the following recommendations were forwarded. Key success factors are considered as instrumental tools that can help projects to be successfully completed. Identification of such factors and executes the project based on the predetermined and an ordered factor minimizes wastage and maximizing opportunities of project

successes. Based on this study, therefore policy designers and implementers should consider these key success factors for the overall improvement of projects by applying the method.

5.3 Recommendations for Further Research

Key success factors are important tools of improving project performance. Many researchers argue that such factors play paramount role in the determination on the success/failure of fate of contemporary projects. Success in project management of a completed facility depends on many issues with a variety of factors. Identification of key success factors particularly in the execution phase of a project can help interested parties to determine significant factors that should be given special attention to ensure the success of a project. Furthermore, key success factors can be considered to be means to improve the effectiveness of a project through the entire phase of the project life cycle. This study focuses on investigating key success factors for the performance of road projects. However the current study was limited to capturing the perceptions of clients, contractors and consultants on key success factors only in the northern region of Ethiopian successfully completed road projects from 2009-2018.As a result the findings might not be generalized to other. In future research, it would be interesting to identify and compare the perceived key success factors across other projects of Ethiopia. A number of future studies using the proposed approach are also strongly recommended. More information on this field would help us to establish a greater degree of agreement on the key success factors influencing project performance for different objectives in the construction industry.

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Appendix I: Questionnaire

Addis Ababa University

College of Business and Economics

School of Commerce

Graduate Program in Project Management

Dear Respondent: This questionnaire is designed to gather relevant information for a Masters Research thesis entitled "Key Success Factors Influencing the Performance of Road Construction Projects under Ethiopian Roads Authority: The Case of Northern Region." In doing so, the information you provide is highly important for the successful completion of this research. So, I, the researcher, kindly request you to provide me with your accurate and genuine information. All information you offer will be kept in secret as the research is only for academic purpose.

Thank you for your cooperation!

I. Personal Characteristics

1. **Position:**_____
2. **Gender**:male ☐ female ☐
3. **Age**: <30 years old ☐ 31-35 years old ☐ 36-40 years old ☐

   41-45 years old ☐ 46-50 years old ☐ >50 years old

4. **Job title**: project manager ☐ project director ☐ managing director ☐ quality control manager ☐ mechanical and electrical engineer ☐ consultant ☐ contractor ☐ client representative ☐ other, specify ☐

5. **Number of years working experience**

<5 years ☐ 5-10 years ☐ 10-15 years ☐ 15-20years ☐ 20-25 years ☐ >25 years ☐

II General Characteristics of Road Projects

A. Type of Project Delivery Systems: Design-bid-build ☐ design-build ☐

B. **Type of Contract:** Lump sum contract ☐ unit price contract ☐

C. Payment Type: AC ☐ DBST ☐

General Guidance : The following key individual success factors are given, then, please tick (✓) your correct and genuine response in accordance with the priority (order of importance) you gave in the execution phase of your project(s) in the spaces provided among the five alternatives given below in each eight performance groups .

Time Performance

S. No	Key Individual Factors	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Adequate experience of project participants					
2	Commitment and involvement of all parties to the project					
3	Effective road site management and supervision					

4	Clear objectives					
5	Top managements support					
6	Contractual incentives					
7	Competence of project participant					
8	Adequacy of communication and coordination among parties					
9	Effective change order management					
10	Rapid decision making					

Cost Performance						
S.No	Key Individual factor	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Eliminating wastage					
2	Availability of adequate resources					
3	Effective contract administration and management					

4	Availability of adequate fund					
5	Relationship among project participants					
6	Effective road project site management and supervision					
7	Adequate raw materials and equipment					
8	Frequent progress meetings					
9	Adequacy of communication and coordination among project parties					
10	Rapid decision making					

Quality Performance						
S.No	Key individual factors	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Quality of equipment and raw materials					
2	Availability of competence staff					
3	Favorable working condition					
4	Effective cooperation between parties taking part in the project					

5	Management commitment to continual quality improvement					
6	Competency of project manager					
7	Effective monitoring and feedback by project participants					
8	Effective quality assurance system in the organization					
9	Management leadership in promoting high process quality					
10	Top management sponsorship of project team					

Human Resource Management Performance						
S .No	Key individual factors	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Availability of skilled personnel					
2	Stakeholder engagement to the project					
3	Team sprit among employees of the project					
4	Commitment of all parties to the project					

5	Availability of internal promotion					
6	Positive attitude of employees					
7	adequacy of skill training and development for all employees					
8	Effective monitoring and feedback					
9	Adequate employees support from senior management					
10	Effective conflict resolution mechanisms					

Client Satisfaction Performance

S.No	Key individual factors	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Client's emphasis on quick construction					
2	Ability to meet the client's deadline					
3	Client's emphasis on low construction cost					
4	Durability of the completed work					
5	Prompt response to legitimate complaints					
6	Aesthetic of the completed work					
7	Efficient functionality of the					

	service					
8	Effective coordination between client and project parties					
9	Quality of the service to match the standard					
10	Professionalism of services of project team					

Environmental Performance						
S. No	Key individual factors	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Sufficient provision of environmental management training to all staff					
2	Careful positioning and maintenance of site environment					
3	Environmentally friendly site planning					
4	Use of environmentally friendly equipment, machines					
5	Regular maintenance of equipment for the project					
6	Effective waste pollution control					
7	Use of eco-innovative technology					
8	Continuous environmental auditing					

	activities					
9	Effective water pollution control					
10	Proper monitoring of energy consumption					

Safety Performance

S. No	Key individual factors	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Provision and conduction of appropriate safety education and training to all parties					
2	Adequate number of site safety representatives					
3	Conduction of safety hazard identification and review involvement in safety awareness of project participants					
4	Conducting regular safety meeting or talk on site					
5	Frequent conduction of appropriate site safety					
6	Inspection and supervision					
7	Interrelation between the employee and supervisor					

8	Effective coordination, control and management of sub-contractors					
9	Positive personal attitude of project participants towards safety management					
10	Implementation of safety management system in accordance with legislation					

Risk Management Performance						
S.No	Key Individual factors	Least important	Slightly important	Moderately important	Very important	Extremely important
1	adequacy of risk management techniques					
2	Quality of works to match standards					
3	Timely payment on contract and extra work					
4	Project participants' competence					
5	Effective control of third –party delay					
6	adequacy of communication and coordination among parties					
7	Absence of defective materials					
8	Availability of funds as planned					

	throughout the project duration					
9	Implementation of effective site safety management program					
10	Certainty of cash flow of the project					

	Major Performance group					
S. No	Performance group	Least important	Slightly important	Moderately important	Very important	Extremely important
1	Time					
2	Cost					
3	Quality					
4	Human resource					
5	Client satisfaction					
6	Environment					
7	Safety					
8	Risk management					

Appendix II: Key Informant Interview

1 What were the challenges that face road projects?

2 What solutions would you recommend for solving these challenges?