ST. MARY'S UNIVERSITY COLLEGE

SCHOOL OF GRADUATE STUDIES

ASSESSMENT ON IDENTIFYING PERFORMANCE FACTORS OF ROAD PROJECTS:
THE CASE OF SELECTED DEFENSE CONSTRUCTION ENTERPRISE ROAD PROJECTS

BY

NEWAY DESALEW (SGS/0410/2010A)

MAY-2019

ADDIS ABABA, ETHIOPIA

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FACULTY OF BUSINESS

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List of Abbreviations

DCE	Defense Construction Enterprise
KPIs	Key Performance Indicators
GDP	Growth Domestic Product
IBM	International Business Management
SPSS	Statistical Package For Social Science
ERA	Ethiopian Roads Authority
ROW	Right of Way
KSA	Knowledge, Skill, Attitude

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Tiruneh Legesse (Ass. Prof.). All sources of material used for this thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institutions for the purpose of earning any degree.

Neway Desalew Tilahun _____ _____

Name Signature

St. Mary's University College, Addis Ababa May, 2019

ENDORSEMENT

This thesis has been submitted to St. Mary's University College, School of Graduate Studies for the examination with my approval as a university advisor.

_____ _____

Advisor Signature

St. Mary's University College, Addis Ababa May, 2019

ABSTRACT

Infrastructure projects, such as road constructions, are one of the most important projects in Ethiopia. Growth in this sector is critical for growth in national income as it is among the largest sectors that generates employment within the country as well as a key driver for economic development of Ethiopia. Ethiopian Roads Authority has administered many projects at the federal level involving local contractors on the projects. However, projects executed by contractors are facing critical problems with respect to different factors. There are several factors that are contributing to the performance problems of local contractors. Accordingly, this research attempts to identify the major causes or factors affecting the performance of DCE road projects, which can serve as the way forward for future work in coping with this performance problem. A thorough literature review and desk study was done, through which a number of performance factors were identified in different construction industry scenarios. To obtain expert opinions from the sector, in total thirty four (34) factors with 07 main groups were identified and made part of the survey questionnaire and the survey was conducted with DCE head office and selected project staffs. In addition, semi structured interview is prepared and conducted with selected staffs. Results show that educated personnel and experience and leaders ability to integrate and coordinate activities are the main quality and leadership related factors affecting the performance of road projects in DCE respectively. It is recommended that the client (ERA) gives due attention to grant contractors timely possession of site (ROW) and local contractors to deploy experienced professionals in the area of project management.

Key words: Ethiopian Roads Authority, DCE, Performance, ROW, Construction

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Construction industry makes significant contributions to the socio-economic development process of a country. Its importance emanates largely from the direct and indirect impact it has on all economic activities. It contributes to the national output and stimulates the growth of other sectors through a complex system of linkages. It is noted that about one-tenth of the global economy is dedicated to constructing and operating homes and offices (UNEP, 1996). UNEP further observes that the industry consumes one sixth to one half of the world's wood, minerals, water and energy. It contributes to employment and creates income for the population and has multiplier effects on the economy. Construction industry has complexity in its nature because it contains a large number of parties such as clients, contractors, consultants, stakeholders, shareholders, regulators and others.

The construction industry has important contributions to the Ethiopian economy, as demonstrated by its share in the GDP. The sector has registered relatively higher growth as compared to the growth of GDP during this period. Over this period, there has been increased investment on the development and expansion of various infrastructure projects like roads, airports and residential and non-residential housing units.

Every government has a vision to improve the living standards and conditions of its citizen and, generally, this is achieved through development programs. It is an accepted assumption that a development program can be broken down into well-organized development projects and that if project activities are planned and implemented effectively the overall intended objectives and purpose of program will be achieved.

Maintaining steady cost projection on construction projects had been until recently an issue of serious concern, both to the client and project contractors. Cost should be paid for high quality has raised many important issues affecting cost accounting, quality control, repairs

and maintenance, supply chain, production management, stores, safety and health, education.

Time and cost overruns on infrastructure development projects during implementation continue to pose great challenges to developing countries. Ideally, projects designed and managed by highly trained construction professionals and executed by qualified contractors selected on the basis of their capability should meet the project performance goals. These goals are in terms of the contract period, budget, quality, and client satisfaction. However, there is evidence that despite trained of professionals in DCE construction projects do not always meet their goals. This is manifested in road and building projects undertaken by the enterprise that have cost overrun, delayed completion period and poor quality resulting in reworks in various projects, high maintenance costs, dissatisfied clients.

1.2. Background of the Company

Defense Construction Enterprise was established in 2010 by Ethiopian ministry of council regulation NO 185/2010 as public enterprise and National Defense as supervising authority of the enterprise.

The purpose for which the enterprise is established is to engage in any construction activity mainly to satisfy the national defense construction and infrastructural development needs. Besides, to engage in the construction of roads, dams, irrigation infrastructure, Buildings and other construction related works in the country.

Henceforth it establishment, the enterprise had completed 20 roads, dam, irrigation, building and real estate projects which worth around birr 4.2 billion in the last five years. Currently, there are 33 construction projects under construction which worth around 8.1 billion. 11 of them are road projects. The enterprise annual income turnover is around 1.4 billion on average for the last seven years.

1.3. Background of the Projects

Most of the road projects managed by DCE are located in rural and desert areas. Some of them are Mekelle Dangolat Samri Finarwa Road Project, Dicheto Galafi Rigid Pavement Road Project, Beles Mekanebirhan Road Project, Debre Zeit Air Force Compound Road Project and Adigudem Mekelle Wukro Road Maintenance Project.

Mekelle Dangolat Samri Finarwa Road Project is located in the Tigray National Regional State of Ethiopia. The Project road intended to connect three weredas, namely Enderta, Hintalo-Wajirat and Sahrti-Samre weredas to Mekelle city. And the work under this project consists of construction of 18.3 km length of the urban section (30m width in Mekelle city), 9.2km (21m width in Dengolat and Samre) and 66.5 km length of rural section and a total of 94 Km road. The duration of the construction period are 1095 calendar days including mobilization period. The total budget for the project is 1,261,005,462.56 ETB and a contract time of 1095 Cal. Days. To date accomplishment (as of January 2019) of the project is 475,972,430.56 ETB which is 38.1% of the contract amount, even if the time elapsed is 821 days or 75%.

Ditchoto Galafi Junction - Elidar – Belho Rigid Concrete Road Project is located in the Afar National Regional State (ANRS), the North-Eastern part of Ethiopian. The Route starts at a junction point along Ditchoto - Galafi Road. The first and second control points are located in coordinate system at GPS reading 807942 mE, 1302478 mN (Ditchoto-Galafi Road junction) and 806623.464 mE, 1321709.428 mN (Dobi-Elidar Junction) respectively. This route is selected mainly to bypass the unstable section of the old route between Dobi village and Dichoto Elidar junction and terminates at Belho village at GPS reading 194325 mE, 1334588 mN (Zone 38P) in the Republic of Djibouti after traversing about a distance of 85.00 km. The total budget for the project is 2,316,229,584.13 ETB and a contract time of 1170 cal. Days. To date accomplishment (as of January 2019) of the project is 1,532,039,920.88 ETB which is 66% of the contract amount, even if the time elapsed is 1100 days or 94.01%.

Beles Mekane Birhan Design and Build Road Project lies in the Amhara Regional State, in the Northern part of the country. The proposed route is inaccessible with 4WD vehicle. The beginning point of the project is around Beles Village where portion of Debark-Buahit Road project ends and it is specifically located at about 868km from Addis Ababa City. The control points through which the proposed road shall traverse are Beles Town, Weyna and Mekane Birhan. The project will have 39 Km length. The total budget for the project is 866,109,508.47 ETB and a contract time of 1095 cal. Days. To date accomplishment (as of January 2019) of the project is 257,265,483.96 ETB which is 30 % of the contract amount, even if the time elapsed is 360 days or 75.0 %.

Debre Zeit Air Force Compound Road Project is located in the city of Debrezeit and it includes construction of Concrete pad for the air force with a contract amount of 113,266,490.66 ETB. The total budget for the project is 113,266,490.66 ETB and a contract time of 665 cal. Days. To date accomplishment (as of January 2019) of the project is 89,662,800.65 ETB which is 79 % of the contract amount, even if the time elapsed is 1058 days or 159.1 %. Adigudem Mekelle Wukro Road Maintenance Project stretches from Adigudem to Wukro city and the work includes maintenance of the existing asphalt road project. Currently they are using the most advanced technology of Recycler which reduces the cost and time of road maintenance. The total budget for the project is 893,586,879.31 ETB and a contract time of 1095 cal. Days. To date accomplishment (as of January 2019) of the project is 349,524,196.73 ETB which is 39 % of the contract amount, even if the time elapsed is 917 days or 84 %.

The following reasons are reported in most of the months as problems for the low performance of the road projects in DCE.

- ✓ Shortage of Bitumen, rebar and wagon drill
- ✓ Widely spread ROW Problem on large portion of the project
- ✓ Very low progress of sub-contractors.
- ✓ Frequent break down of crushers
- ✓ Working habit/culture of the employees

- ✓ Political instability in some of the project areas
- ✓ Local currency shortage in the country

1.4. Statement of the Problem

Ethiopia as a country has witnessed a substantial increase in the number of stalled projects due to in appropriate project organization structures and ineffective leadership. There is evidence that the performance of the road construction project in DCE is poor in terms of the three triangles time, cost and quality performance and other related factors. According to the strategic plan of the enterprise (2016), there is an average of 9.5% and 40% cost and time overrun respectively in the 9 of the completed road projects. There was also significant amount of reworks due to poor quality of constructions once the provisional acceptance had been undertaken. This is manifested by high maintenance costs, dissatisfied clients and even projects which are not functional.

This research aims to investigate the factors affecting the performance of road construction projects in DCE especially in the ongoing road projects in order to overcome cost, time, quality and leadership performance problem and to improve performance of its road construction projects. Hence, performance of any construction projects can be evaluated according to key performance indicators (KPIs). As per the reports of the company 32% of the project is located in town sections, which makes these projects prone to right of way problems. Right of problems have been and still are the main bottle necks to the performance of road projects in the country. The client, usually Ethiopian Roads Authority, have no efficient way of solving ROW. Some of the projects affected by ROW cases are Mekelle-Dangolat-Samri-Finarwa Road project, which have 18 km of its sections in town areas, Beles – Mekane Birhan Design and Build Road Project, which have 6.5 Km of its section in towns, and Mekelle – Adigudem – Wukro Maintenace Project. The other main issue is political instability, which is affecting the countries construction industry for the last 4 or 5 years. DCE is also one of the companies in which political unstability affects its work in some of its projects including Dichetto Gallafi Rigid Pavement Road Project and Beles – Mekane Birhan Design and Build Road Project.

These and other issues like client related factors, contractual relationship factors, health and safety factors, people factors and environmental factors and their effect on the performance of DCE road projects is also the concern of this research.

Many researchers conduct their research work by targeting the three stakeholders of a construction: client, contractor and consultants. Researcher find so little reviews done to identify and investigate which factors contractors believe affecting their performance hence this this research will solve that.

1.5. Research Questions

The following research questions will be answered by the research either qualitatively or quantitatively.

1. Which **cost, quality and time related, leadership related, contractual relationship related, client related and environmental related factors** which affect the performance of road construction projects in DCE?
2. How procurement plan and PM ability affect or influence the performance of road construction projects in DCE?

1.6. Objective of the Study

1.6.1. General objective

The research will have the following general objective:

- To identify performance factors of road construction projects in Defense Construction Enterprise.

1.6.2. Specific Objectives

The research will have the following specific objectives to achieve in relation to performance of road projects in DCE.

1. To identify cost, quality and time related, leadership related, contractual relationship related, client related and environmental related factors which affect the performance of road construction projects in DCE?

2. To know how procurement plan and PM ability affect or influence the performance of road construction projects in DCE?

1.7. Definition of Key Terms

Project: As per PMBOK (3rd Edition), A project temporary endeavor with a beginning and an end and it must be used to create a unique product, service or result.

In this research projects refers to Road construction projects constructed by Defense Construction Enterprise.

Construction: Dina El Chammas Gass (1998) states in terms of engineering, construction is the activity of putting together different elements, using a detailed design and plan, to create a structure for a certain location.

In this research construction means the construction of new road projects under Defense Construction Enterprise.

Performance: as per business dictionaries it is the accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed.

In this research it refers to the accomplishment of a given road construction projects against the contractual cost, time and quality standards.

Design and Build Projects: Design-Build is a method of project delivery in which one entity – the design-build team – works under a single contract with the project owner to provide design and construction services.

PRP: Performance related payment, which is implemented in road projects of the company.

1.8. Significance of the study

This work will be important to identify and to evaluate the time, cost, and quality and other related factors affecting the performance of road construction projects in the DCE. The practices concerning with the KPIs including time, cost, and quality in road construction

project checklists will be analyzed in order to know the main practical problems of projects performance regarding factors affecting road construction project in DCE and then to formulate recommendations to improve performance of road construction projects. The work will also give some recommendations for other companies and the construction industry as a whole to know and give solutions to factors which are affecting the road construction industry.

1.9. Scope and Limitation of the study

This research will be limited to the time, cost, quality and leadership factors affecting the performance of road construction project in DCE. Hence, the target respondents will be Head Office Department Team Leaders, Head Office Project Follow up Engineers, Project Managers, Project Chief Surveyors, Project Construction Engineers, Project Site Engineers, Machine Operators and Senior Office Engineers that are involved in road construction projects at time bounded under DCE. The selected road projects have an average contract amount of 1,090,039,585.02 ETB in which the lowest one is 113,266,490.66 ETB of Debrezeit Airforce and the highest is 2,316,229,854.23 ETB of Dichetto Galafi rigid pavement road project. All of the selected road projects are ongoing projects with an average of 97.46% elapsed time and average of 50.7% financial progress. The sampled projects are either from rural section or those in town section. For better diversity of selection the samples range from the very common type of roads, Asphalt Concrete to the modern and rare one, rigid pavement Road Projects.

The study will look relevant information from respondents who actually working on the actual project and head office. This leads to the methodological limitation of small sample size where only head office and project staffs are sampled. The study will be envisaged from the contractor's perspective towards factor affecting the construction project thus clients and consultants views will not be considered in the study due to unavailability and timely response of the stakeholders. Since the researcher is working in the industry some personal bias might be observed.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Theoretical Literature

2.1.1. Road Construction Projects

According to Wikipedia, construction is a process that consists of the building or assembling of infrastructure. Construction is the recruitment and utilization of capital, specialized personnel, materials, and equipment on a specific site in accordance with drawings, specifications, and contract documents prepared to serve the purposes of a client. Moavenzdadeh F. (1976) also states construction contributes to the economic development of any country by satisfying some of the basic objectives of development including output generation, employment creation and income generation and re distribution; it also plays a major role in satisfying basic physical and social needs, including the production of shelter, infrastructure and consumer goods.

A project is a temporary endeavor undertaken to create a unique product, service or result (Project Management Institute, 2008). According to Hillson D., (2009), all projects are risky and there are three separate reasons for that. The first reason is that all projects share common characteristics which inevitably introduce uncertainty. Some of this common characteristics are projects are unique, complex, involve assumptions and constraints, performed by people and involve change from a known present to an unknown future. The second reason is that all projects are undertaken to achieve some specific objectives. The final reason is that all projects are affected by the external environment they exist in.

The construction sector particularly road construction is a very important sector for the Road contractor's performance problem appears in many aspects in developing countries development and economic growth (M. Haseeb, 2011). Many road projects fail in time performance, others fail in cost performance and others fail in other performance indicators. In the past there were many road projects which finished with poor performance because of many evidential reasons such as: obstacles by client, non-availability of materials, road

closure, amendment of the design and drawing, additional works, waiting the decision, handing over, variation order, amendments in Bill of Quantity (B.O.Q) and delay of receiving drawings.

There are other indicators for problems of road contractor's performance in developing countries such as project management, coordination between participants, monitoring, and feedback and leadership skills. In addition, political, economic and cultural issues are three important indicators related to failures of road projects' performance in the Country (Becerik, 2011).

2.1.2. Critical Chain Project Management Theory

Critical Chain Project Management is the Theory of Constraints logistical application for project operations. It is named after the essential element; the longest chain of dependent resourced tasks in the project. The aim of the solution is to protect the duration of the project, and therefore completion date, against the effects of individual task structural and resource dependency, variation, and uncertainty. The outcome is a robust and dependable approach that will allow us to complete projects on-time, every time, and most importantly within at most 75% of the current duration for single projects and considerably less for individual projects within multi-project environments. The shorter duration provides a sterling opportunity in the marketplace to differentiate ourselves from our competitors who deliver poorer outcomes, and late at that, via other project management methods. It also offers the opportunity to deliver more projects over all, in the same amount of time, and at no increase in operating expense, thus significantly improving the bottom line.

2.1.3. Implication of Time and Cost Overrun

Time and cost overrun have an implication and affection to the road construction project performance and to the client or project owner. Time and cost certainty is known to be the top priorities of construction clients. Although affected by many internal and external factors, construction time and cost is considered a good and measurable indicator of project performance. However, low cost and speedy project are not always the main concern of clients today; instead time and cost certainty are becoming increasingly important and it is

one of the most important contractor performance criteria for clients satisfaction (Hong Xiao etal,2010).

2.1.4. Road Construction Projects and Performance

Success of road construction projects depends mainly on success of performance. Many previous researches had been studied performance of construction projects. Dissanayaka and Kumaraswamy (1999) remarked that one of the principle reasons for the construction industry's poor performance has been attributed to the inappropriateness of the chosen procurement system. Reichelt and Lyneis (1999) remarked three important structures underlying the dynamic of a project performance which are: the work accomplishment structure, feedback effects on productivity and work quality and effects from upstream phases to downstream phases. Identified the main performance criteria of construction projects could be financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting.

Cheung et al (2004) identified project performance categories such as people, cost, time, quality, safety and health, environment, client satisfaction, and communication. It is obtained by Navon (2005) that a control system is an important element to identify factors affecting construction project effort. For each of the project goals, one or more Project Performance Indicators (PPI) is needed. Pheng and Chuan (2006) obtained that human factors played an important role in determining the performance of a project. Ugwu and Haupt (2007) remarked that both early contractor involvement and early supplier involvement would minimize constructability-related performance problems including costs associated with delays, claims, wastages and rework, etc. Ling et al (2007) obtained that the most important of practices relating to scope management are controlling the quality of the contract document, quality of response to perceived variations and extent of changes to the contract.

2.1.5. Factors Affecting Cost and Time Performance

Chan and Kumaraswamy (2002) remarked that studies in various countries appear to have contributed significantly to the body of knowledge relating to time performance in construction projects. Iyer and Jha (2005) remarked that project performance in term of cost is studied since 1960s. These studies range from theoretical work based on experience of researcher on one end to structured research work on the other end. Moreover, Pheng and Chuan (2006) stated that there have been many past studies on project performance according to cost and time factors. Chan and Kumaraswamy (1996) stated that a number of unexpected problems and changes from original design arise during the construction phase, leading to problems in cost and time performance. It is found that poor site management, unforeseen ground conditions and low speed of decision making involving all project teams are the three most significant factors causing delays and problems of time performance in local building works. Okuwoga (1998) stated that cost and time performance has been identified as general problems in the construction industry worldwide. Dissanayaka and Kumaraswamy (1999) remarked that project complexity, client type, experience of team and communication are highly correlated with the time performance; whilst project complexity, client characteristics and contractor characteristics are highly correlated with the cost performance. Reichelt and Lyneis (1999) obtained that project schedule and budget performance are controlled by the dynamic feedback process.

Al-Momani (2000) stated that the success of any project is related to two important features, which are service quality in construction delivered by contractors and the project owner's expectations. Managing the construction so that all the participants perceive equity of benefits can be crucial to project success. It is obtained that the complete lack of attention devoted to owner's satisfaction contributes to poor performance. Declining market shares, low efficiency and productivity, and the rapid construction cost escalation also lead to poor performance.

The UK working groups on Key Performance Indicators (KPIs) have identified 10 parameters for benchmarking projects in order to achieve a good performance in response to Egan’s report (1998). However, most of these indicators, such as construction cost,

construction time, defects, client satisfaction with the product and service, profitability and productivity, promote result-orientated thinking, whereas predictability of design cost and time, and predictability of construction cost and time, and safety can be regarded as process-orientated thinking. There are no suggestions for performance indicators in benchmarking projects at the project selection phase i.e., analysis stage, when the client and end-user's requirements need statements and the delivery strategy are determined. The output of the requirements at the analysis stage will most likely determine the output of the entire development process. They indicate that the origination and initiation phase, in which major decisions are made, such as decisions on the project's objectives and planning the project's execution, has the most influence on the project's success. The issue is much more serious when the kind of activities that should be undertaken depends on the outcome of earlier activities. It is therefore important to identify parameters (performance indicators) for benchmarking projects at the project selection phase in order to achieve good project performance. Posten (1985), who found that 55% of all defects in research and development projects occur during requirement analysis and specification, earlier documented this position, whereas 43% of all defects are not found until after the testing stage. It is not surprising that the same situation is applicable to construction projects.

2.1.6. Cost Factors

The cost management system tracks current spending and commitments and predicts ultimate cost outcome. Procurement selection criteria of cost, time, quality, project characteristics and external environmental factors have effects on project performance. Fetene (2008) found that the most common effects of cost overrun were delay, supplementary agreement, adversarial relations among stakeholders, and budget shortfall of project owners which guides efforts to improve the performance of the construction industry in the future. Aftab, Rahman, Abdullah and Azis (2010) stated that fluctuation in price of material, cash flow and financial difficulties faced by contractors, shortage of site workers, lack of communication between parties, incorrect planning and scheduling by contractors are most severe factors while frequent design changes and owner interference are least affecting factors on construction cost performance. Factors such as contractor‟s in experience, inadequate planning, inflation, incessant variation order, and change in project

design were critical to causing cost overrun, while project complexity, shortening of project period and fraudulent practices are also responsible. Baloyi and Bekker (2011) discovered that the increase in material cost is the single largest contributor to cost overruns for both global and local projects. Mrema and Mhando (2005) found that in most cases, malignancy of clients to assume roles of their consultants through making decisions and changes that affect the design and the project cost has undermined the efforts to attain the intended goals. The most important factors affecting the performance of construction projects agreed by the owners, consultants and contractors were: average delay because of closures and materials shortage, availability of resources as planned through project duration, leadership skills for project manager, escalation of material prices, availability of personals with high experience and qualification and quality of equipment and raw materials in project.

2.1.7. Time Factors

Time is money to owners, builders, and users of the constructed facility. From the owner's perspective there is lost revenue by not receiving return on investment, cash flow crunch, potential alienation and loss of clients/tenants, extended interest payments, and negative marketing impacts. From the users‟ perspective, there are financial implications similar to owners. Aje, Odusami and Ogunsemi (2009) showed that contractors' management capability has significant impact on cost and time performance of building projects. Wiguna and Scott (2005) showed the critical risks affecting both project time and cost perceived by the building contractors were similar. They were: high inflation/increased material price, design change by owner, defective design, weather conditions, delayed payments on contracts and defective construction work. With respect to time delays the most significant contributing factor for global projects was late delay in payments while for the stadia projects design-related factors caused the most delays (Baloyi & Bakker, 2011) identified the factors that contribute substantial detrimental effect to project performance, thus affecting the integrity of the construction industry.

2.1.8. Quality Factors

The quality management system monitors and analyzes quality of the constructed project and predicts quality problems and issues. Typical quality measures include: (i) Quality

control tests: number performed, frequency and percentage passed/failed, number of non-conformance issues, number of change requests and root causes, cost of rework, number of exceptions at turnover and cost of quality (ii) Quality Assurance Cost (cost of resources): quality assure cost as a percentage of construction cost, cost of quality and Cost of quality as percentage of construction cost. Lepartobiko (2012) stated that quality can be assured by identifying and eliminating the factors that cause poor project performance. The project manager's competence and top management support are found to contribute significantly in enhancing the quality performance of a construction project. Lack of contractor experienced topped the quality related cause of project failure. Ling and Bui (2010) discovered that major enablers that lead to project success are foreign experts" involvement in the project, government officials inspecting the project and very close supervision when new construction techniques are employed. A factor which leads to poor performance is the lack of accurate data on soil, weather, and traffic conditions.

2.1.9. Leadership Factors

Every manager/leader has a unique style of leadership; some are more open and participative while others are very assertive. There are a number of leadership styles like transactional, transformational, authoritarian democratic, participative and laissez-faire (Belout & Gauvreau, 2004). "There are four main characteristics of a good leader, which includes inspiration, entrepreneurship, creativity and a shared sense of commitment. Good leadership requires that the goals be achieved in a timely manner so that the business can grow in the marketplace". It can be argued that good management is not possible without good leadership (Hyvari, 2006). Good management requires good goal setting and then leading subordinates to achieve the organizational goals. The leadership styles are not fixed and may depend on the situations (Yang et al., 2011).

According to Ammeter & Dukerich (2002) you can be an excellent manager without becoming a good manager, but you cannot be an excellent leader without becoming a good manager. For example, Kloppenborg (2003) point out that leaders are people who do the right thing, but managers are people who do the thing right. Both roles are crucial, but they differ profoundly. "The literature suggests that a person can be both a

good leader and good manager but that good managers are not necessarily also good leaders if they do not display the leadership qualities of communicating vision/ideas to their subordinates".

Successful Leadership is very essential for the success of the project. When we say leadership it involves efficient use of materials, equipment's and time in every stage of the project. Some of leadership related factors which affect the performance of the road construction projects are: Leader's professional education and work experience, Adequate training to leaders, Leader's ability to motivate employees, Leader's ability to integrate and coordinate activities, Leader's ability to provide timely decision making.

2.1.10. Contractual Relationship Factors

Contractual issues are the main causes of dispute in the industry. Especially in road projects there are a lot of issues to be solved by the stakeholders. One of these main issues is right of way clearance. Taking most of the road projects in Ethiopia as a reference, right of way is the main cause of cost and schedule overrun even if low efficiency of the contractors has its own part. The work methodology the client, Ethiopian Roads Authority, uses to solve ROW issues is solving each of the causes in parallel with the actual works, which affects the contractors master plan because there is no defined time frame to solve the ROW issues.

There is a wide agreement that the choice of contract types should be contingent upon various circumstances such as product and/or process uncertainty, desired allocation of risk, owner in-house capability, and market conditions (Merrow, 2011; Turner and Simister, 2001; Walker and Rowlinson, 2008). A proper contract type is chosen to encourage the owner and contractor to work rationally together to achieve the best outcomes in accordance to their common objectives and within the expected risk (Morris and Pinto, 2007; PMI, 2008; Smith, 2002; Turner, 2009; Walker and Rowlinson, 2008). However, two separate empirical studies at different times by CII (1986) and IPA (2010) suggest that there is no clear or direct relationship between the contract type and project performance. CII suggests that regardless the choice of contract type, the real issues that affect the project cost performance are associated with the alignment between owner and contractor and their agreement in allocating and managing risk. The other contractual relationship factors are the

overall management actions communication system among project participants, feedback capabilities between project participants, control mechanism of the project activities

2.1.11. Client Related Factors

Client satisfaction is an important determinant of contractor performance evaluation and comparison and it is the driving force for continuous improvement of contractor performance (Ahmed and Kangari, 1995). Companies differentiate themselves from competitors and maintain a competitive edge by providing and keeping clients satisfied (Torbica and Stroh, 2001).Client long term interest to the performance of contractor is in the work performed. It must conform to the specifications established for the project. Low cost and speedy construction should be achieved because it has significant implication to the client's interest about the way of contractor work in the project performance (Xiao and Proverbs, 2001). Besides that, delays (time overrun) and cost overrun are costly and often result in disputes and claims, impair the feasibility for project owners, and retard the development of the construction industry (Odeh, A. M and Battaineh, H. T, 2002). Fetene (2008) categorized some of the major causes of cost overrun under faults of the clients, consultants, contractors, government and others. Inadequate project preparation as the most important factor that underlie cost overrun, which often lead to scope changes during implementation. The inadequacies cover deficiencies in demand forecasts, ground surveys and technology choice. Murali and Yau (2006) in their research identified contract- related factors such as change orders, mistakes and discrepancies in the contract document as the major causes of cost overrun. Doloi and Young (2009) reported among these three categories, the five most significant sources of cost overruns as perceived by the consultants, clients and contractors which are extent of completion of pre-contract design, escalation of material prices, mistakes and discrepancies in contract documentation, client initiated variations and shortage of materials.

2.1.12. Environmental Factors

According to Farhaji etal (2017) Environmental factors also have a significant impact on execution and performance of projects. A study carried out in Nigeria explored the impact of environmental factors on performance of building project using different statistical tests. These environmental factors include political, cultural, economic, physical, legal, financial and sociological factors. These factors are also considered as critical success factors for projects due to their significance. Most of environmental factors have a significant influence on projects during planning phase but some factors affect the projects till their completion, such factors include social and natural environment. One of the most significant factor which influence project's performance is political situation.

As mentioned earlier the road construction industry in Ethiopia is difficult for most of employees. Especially road projects in rural areas and those which have long stretches are difficult for employees whom cannot work in in dynamic environment. Some of the environmental related factors include: Air quality, Noise level, Wastes around the site and Climate condition.

2.2. Empirical Literature

Shaban (2008) in his thesis on factors affecting the performance of construction projects in the Gaza Strip, found out that the most important factors agreed by the owners, consultants and contractors were: average delay because of closure and materials shortage, availability of resources as planned through project duration, leadership skills for project manager, escalation of material prices, availability of personals with high experience and qualification and quality of equipment and raw materials in project. Bui and Ling, (2010) in the study that was carried out in Vietnam on factors affecting construction project outcomes discovered that major enablers that lead to project success are foreign experts‟ involvement in the project, government officials inspecting the project and very close supervision when new construction techniques are employed. A factor which leads to poor performance is the lack of accurate data on soil, weather, and traffic conditions. Amusan, (2011) studied factors affecting construction cost performance in Nigerian construction sites. It was discovered from the analysis that factors such as contractor's inexperience, inadequate planning,

inflation, incessant variation order, and change in project design were critical to causing cost overrun, while project complexity, shortening of project period and fraudulent practices are also responsible. Fetene, (2008) did a study on causes and effects of cost overrun on public building construction projects in Ethiopia. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun. The rate of cost overrun ranges from a minimum of 0% to the maximum of 126% of the contract amount for individual projects. Iyer and Jha (2006) did a research on factors affecting cost performance evidence from Indian construction projects and found out that the project manager's competence and top management support are found to contribute significantly in enhancing the quality performance of a construction project. Nyangilo, (2012) did an assessment of the organization structure and leadership effects on construction projects' performance in Kenya, he found out that lack of appropriate project organization structures, poor management systems and leadership are the major causes of poor project performance. Gbadura and Oke, (2010) examined project management leadership styles of Nigerian quantity surveyors, on the general note, Nigerian quantity surveyors were found to be autocratic using Jerrell/Slevin measuring instrument while in the opinion of Nigerian construction professionals; they are more of task oriented in discharging their duties as construction project managers. Iyagba, OdusamiandOmirin, (2003) did a research on the relationship between project leadership, team composition and construction project performance in Nigeria. The tests of the hypotheses led to the conclusion that there was significant relationship between the project leader's professional qualification, his leadership style, team composition and overall project performance. No significant relationship was found between the project leader's profession and overall project performance.

2.3 Conceptual framework

The conceptual framework in this study was used to show various variables that affect the performance of construction projects.

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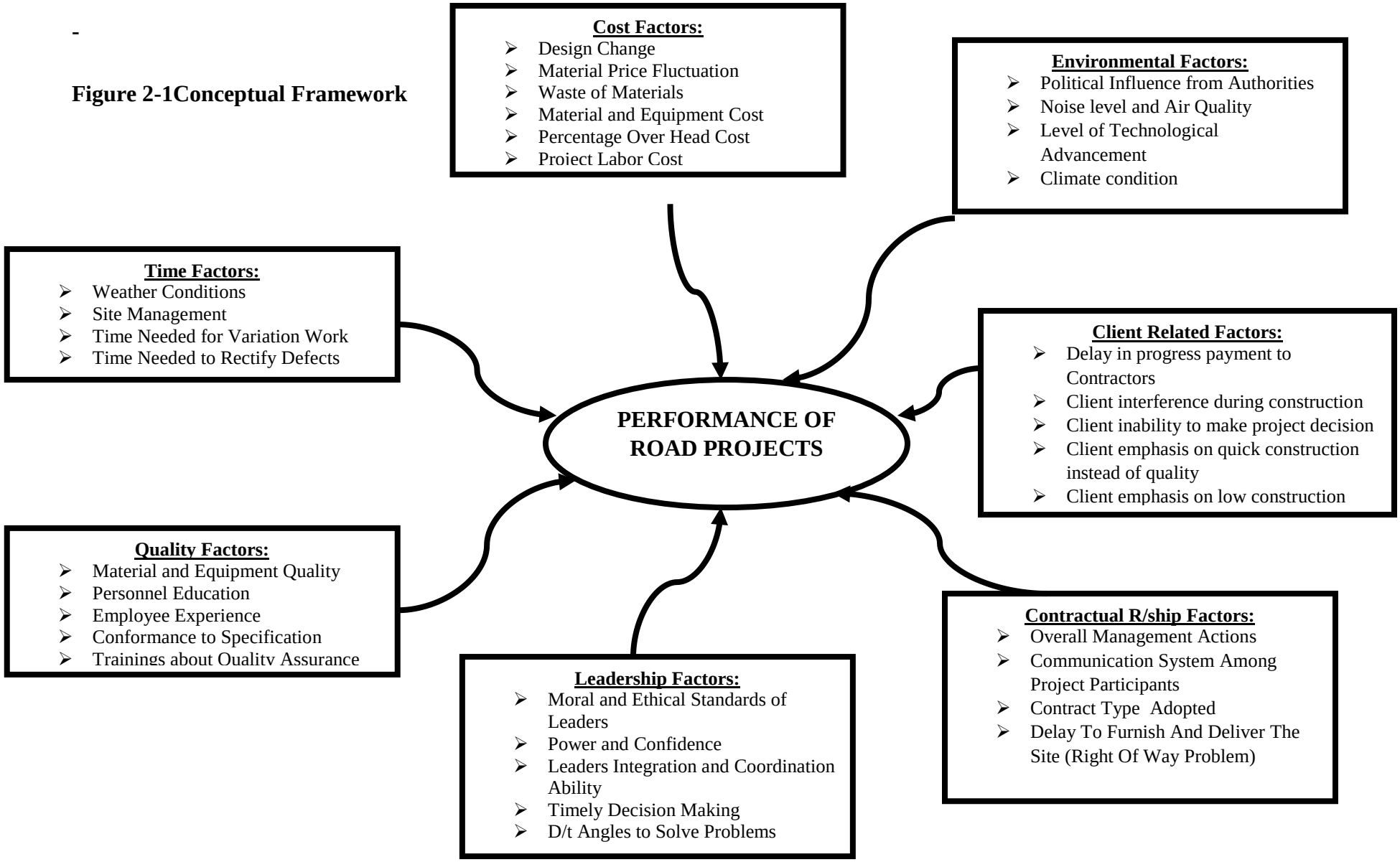
Figure 2-1Conceptual Framework



CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Research Design and Approach

The research used descriptive type of research design, because it attempt to describe the actual rate of performance indicators and the variables or factors affecting construction project performance in Defense Construction Enterprise. The research obtains qualitative data in nature, which in turn were used for description. The research used qualitative approach since it was found to be better to identify the main performance related factors.

3.2. Target Population,

The target population for the study involves employees at Defense Construction Enterprise at head office level in departments including Road, Irrigation and Dam Core Process Department, Procurement, Internal Audit, Planning and Business Development, and Construction Equipment Management. At project level Project Managers, Site and Office Engineers, Machine Operators, Construction Engineers, Equipment Administration Team, Resource Supply Team and Others have been targeted.

Table 3.1. Target Population

S.N	**Target population**	**Number of Employee**
	Head Office	
1	Road, Irrigation and Dam Core Process Department	45
2	Procurement Department	42
3	Planning and Business Development Department	15
4	Property Administration Department	25
5	Resource Supply Department	30

	Project Office	
1	Project Managers	05
2	Site and Office Engineers	36
3	Construction Engineers	10
4	Operators	81
5	Equipment Administration Team	25
6	Resource Supply Team	28
Total		**342**

3.3. Sampling Design

A sample of respondents has been drawn from the employees of Defense Construction Enterprise. The study uses purposive sampling technique to select the sample, where 23.4 % of the target population will be taken to arrive at a sample size of 80 respondents. Statical equation has been used to calculate sample size as described in equations below. According to Kothari (2004), purposive sampling starts with a purpose in mind and the sample is thus selected to include people of interest and exclude those who do not suit the purpose. The technique allows a researcher to use cases that have the required information with respect to the objectives of the study (Kothari, 2004). The study will deem managers, team leaders, senior officers in the road construction department, human resource, finance, procurement, internal audit, planning and business development, Information Communication, property administration and construction equipment management departments to be knowledgeable on factors affecting construction projects performance in Defense Construction Enterprise.

$SS= [Z^2*P*(1-P)]/C^2$ …….. ……. Equation 1 : Sample size for unlimited population.

Where:
SS= Sample Size
Z = Z value (e.g. 1.96 for 95% confidence level)
P= Percentage picking a choice as a decimal (0.5 used for sample size needed)
C = Margin of Error (9%)

$SS = [1.96^2*0.5*(1-0.5)]/0.09^2 = 118.57 = 119$

Correction for finite population:

SS new = SS/ [1+ (SS-1)/POP] ……. Equation 2

Where POP is the population of the DCE staff, which is is 342 as per the data.

SS new = 119/ [1+ (119-1)/342] = 81.02 = 80

3.4. Sampling Distribution

After sample departments were identified purposively each department respondents were selected using Stratified random sampling –population is divided into strata according to their department, and samples are then randomly select from each stratum for heterogeneous population.

Table **3.2**. Sampling distribution

S.N	**Target population**	**Number of Employee**
	Head Office	
1	Road, Irrigation and Dam Core Process Department	07
2	Procurement Department	02
3	Planning and Business Development Department	02
4	Property Administration Department	02
5	Resource Supply Department	02
	Project Office	
1	Project Manager	05
2	Site and Office Engineers	20
3	Construction Engineers	10
4	Operators	06
5	Equipment Administration Team	12
6	Resource Supply Team	12

Total	**80**

3.5. Sources and Tools of Data Collection

This study uses both primary and secondary data sources. Primary sources of data include interview and questionnaire, where as to identify the factors affecting construction project performance various literature reviews was taken.

3.5.1. Questionnaire

Semi-structured questionnaire prepared and distributed to managers, team leaders, and senior officers. The questionnaire has close-ended questions. The target groups are selected as respondents because they are deemed to be knowledgeable about factors affecting the performance of road construction projects in the enterprise and could provide important perspective on various factors that affecting road construction projects performance turnover in the enterprise.

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. In this research, ordinal scale is used. Ordinal scale is a ranking or a rating data normally uses integers in ascending and descending order. Hence, the questionnaires will be structured based on those used by Iyoha and Faboyede (2011), and Sharif (2010).With regard to the close- ended questions, the respondents will be asked to indicate their level of agreement on a five point Likert scale as shown in the following ratings.

Table 3.3 : Five Point Likert Scale

Item	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Scale	(1)	(2)	(3)	(4)	(5)

On this scale a score of 5 or 4 indicates that the item is perceived to be essential while a score of 3 or 2 indicates that the item is perceived to be fairly important, but not essential,

while a score of 1 indicates that the item could be disregarded for being unimportant. Similar scales have been used by Courtis (1992) and Iyoha and Faboyede (2011) and is found suitable.

The relative index technique has been widely used in construction research for measuring attitudes with respect to surveyed variables. Several researches use the relative importance index in their analysis. The respondents have been asked to gauge the identified interface problems on a five-point Likert scale (1 for the not significant to 5 for the extremely significant). Based on the survey response, a mean value will be tabulated.

3.5.2. Interview

Interview using the semi-structured questionnaire have been conducted with top and middle management members of the Enterprise. It allows some degree of flexibility at the time of interviewing for the pursuit of unexpected line of inquiry.

3.6. Method of Data Analysis

To analyze the respondent's perspective on the factors affecting the performance of road projects in DCE, the component part of descriptive statistics such as mean and standard deviation will be used while analyzing the data and presented in tabular and graphic forms. The questionnaire quantitative data analysis will be done by using the Statistical Package for the Social Science IBM SPSS 20 and the following statistical tools were used:

3.6.1 The Relative Importance Index (RII)

Likert scaling will be used for ranking questions that have an agreed level. The respondents were required to rate the importance of each factor on a 5-point Likert scale using 1 for strong disagree (not important at all), 2 for dis agree (no importance), 3 for neutral (somewhat important), 4 for agree (important) and 5 for strong agreement (very important). Then, the Relative Importance Index was computed using the following equation:

$$RII = \frac{\sum_{i=1}^{5} Wini}{AN}$$ **…… Equation 3**

Where: RII= Relative Importance Index

Wi= range given to each factor range from 1-5, (n1 = number of respondents for strongly disagree, n2 = number of respondents for disagree, n3 = number of respondents for neutral, n4 = number of respondents for agree, n5 = number of respondents for strongly agree).

A =the highest weight (i.e. 5 in the study)

N=the total number of samples. The relative importance index ranges from 0 to 1.

3.6.2. Data Coding

For the ease of the analysis codes have been using while analyzing responses in SPSS 20. The codes have been given a per the questionnaires order from A-G. For example A1 represents design changes affects the performance of DCE road projects, A2 represent fluctuation in the cost of materials affects the performance of DCE road projects. All the coding's used in the SPSS 20 analysis has been attached in Appendix C.

3.7. Validity of the Instruments

To ensure validity of the research instrument, the questionnaires is prepared in advance and pre-tested using a small number of respondents, randomly selected from target respondents. This assist in removal of any ambiguities hence focused the questionnaire to collect data relevant to the study. In addition, the researchers give the questionnaire for expert opinion to ensure validity of the data collection instrument. This involved going through the questionnaire in relation to the set objectives and making sure that they contain all the information that can enable answer these objectives.

3.8. Reliability of the Research

Reliability is referred as the extent to which a test, measurement procedure or a questionnaire generates common outcomes on repeated trials. Shortly it is the consistency or stability of scores across raters or over time (Sandelowski, 2000). Similarly (Hooley et al. 2008) has mentioned that reliability is the degree to which the measures yield stable results and are free from error i.e. the measurement procedure stableness. If a procedure or measurement device stably assigns similar score to objects or individuals with common values, the components is assumed reliable. Reliability involves the reproducibility or consistency of scores test i.e., the degree to which one can expect similarly stable individual's deviation scores across testing situations on parallel or verifying components. Reliability is adopted in this study by ensuring that no question is answered twice by the same respondent and all respondents have answered all the questions in the questionnaire. Cronbach's alpha is also be used to check their reliability and to know internal consistency among the given items.

3.9. Ethical Consideration

Ethics is an important aspect in any research. There has to be some basic ethics to be adopted in any research. In the study ethics is handled by the researcher by keeping the answers acquired strictly confidential especially for administrative type questions. Besides, a prior permission was taken by the researcher from the target respondents before conducting the research.

CHAPTER FOUR

4. RESULTS AND DISCUSSION

4.1. Introduction

This chapter provides explanations for data collection such as distribution of the questionnaire, collection of responses and subsequent analysis of the data acquired through the responses from professionals and staffs who are working in road projects of Defence Construction Enterprise.

The principal purpose is to identify the factors affecting the performance of selected road projects in the construction industry especially in DCE and to find out the way how to enhance the performance of these projects.

A questionnaire survey and interview questions has been conducted to gather the required information from staffs at head office and selected road projects of DCE. The selected road projects are Mekelle – Adigudem – Wukro Maintenace Project, Debreeit air force compound road project, Beles Mekanebiran Design and Build Road project, Mekelle – Dangolat – Samri - Finarwa Road Project and Dicheto-Galafi Rigid Pavement Road project.

A total of 80 questionnaires were sent to the selected sample of respondents which comprise of 15 from head office staffs and the rest 65 are from project sites of the selected five road projects. A sample of the questionnaires is attached in Appendix A. The interview questionnaires were prepared for 05 top and middle management members of the Enterprise at head office level.

A total of 80 questionnaires were sent to the two groups of respondents in the company. Out of 80 questionnaires, 67 questionnaires were collected on person for the head office staffs and through different Medias for the project staffs. Out of the returned 15 are from head office staffs and 52 from project site staffs. The table below shows the breakdown of responses from the two sample groups.

Table 4.1 : Respond Rate

Group	Questionnaires	Questionaries'	Percentage
Head Office Staffs	15	15	100%
Project Staffs	65	52	80%
Total	**80**	**67**	**83.7%**

Source: Own Survey

4.2. Analysis and Discussion of Results

In this section, analysis of respondents' understanding and views on the factors affecting the performance of road projects in DCE have been considered and discussed. The responses of the various contract groups to the questionnaire (Appendix A) were analyzed and discussed in subsequent sections.

4.2.1. Respondents Demographic Information's

The following figure shows the gender composition of respondents as per the collected responses. Accordingly, 61.2% respondents are male and 38.8% are female. It means most of the respondents are male.

The table also shows respondent's age composition and educational background and the total percentage they possess. Accordingly, majorities (49.3 %) of the respondents were aged between 31 and 40 years and 35.8 % are above 41 years. In case of educational background/level of respondents, majorities (58.2 %) are first degree holder and the rest are diploma and second degree holder.

As per the table respondent's position in DCE and their work experience on road projects and the total percentage they possess. Accordingly, majority (47.8 %) of the respondents were senior engineer mostly working on sites. In case of respondents experience on road projects, majorities (46.3 %) have 5-10 years of experience while 32.8% have more than 10 years' experience.

Table 4.2: Demographic information's

Variable	Frequency	Percent
Male	41	61.2
Female	26	38.8

Total	67	100.0
Respondent age	N (%)	
20 - 30	10 (14.9)	
31 - 40	33 (49.3)	
41 - 50	17 (25.4)	
Greater than 50	07 (10.4)	
Educational levels		
Diploma	13 (19.4)	
Bachelor degree	39 (58.2)	
Post graduate	15 (22.4)	
Respondent Position	N (%)	
Senior Engineer	32 (47.8)	
Project Manager	05 (7.5)	
Supporting Staff	15 (22.4)	
Operators	04 (6.0)	
Equipment Department	11 (16.4)	
Experience of Respondents		
<5	14 (20.9)	
5-10	31 (46.3)	
10-15	15 (22.4)	
>15	07 (10.4)	

Source: Own Survey

4.2.2. Identified Performance Factors Which Affect the Performance of Road Projects in DCE

4.2.2.1. Cost Factors

Of the sampled projects Mekellle Dangolat Samre Finarwa Road Project has a total of 6% cost overrun as of April 2019, which is 75,660,000 ETB additional costs above the schedule. This will have its own influence on the performance of the project and the company as a whole. The respondents were asked to indicate their level of agreement with the following six cost related factor and their influence on the performance of road projects in DCE. The response was rated on a five-point scale on which 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=strongly agree, and the findings are presented in table 8 below.

Table 4.3 : Cost Factors

No	**Cost Related Factors**	Code	N	Mean	RII	Rank
1	Design Changes	A1	67	3.78	0.755	2
2	Fluctuation in the cost of materials	A2	67	3.82	0.764	1
3	Waste of materials	A3	67	2.96	0.591	6
4	Material and equipment cost	A4	67	3.64	0.728	3
5	Low overhead percentage of project	A5	67	3.27	0.654	5
6	Low project labor cost	A6	67	3.30	0.660	4
			Average	**3.46**	**0.692**	

Source: Own Survey

As shown above fluctuation in the cost of materials ranked 1st as it is the main cost factor which affects the performance of road projects in DCE. In the company, Most of the road projects have an average of 4 years life time, which is long enough to have a lot of fluctuations in the cost of materials from the estimated and signed contract amount considering Ethiopians economic stability. These fluctuations are usually uprising and this increase in the cost of materials will affect the cash flow of the company, which means less equipment's and manpower to be mobilized which in turn affect the performance of these road projects. Furthermore as per the responses design changes made during project life and equipment cost are listed in the top three cost factors which affect the road projects performance. There is no clear number stated in the contracts for the frequency of revisions to be made in the project life cycle. Design changes or revisions for the completed sections of the project might add temporary cost value to DCE but it will affect the time and overall performance of the project in long run. The more design changes at completion stage of the project the more their effect on the performance. Since there are more than 11 road projects in DCE it is difficult to work with own equipment's in all of the projects, so the better solution is to rent them. Rental equipment's need more careful site and office management during working hours. The more reluctant on controlling their work, the more their effect on the company cash flow which have a direct effect on the performance of the road project.

When we see the cost factor generally respondents were asked to indicate their level of agreement on the extent that the cost factors will affect the performance of road projects in DCE and majority of them (mean score 3.46) agreed with that the fact that cost factors indeed affect the performance.

4.2.2.2. Time Factors

Time factors are one of the many factors which are identified and listed as one of the possible factor to affect the performance of road projects in DCE. Respondents indicate their level agreement for the time factors as shown below in table 9.

Table 4.4 : Time Factors

No	**Time Related Factors**	Code	N	Mean	RII	Rank
1	Weather Condition	B1	67	4.16	0.833	1
2	Project site management problem	B2	67	3.69	0.737	2
3	Delay in claim approval	B3	67	3.67	0.734	3
4	Long time needed to implement	B4	67	3.19	0.639	5
5	Long time needed to rectify defects	B5	67	3.34	0.669	4
			Average	**3.61**	**0.722**	

Source: Own Survey

As shown above weather condition of the projects ranked 1st as it is the main time factor which affects the performance of road projects in DCE. Of the sampled 5 projects, 3 of them are located in Afar region and 2 of them are in good weather condition areas. As per company report, when we compare their monthly performance the ones located in good weather condition have good performance when comparing to the Afar area project. This can be related with the working time in Afar is less than the other sections due to its weather condition and equipment costs are higher in Afar areas than the others since equipment's have frequent breakdown and chance of getting the required spare part nearby is unlikely. This affects the time and cost performance of the road project. Furthermore as per the responses Project site management problem and Delay in claim approval are listed in the top three time factors which affect the road projects performance. Project site managements like dispute resolution systems, stakeholder's management, scheduling of engineering works and other need considerable effort from project administers, time to solve them and related cost. In Ethiopia the main gap of Ethiopian contractors in in managing these site management issues in the required degree, with in less time and budget, which have a direct and considerable effect on the performance of these road projects. These days' time and cost claim are common in most of DCE projects, but clients take time to check and approve these

issues and grant the required claim. These delays in approval have effect on DCE road projects performance.

When we see the time factor generally respondents were asked to indicate their level of agreement on the extent that the time factors will affect the performance of road projects in DCE and majority of them (mean score 3.61) agreed with that the fact that time factors indeed affect the performance.

4.2.2.3. Quality Factors

Quality factors are one of the many factors which are identified and listed as one of the possible factor to affect the performance of road projects in DCE. Respondents indicate their level agreement for the quality factors as shown below in table 10.

Table 4.5 : Quality Factors

No	**Quality Related Factors**	Code	N	Mean	RII	Rank
1	Low quality of materials and equipment used in the project construction	C1	67	3.42	0.684	3
2	Educated personnel and experience	C2	67	3.73	0.746	1
3	Conformance to specifications	C3	67	3.19	0.639	4
4	Quality assurance training and follow up	C4	67	3.46	0.693	2
			Average	**3.45**	**0.691**	

Source: Own Survey

As shown above educated personnel and their experience ranked 1st as it is the main quality factor which affects the performance of road projects in DCE. Educational back ground and experience of employees in the company especially those at management level are mandatory for the success and failure of a certain project. In DCE, since the company is governmental institution, there is a fixed fee for each of the position as per the human resource manual. Taking in to consideration the shortage of experienced experts in the country, the company will not be competitive enough to have those experts for its project. This gap has its own effect on the performance of the road projects. Furthermore as per the responses Quality assurance training and follow up and Low quality of materials and

equipment used in the project construction are listed in the top three quality factors which affect the road projects performance. Due to lack of experienced personnel's, the company introduces continuous quality assurance training programs for its employees. The more effective these trainings are the better performance the projects will have. Use of Low quality of materials and equipment in the project construction is the other main factor affecting the performance of road projects in DCE. There is a knowledge gap on purchasers while selecting materials and equipment's from the stock market.

When we see the quality factor generally respondents were asked to indicate their level of agreement on the extent that the quality factors will affect the performance of road projects in DCE and majority of them (mean score 3.45) agreed with that the fact that quality factors indeed affect the performance.

4.2.2.4. Leadership Factors

Leadership factors are one of the many factors which are identified and listed as one of the possible factor to affect the performance of road projects in DCE. Respondents indicate their level agreement for the leadership factors as shown below in table 11.

Table 4.6: Leadership Factors

No	**Leadership Related Factors**	Code	N	Mean	RII	Rank
1	Leader's professional education and work experience	D1	67	2.93	0.585	7
2	Adequate training to leaders	D2	67	3.49	0.699	2
3	Leader's ability to motivate employees	D3	67	3.37	0.675	3
4	Leader's ability to integrate and coordinate activities	D4	67	3.49	0.699	1
5	Leader's ability to provide timely decision making	D5	67	3.09	0.618	5
6	Power and Confidence	D6	67	2.99	0.597	6
7	Different angles to Solve Problems	D7	67	3.33	0.666	4
		Average		**3.24**	**0.645**	

Source: Own Survey

As shown above Leader's ability to integrate and coordinate activities ranked 1st as it is the main leadership factor which affects the performance of road projects in DCE. In construction, there are serious of activities which need to be started and completed on their own time. Leaders having good planning knowledge are the ones which are successful in managing and performing tasks. The main profit and loss of the project depends on managing each and every task of the project to be completed as per the plan especially those on critical path line. Since resources are limited in each project, one lag of a task means another cost and time increase in the whole project. A project having Leaders with the knowledge and ability of planning and managing these activities is more chance of success that those who doesn't have. Furthermore as per the responses Leader's ability to motivate employees and adequate training to leaders are listed in the top three leadership factors which affect the road projects performance. Quality of leaders expressed not only in their ability in planning and managing tasks but also in managing and motivation employees when needed. Motivated employees are more productive in their work, which in turn increases the performance of the road projects in DCE.

When we see the leadership factor generally respondents were asked to indicate their level of agreement on the extent that the leadership factors will affect the performance of road projects in DCE and majority of them (mean score 3.24) agreed with that the fact that leadership factors indeed affect the performance.

4.2.2.5. Contractual Relationship Factors

Contractual relationship factors are one of the many factors which are identified and listed as one of the possible factor to affect the performance of road projects in DCE. Respondents indicate their level agreement for the Contractual relationship factors as shown below in table 12.

Table 4.7 : Contractual Relationship Factors

No	**Contractual Relationship Factors**	Code	N	Mean	RII	Rank
1	Overall Management Actions	E1	67	3.55	0.710	2
2	Communication System Among Project Participants	E2	67	3.12	0.624	4
3	Contract Type Adopted	E3	67	3.49	0.699	3

4	Delay To Furnish And Deliver The Site (Right Of Way Problem)	E4	67	4.21	0.842	1
			Average	**3.59**	**0.719**	

Source: Own Survey

As shown above Delay to furnish and Deliver the Site (Right Of Way Problem) ranked 1st as it is the main Contractual relationship factor which affects the performance of road projects in DCE. As per the trend of Ethiopian construction solving ROW problems started after commencement of actual works by the contractor. The number and extent of ROW are not known even after the actual commencement of the works. Most of the time claims granted in DCE road projects status is due to untimely response on right of way problems. As it is seen from mean value (4.21), respondents without doubt strongly agree on its effect on the performance of road projects in DCE. As per the monthly reports of DCE, even if 98% of the project contract time is elapsed, more than 75% of the right of way issues (mostly houses) are not resolved yet. Omitting ROW section and mobilizing resources to ROW free sections irrespective of current schedules leads to additional mobilization cost, which in turn affects the cash flow, quality of road, employees motivation and stakeholders satisfaction. All these have their own effect on the performance of the road projects in DCE. Furthermore as per the responses Overall Management Actions and Contract Type Adopted are listed in the top three Contractual relationship factors which affect the road projects performance. There are mainly two contract types as per the contract agreements of DCE, Admeasurement & Design and Build. In Admeasurement contract type all the design have been prepared and approved by the consultants and any quantity variation or design issue will not be the responsibility of contractor. The contractor will be paid for each and every work performed as per the contract. This contract type give freedom to contractors and most of the time they are beneficial with respect to decreasing the time needed to prepare and approve drawings and the risks are shared. In Design and Build type of contracts all the design are prepared by the contractor as per their proposal but before actual construction the designs need to be approved by the consultant. These lead to unplanned time delays till design are approved. The advantage of this contract type is the contractor can submit any design proposal which it thinks it will decrease the cost, so that it will be beneficial with the

cost difference. So the types of contract used have its own direct effect on the time, cost and quality of road projects in DCE.

When we see the Contractual relationship factor generally respondents were asked to indicate their level of agreement on the extent that the Contractual relationship factors will affect the performance of road projects in DCE and majority of them (mean score 3.59) agreed with that the fact that Contractual relationship factors indeed affect the performance.

4.2.2.6. Client Related Factors

Client related factors are one of the many factors which are identified and listed as one of the possible factor to affect the performance of road projects in DCE. Respondents indicate their level agreement for the Client related factors as shown below in table 13.

Table 4.8 : Client Related Factors

No	**Client Related Factors**	Code	N	Mean	RII	Rank
1	Delay in progress payment to Contractors	F1	67	3.51	0.701	3
2	Client interference during construction	F2	67	2.58	0.516	4
3	Client emphasis on quick construction	F3	67	3.73	0.746	2
4	Client emphasis on low construction cost	F4	67	3.85	0.770	1
		Average		**3.42**	**0.683**	

Source: Own Survey

As shown above Client emphasis on low construction cost ranked 1st as it is the main Client related factor which affects the performance of road projects in DCE. Especially in Admeasurement contract type clients are determined to decreases the construction costs of the project, since all the design are prepared by the consultant. Unlike that of Design and Build contracts where the clients are determined to be concerned on the safety and quality of the projects irrespective of the cost to be incurred, sometimes road qualities are affected due to the low cost mentality of clients. These low cost assumption have a direct effect on the quality of the road, contracts quality habit and stakeholders satisfaction. As per the reports of DCE, most of disputes are occurred due to quality disagreements between client and

contractor (DB Contracts) and cost disagreements (Admeasurement contracts). Furthermore as per the responses Client emphasis on quick construction and Delay in progress payment to Contractors is listed in the top three Clients related factors which affect the road projects performance. In addition to client emphasis on low cost construction, they emphasis on quick constructions as well. As per the data's in DCE reports there wasn't any liquidated damages incurred by DCE in its road projects history even if most of the projects have been completed at an average of 125% elapsed time. This doesn't necessary indicate the client has no emphasis on quick construction cost yet granting that average 25% additional time wasn't easy and it did affect the performance of the project considering the time taken to approve it. With regard to payment issues, most of the sub-contractors in DCE are affected due to the low cash flow of the company which leads to low performance of sub-contractors and has its effect on the performance of the main projects.

When we see the Client related factors generally respondents were asked to indicate their level of agreement on the extent that the Client related factors will affect the performance of road projects in DCE and majority of them (mean score 3.42) agreed with that the fact that Client related factors indeed affect the performance.

4.2.2.7. Environmental Factors

Environmental factors are one of the many factors which are identified and listed as one of the possible factor to affect the performance of road projects in DCE. Respondents indicate their level agreement for the Environmental factors as shown below in table 14.

Table 4.9: Environmental Factors

No	**Environmental Factors**	Code	N	Mean	RII	Rank
1	Political Influence from Authorities	G1	67	3.66	0.734	2
2	Noise level and Air Quality	G2	67	3.52	0.704	4
3	Level of Technological Advancement	G3	67	3.58	0.716	3
4	Climate condition	G4	67	4.13	0.827	1
		Average		**3.72**	**0.745**	

Source: Own Survey

As shown above Climate condition ranked 1st as it is the main Environmental factor which affects the performance of road projects in DCE. Especially for structural works of the road projects, it was difficult to forecast the exact climate condition of the project areas even if with the support of National Metrology data's. Most of the arid areas have less than a month of rain seasons yet most of the gorges of these areas get unexpected flood for the whole summer and other seasons of the country. As per the dates in DCE reports up to date more than 5 bridge constructions have been destroyed by unexpected flood and incurred an extra time and cost variation on the company. Furthermore as per the responses Political Influence from Authorities and Level of Technological Advancement are listed in the top three Environmental factors which affect the road projects performance. This time political influence of authorities is one of the main factors affecting not only the performance of the road project but also the existence of some local contractors. As per the data's in DCE reports as of May 2019, a total of 95 days has been delayed in one of its projects due to political influence of authorities. In level of technological advancement, DCE uses more advance technologies in 02 of the selected road projects.

When we see the Environmental factors generally respondents were asked to indicate their level of agreement on the extent that the Environmental factors will affect the performance of road projects in DCE and majority of them (mean score 3.72) agreed with that the fact that Environmental factors indeed affect the performance.

4.3. Descriptive Results

The survey achieved an overall response rate of 83.7%. The analyses of the survey revealed the following key observations:

1) Most of the respondents (61.2%) are male and as per the data half of the respondents (49.3%) are aged between 31 and 40 where as 10.4% are above 50 years.

2) More than half of the respondents (58.2%) are bachelor degree holders and 22.4% are post graduates.

3) As per the relative importance index test the analysis revealed that as a category (taking average value) Environmental Factors are the main (ranked 1st) factors

affecting the performance of road projects in DCE whereas Time Related Factors and Contractual R/ship Factors are one of the top three factors to affect the performances.

4) As per the relative importance index (RII) index the following are the top ten factors which affect the performance of road projects in DCE identified by respondents.

Table 4.10 – Top ten factors which affect the performance of the road projects:

No.	Code	Factor	RII	Categories
1	**E4**	Delay to furnish and deliver the site (ROW)	0.842	Contractual R/ship Factors
2	**B1**	Weather condition	0.833	Time Factors
3	**G4**	Climate condition	0.827	Environmental Factors
4	**F4**	Client emphasis on low construction cost	0.770	Client Related Factors
5	**A2**	Fluctuation in cost of materials	0.764	Cost Factors
6	**A1**	Design change	0.755	Cost Factors
7	**F3**	Clients emphasis on quick construction	0.746	Client Related Factors
8	**C2**	Educated personnel and experience	0.746	Quality Factors
9	**B2**	Project site management problem	0.737	Time Factors
10	**B3**	Delay in claim approval	0.734	Time Factors

Source: Own Survey

4.4. Analysis of Qualitative data from interview

A semi structure interview has been prepared for 06 top and middle management staffs at head office and project level has been conducted. The following is there position and project.

Table 4.11 : Interviewed DCE staffs

No.	Staff Position	Working Station	Remark
1	Project Manager	Project	Mekelle Dangolat Samri Finarwa Road Project
2	Project Manager	Project	Debrezeit Air Force Compound Road Project

3	Senior Engineer	Project	Beles Mekane Birhan Design and Build Road Project
4	Senior Engineer	Head Office	Addis Ababa
5	Resource Supply Officer	Head Office	Addis Ababa
6	Procurement Officer	Head Office	Addis Ababa

Source: Own Survey

Respondents reply has been compiled below as per the interview questions order.

1. **How do you see the relationship between client, consultant and the contractor affect the performance of your project?**

   One of the interviewee explained the performance of road project depends on the relationship between the consultant and contractor. The consultant main purpose is to assist the contractor in solving problems and bottle neck situation so that the project will be completed on time, within budget and within scope. Furthermore the other interviewee added that most of the time client did not interfere with the day to day work of the contractor unless and otherwise some ambiguous issues occurred and need client's interference. Interviewee at Beles agrees on the explained purpose of consultants yet he added that in their specific project consultants are the main causes regarding the poor performance of the road project. He added some of consultant staffs believe they have the whole power in commencing and terminating a specific activity even if it's their common duty to follow the procedures until a specific output is delivered.

   Interviewee at Head Office added clients have a problem in maintaining the contract they have agreed with contractors. Some contract time have been elapsed more than 200% yet clients (mostly Ethiopian Roads Authority) did not terminate the project this makes contractors not to give due attention to contract agreements in the upcoming projects and it will loosen the contract administration habit of contractors.

2. **How right of way does is affecting the project performance? Is there any solution you propose to solve the issue?**

Two of the interviewees complain on this issue and explain that it is the main problem in every road projects as they have seen in their experience. Interviewee at Mekelle gives a statistical data for his project regarding ROW problems as follows:

- As of March 30, 2019 the project physical status is 42.3% whereas the elapsed time is 81%. Currently 5.6 km of the town section and 3.6 Km of rural section have ROW problems which have not solved yet even if their existence is known right after the design completed on June 25, 2016. It's clear that the contractor has its contribution to the slow progress of the project but the client has not cleared its duty as per the contract agreement and now the project is requesting 200 calendar days of extension time to complete the remaining works.

The interviewees suggest the following solutions to decrease the effect of ROW problem on the road projects.

A. The client should know the possible obstruction to be cleared before bidding the projects to potential contractors and the ROW clearance should be started at least 6 months before the contractor's commencement date.
B. Awareness should be created for the community and local authorities especially the rural areas so that proper compensation should be given to the rightful person. (since most of the delay is due to the amount of compensation estimated and to whom it should be paid)
C. Written and proper responsibility should be given to local Ethiopian telecommunication and ELPHA authorities and city mayors before the commencement of the project so that they should be aware of the issues ahead.

Interviewee at head office added that in addition to the above solution the compensation payment procedure of clients should be revised to decrease the time it takes even after the readings and estimations have been done. Sometimes it took more than 3 months to transfer the payments.

3. **How do you rate the performance of your project manager and its contribution to the performance of the project?**

   Interviewee at project explains having a good project manager does affect the performance of the road projects in DCE. Some project managers have the technical skill about the engineering work yet they don't have enough management and leadership skill to motivate and manage workers and vice versa.

   The other interviewee added that of the staffs at project levels the performance of the project manager is the main factor in the overall project progress. Both suggest there should be proper and well defined guidelines in selecting and follow up of project managers.

4. **As per your perspective, what are the main reasons for the time delay of the project?**

   The following are the reasons forwarded by the staffs for the time delay of the road projects:

   1. Inadequate planning and scheduling
   2. Poor project management system
   3. Right of way problem
   4. Poor site management and supervision
   5. Lack of equipment efficiency
   6. Insufficient Numbers of equipment and labour
   7. Poor resource management
   8. Cash flow and financial difficulties faced by contractors
   9. Mistakes and Errors in design
   10. Unrealistic contract duration and requirements/ Inaccurate time estimate by clients

5. **How do you see the knowledge, skill and ability of employees in the project and their contribution to the success of the project?**

One of the interviewee explained the knowledge, skill and ability of employees is enhance through trainings and internships. Since the company is governmental institution they did accept employees with zero work experience and there is a way to introduce them to the actual work and incase gap seen their skills are developed through continuous trainings.

Interviewee at head office agrees there is training schedules for employees even if it is not well scheduled and regular. As per his believe the trainings given has not succeeded their intended purpose in increasing employees KSA. The main reasons are employees did not select the type of trainings the wanted yet they have been chosen by their superiors. Employee's attitude in believing the training will fill their KSA gap is poor and they will not give enough attentions.

The other interviewees at project level complain most of the trainings are given to head office staffs and even the ones given to project staffs are not given to the right employees.

6. **Does the procurement system at project and head office affect the performance of the project, if yes how?**

One of the interviewee explains it indeed affect the performance of the projects since most of project request are not delivered on time. He also added the company follows government procurement laws and the procurement plan of the company has many restrictions on projects. The procurement plan did not give responsibility for projects to purchase fixed items at project level, even 1000 ETB value item, which make a lot of pressure for head office procurement department considering more than 10 road projects and a lot of building projects at a time.

The interviewees added the procurement plan and system of the company is the second most influencing factor for the poor performance of road projects. They mention as per clause 9 (Head Office and Projects Purchase Authority), sub clause 9.2 (Projects purchase authority), item 9.2.4 to 9.2.8 the procurement plan give the projects the power to purchase items with a total range of 25,000 – 600,000 only. The interviewees suggested these ranges are becoming constraints for some big projects like Dicheto-Galafi Rigid Pavement Road Project (Contract Amount of 2.2 Billion ETB). It's clear that there should be limit on projects purchase authority but it should not been uniform since it will affect the performance of some projects.

The interviewee at head office added that in addition to the stated issues trainings should be given to employees of the procurement department since it will not be good if spare part of 01 dozer (which can cause 1400 ETB loss per hour if it is idle) and soap and detergent accommodation of employees have the same priority in the purchase officers perspective, which happen a lot.

7. **How do you rate the health and safety procedures of the project and its relation to the performance of the project?**

One of the interviewee stated the department is purchasing all requested health and safety equipment's yet projects have not put them in work as per the site visit repots.

The other interviewees added it's clear that health and safety procedures are getting more concern by clients now days. The more the procedures applied, the safe and healthy employees will be and which in turn have a direct effect on the performance of road projects.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The performance of local contractors in the road sector has much significance in developing countries like Ethiopia; hence, their performance in the road construction industry has many impacts on the industry also. Therefore, carrying out a research in this area will have a paramount importance. Identification of factors affecting the performance of road projects is a prerequisite to minimize or to avoid their poor performance and to enhance their capacity in the construction industry. The aim of this research as indicated in Chapter one is to identify factors affecting the performance of road projects in DCE. From the results obtained in the analysis of the questionnaire survey and the following major conclusions have been drawn:

As per the respondents, fluctuation in cost of material is the main cost related factors whereas weather condition is the main time related factors affecting the performance of road projects in DCE. In the company, Most of the road projects have an average of 4 years life time, which is long enough to have a lot of fluctuations in the cost of materials from the estimated and signed contract amount considering Ethiopians economic stability. Of the sampled 5 projects, 3 of them are located in Afar areas and 2 of them are in good weather condition areas. As per company report, when we compare their monthly performance the ones located in good weather condition have good performance when comparing to the Afar area project. And with respect to quality educated personnel and their experience is the main quality factor affecting the performance of road projects in DCE.

Educated personnel and experience and leaders ability to integrate and coordinate activities are the main quality and leadership related factors affecting the performance of road projects in DCE respectively. In construction, there are serious of activities which need to be started and completed on their own time. Leaders having good planning knowledge are the ones

which are successful in managing and performing tasks. The main profit and loss of the project depends on managing each and every task of the project to be completed as per the plan especially those on critical path line.

Relationship between contractors (DCE) and consultants indeed affect the performance of road projects in the company either positively or negatively. There is a gap in clients contract administration which indirectly affecting the performance of local contractors including DCE. As per the trend of Ethiopian construction solving ROW problems started after commencement of actual works by the contractor. The number and extent of ROW are not known even after the actual commencement of the works. Most of the time claims granted in DCE road projects status is due to untimely response on right of way problems

ROW problems are listed as the number 1 factors in affecting DCE road projects performance in both town and rural sections. ROW factors do also affect client's budget and project stakeholder's confidence. The following four solutions has been recommended as a solution: The client should know the possible obstruction to be cleared before bidding the projects, Awareness should be created for the community and local authorities, Written and proper responsibility should be given to local Ethiopian telecommunication and Ethiopian Electric Company authorities and city mayors before the commencement of the project and compensation payment procedure of clients should be revised to decrease the time it takes. Delay to furnish and deliver the site – ROW is the main contractual relationship factors whereas client emphasis on low construction cost are the main client related factors affecting the performance of road projects in DCE.

Respondents also believe that climate condition is the main environmental factors affecting the performance. Especially for structural works of the road projects, it was difficult to forecast the exact climate condition of the project areas even if with the support of National Metrology data's.

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5.2. Recommendation

From the study of the research paper; the following major recommendations are forwarded; As Contractors are mainly responsible for the performance of projects, DCE is suggested to deploy experienced professionals in the area of project planning and scheduling. It is also recommended that contractors to build its capacity in the way of having a better project management system in the company at head office and project level through a different training and capacity building programs. The contractor, DCE, has also advised to deploy and use the resources such as; equipment, manpower, financial and time in efficient and effective way in order to achieve project objectives. Supervision consultants are suggested to hire a qualified technical staff to manage the projects appropriately, so that they would be able to overcome any poor site management and supervision. It is also advised that supervision consultants have also responsibility in the poor performance of road projects.

The client (ERA)is advised to give due attention to grant contractors timely possession of site/right of way before the construction works starts and the client has to verify all the necessary requirements for delivering the site. DCE should work on the procurement plan of the company so that projects have their requested items on time. Trainings should also be given to purchasers on some technical items and their urgency. DCE should work on its employees training and development schedule to give employees what they need and to increase their efficiency. DCE should adopt new work methodologies for sites with extreme climate condition since most of the respondents agree on the fact that climate condition is one of the main factors affecting the performance.

REFERENCE

Abdella M. Odeh and Hussien T. Battaineh (2002), Causes of construction delay: Traditional contracts, Jordan University of Science and Technology, Jordan.

Al-Momani A.H. (2000), Construction delay: a quantitative analysis, International Journal of Project Management 18, PP 51-59.

Aratame Wiguna and Stephen Scott (2005), Nature of the critical risk factors affecting project performance in Indonesian building contracts, University of Newcastle, United Kingdom

Aftab Hammeed Memon, Ismail Abdul Rahman, Mohs Razaki Abdullah and Ade Asmi Abdu Azis (2010), Factors affecting construction cost performance in project management projects: Case of MARA large projects, University of Tun Hussien Onn, Malaysia.

Baloyi L. and Bekker M. (2011), Causes of construction cost and time overruns : The 2010 FIFA world cup stadia in South Africa, South Africa.

Beclrik Gerber B (2011) Transition in to integrated project delivery: Potential barriers and lessons taught, Lean Construction Journal, 18-21,

Carlos M. Alvarado, Robert P. Silverman and David S. Wilson (2005), Assessing the performance of construction projects: Implementing Earned Value management at the general service administration, Journal of Facilities Management, Vol. 3, PP 92-105

Chan Daniel W.M. and Kumaraswamy Mohn M. (2002), Compressing construction durations: Lessons learned from Hong Kong building projects, The Hong Kong Poly Technic University, China.

Chan Daniel W.M. and Kumaraswamy Mohn M. (1996), An evaluation of construction time performance in the building industry, The Hong Kong Poly Technic University, China.

Doloi H. and Young (2009), Achieving cost performance from the clients, consultants and contractors perspective, Anjuran University of Cape Town, South Africa.

Dr. Tahir Nawaz etal (2013), Causes of schedule overrun in Pakistan construction industry, ISOR Journal of mechanical and civil engineering, Volume 5, PP 01-11.

Fetene N. (2008), Causes and effects of cost overrun on public building construction projects in Ethiopia, Addis Ababa University, Ethiopia.

Hilson D.A. (2000), Project risks – Identifying causes, risks and effects, Volume 14, United Kingdom.

Hong Xiao and David G Proverbs (2001), Cost certainty and Time certainty: An international investigation, school of Engineering and The Built Environment, University of Wolver Hampton, United Kingdom.

Iyer K.C. and Jha K.N. (2005), Factors affecting cost performance: evidence from Indian Construction Projects, Indian Institute of Technology, Hauz Khas, New Delhi.

Iyer K.C. and Jha K.N. (2006), Critical factors affecting schedule performance: Evidence from Indian Construction projects, Indian Institute of Technology, New Delhi.

J. Dadzie, A.R. Abdul-Aziz and A. Kwame (2009), Performance of consultants on government projects in Ghana: Clients and Contractors perspective, Kuamasi Polytechnic, Ghana.

J.J Smallwood (1999), The role of health and safety in project management, University of Port Elizabeth, South Africa

Kenneth Nsom Nyonguo (2018), An empirical investigation in to the drivers of the construction project failure in the technical department of the Cameroon Baptist conventional health services, University of Bamenda/Buea, Cameroon.

Liberatus K. Mrema and Simon K. Mhando (2005), Causes of failure of housing projects: Case of unfinished buildings in Dares Salaam, South Africa.

Ling F.Y.Y. and Bui T.T.D. (2010), factors affecting construction project outcomes: Case study of Vietnam, Journal of professional Issues in Engineering education and practice, Vol 15, PP 25-29.

Ling Florence Yean Yng, Low Suipheng, Wang Shou Qing and Lim Hwee Hua (2007), Key project management practices affecting Singaporean firms project performance in china, International Journal of project management, Vol 22, PP 101-115.

Murali Sambasivan and Yauwen Soon (2006), Cause and effects of delay in Malasian construction Industry, University of Management, Malaysia.

Monthly Reports of DCE, (2011).

Navon R. (2005), Automated project performance control (APPC) of construction projects, Construction Automation Laboratory Faculty of Civil Engineering, Israel.

APPENDICES

Appendix A – Questionnaire

ST.MARY'S UNIVERSITY

School of Graduate Studies

Survey Questionnaire on Factor Affecting the Performance of Road Construction Projects

Dear Respondent!

I refer to the above subject matter and hereby confirm that I am second year MA in **Project Management** student of the above named institution, carrying out my thesis for academic purposes. All responses given in this regard will be handled in strict confidence.

Your understanding and co-operation are being solicited for providing all necessary information needed to accomplish the objective of this study.

You can select one of the choices given on the questions in section A (General Information) and for section B, carefully understand the given description about the factors affecting the performance of road projects and circle on one of the most representative levels of agreements indicated in the right.

For more clarification, do not hesitate to contact me with the following addresses.

Phone No. : +251-913-94 36 79

Email : dtneway2@gmail.com

Neway Desalew

Section A: General Information

1. What is your Gender?

Male	◯	Female	◯

2. Position

Senior Engineer	◯	Operator	◯
Project Manager	◯	Equipment Department	◯
Supporting Staff	◯		

3. Experience in the road sector:

<5 years	◯	5-10	◯
10-15	◯	>15	◯

4. Age in Years:

20-30	◯	31-40	◯
41-50	◯	>50	◯

5. Indicate your Level of Education

Diploma	◯	Degree	◯	Post Graduate	◯

Section B:

ASSESSMENT ON IDENTIFYING PERFORMANCE FACTORS OF ROAD PROJECTS:

The Case of Defense Construction Enterprise Selected Road Projects

6. What is your level of perception with the following statements factors affecting the performance of Road Construction projects?

Circle Using a scale of 1 to 5 where 1 = Strongly Disagree (SD), 2= Disagree (D), 3= Neutral (N), 4= Agree (A), and 5 = Strongly Agree(SA)

S.N	Descriptions	SD-1	D-2	N-3	A-4	SA-5
1	**Cost factor**					
1.1	Design changes	**1**	**2**	**3**	**4**	**5**
1.2	Fluctuations in the cost of materials	**1**	**2**	**3**	**4**	**5**
1.3	Waste of materials	**1**	**2**	**3**	**4**	**5**
1.4	Material and equipment cost	**1**	**2**	**3**	**4**	**5**
1.5	Low overhead percentage of project	**1**	**2**	**3**	**4**	**5**
1.6	Low project labor cost	**1**	**2**	**3**	**4**	**5**
2	**Time factors**					
2.1	weather condition	**1**	**2**	**3**	**4**	**5**
2.2	Project site management problem	**1**	**2**	**3**	**4**	**5**
2.3	Delay in claim approval	**1**	**2**	**3**	**4**	**5**
2.4	Long time needed to implement variation orders	**1**	**2**	**3**	**4**	**5**
2.5	Long time needed to rectify defects	**1**	**2**	**3**	**4**	**5**
3	**Quality factor**					
3.1	Low quality of materials and equipment used in the project construction	**1**	**2**	**3**	**4**	**5**
3.2	Educated personnel and experience	**1**	**2**	**3**	**4**	**5**
3.3	Conformance to specifications	**1**	**2**	**3**	**4**	**5**
3.4	Quality assurance training and follow up	**1**	**2**	**3**	**4**	**5**
4	**Leadership factors**					
4.1	Leader's professional education and work experience	**1**	**2**	**3**	**4**	**5**
4.2	Adequate training to leaders	**1**	**2**	**3**	**4**	**5**
4.3	Leader's ability to motivate employees	**1**	**2**	**3**	**4**	**5**
4.4	Leader's ability to integrate and coordinate activities	**1**	**2**	**3**	**4**	**5**
4.5	Leader's ability to provide timely decision making	**1**	**2**	**3**	**4**	**5**
4.6	Power and Confidence	**1**	**2**	**3**	**4**	**5**
4.7	Different angles to Solve Problems	**1**	**2**	**3**	**4**	**5**
5	**Contractual R/ship Factors**					
5.1	Overall Management Actions	**1**	**2**	**3**	**4**	**5**
5.2	Communication System Among Project Participants	**1**	**2**	**3**	**4**	**5**
5.3	Contract Type Adopted	**1**	**2**	**3**	**4**	**5**

S.N	Descriptions	SD-1	D-2	N-3	A-4	SA-5
5.4	Delay To Furnish And Deliver The Site (Right Of Way Problem	**1**	**2**	**3**	**4**	**5**
6	Client Related Factors:					
6.1	Delay in progress payment to Contractors	**1**	**2**	**3**	**4**	**5**
6.2	Client interference during construction	**1**	**2**	**3**	**4**	**5**
6.3	Client emphasis on quick construction instead of quality	**1**	**2**	**3**	**4**	**5**
6.4	Client emphasis on low construction cost	**1**	**2**	**3**	**4**	**5**
7	Environmental Factors					
7.1	Political Influence from Authorities	**1**	**2**	**3**	**4**	**5**
7.2	Noise level and Air Quality	**1**	**2**	**3**	**4**	**5**
7.3	Level of Technological Advancement	**1**	**2**	**3**	**4**	**5**
7.4	Climate condition	**1**	**2**	**3**	**4**	**5**

Thank you for giving your precious time.

Appendix B - Interview Questions

Interview Questions:

1. How do you see the relationship between client, consultant and the contractor affect the performance of your project?
2. How does right of is affecting the project performance? Is there any solution you propose to solve the issue?
3. How do you rate the performance of your project manager and its contribution to the performance of the project?
4. As per your perspective, what are the main reasons for the time delay of the project?
5. How do you see the knowledge, skill and ability of employees in the project and their contribution to the success of the project?
6. Does the procurement system at project and head office affect the performance of the project, if yes how?
7. How do you rate the health and safety procedures of the project and its relation to the performance of the project?
8. What other bottle necks does the project have which influence its performance?

Appendix C – Coding's

No.	Code	Factor	Group
1	**A1**	Design changes	**Cost Related Factors**
2	**A2**	Fluctuations in the cost of materials	
3	**A3**	Waste of materials	
4	**A4**	Material and equipment cost	
5	**A5**	Low overhead percentage of project	
6	**A6**	Project labor cost	
7	**B1**	Weather condition	**Time Related Factors**
8	**B2**	Project site management problem	
9	**B3**	Delay in claim approval	
10	**B4**	Long time needed to implement variation	
11	**B5**	Long time needed to rectify defects	
12	**C1**	Low quality of materials and equipment used	**Quality Related Factors**
13	**C2**	Educated personnel and experience	
14	**C3**	Conformance to specifications	
15	**C4**	Quality assurance training and follow up	
16	**D1**	Leader's professional education and work experience	**Leadership Related Factors**
17	**D2**	Adequate training to leaders	
18	**D3**	Leader's ability to motivate employees	
19	**D4**	Leader's ability to integrate and coordinate	
20	**D5**	Leader's ability to provide timely decision	
21	**D6**	Power and Confidence	
22	**D7**	Different angles to Solve Problems	
23	**E1**	Overall Management Actions	**Contractual R/ship Factors**
24	**E2**	Communication System Among Project	
25	**E3**	Contract Type Adopted	
26	**E4**	Delay To Furnish And Deliver The Site (Right Of Way Problem	
27	**F1**	Delay in progress payment to Contractors	**Client Related Factors**
28	**F2**	Client interference during construction	
29	**F3**	Client emphasis on quick construction instead	
30	**F4**	Client emphasis on low construction cost	
31	**G1**	Political Influence from Authorities	**Environmental factors**
32	**G2**	Noise level and Air Quality	
33	**G3**	Level of Technological Advancement	
34	**G4**	Climate condition	

Appendix D – Computation of RII and Rank

FACTORS AFFECTING THE PERFORMANCE OF ROAD PROJECTS IN DCE																																	
	QUESTIONS																																
ID	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	C1	C2	C3	C4	D1	D2	D3	D4	D5	D6	D7	E1	E2	E3	E4	F1	F2	F3	F4	G1	G2	G3	G4
1	5	4	2	4	4	5	5	3	4	4	5	4	3	3	3	2	3	3	3	3	2	4	5	4	4	5	3	2	4	3	3	3	4	5
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total	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67
Ɛ(Wini)	253	256	198	244	219	221	279	247	246	214	224	229	250	214	232	196	234	226	234	207	200	223	238	209	234	282	235	173	250	258	245	236	240	277
RII	0.755	0.764	0.591	0.728	0.654	0.660	0.833	0.737	0.734	0.639	0.669	0.684	0.746	0.639	0.693	0.585	0.699	0.675	0.699	0.618	0.597	0.666	0.710	0.624	0.699	0.842	0.701	0.516	0.746	0.770	0.731	0.704	0.716	0.827
Rank	**6**	**5**	**32**	**12**	**26**	**25**	**2**	**9**	**10**	**27**	**23**	**21**	**8**	**28**	**20**	**33**	**19**	**22**	**18**	**30**	**31**	**24**	**14**	**29**	**17**	**1**	**16**	**34**	**7**	**4**	**11**	**15**	**13**	**3**

Appendix E - Cronbach's Alpha Test Result

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	67	100.0
	Excluded[a]	0	0.0
	Total	67	100.0

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.700	.702	34

Item Statistics

	Mean	Std. Deviation	N
Design change affect the performance of road projects in DCE	3.78	.670	67
Fluctuation in material cost affect the performance of road projects in DCE	3.82	.650	67
Waste of materials affect the performance of road projects in DCE	2.96	.806	67
Material and equipment cost affect the performance of road projects in DCE	3.64	.620	67
Low overhead percentage of project did affect the performance of road projects in DCE	3.27	.709	67
Low project labor cost did affect the performance of road projects in DCE	3.30	1.000	67
Weather condition affect the performance of road projects in DCE	4.16	.687	67
Project site management affect the performance of road projects in DCE	3.69	.583	67
Delay in claim approval affect the performance of road projects in DCE	3.67	.561	67
Long time needed to implement Variation order affect the performance of road projects in DCE	3.19	.633	67
Long time needed to rectify defects affect the performance of road projects in DCE	3.34	.708	67
Low quality of materials and equipment's used in the project construction affect the performance of road projects in DCE	3.42	.655	67
Personnel's education and experience affect the performance of road projects in DCE	3.73	.510	67
Conformance to specification affect the performance of road projects in DCE	3.19	.435	67

	Mean	Std. Deviation	N
Quality assurance trainings and follow-ups affect the performance of road projects in DCE	3.46	.682	67
Leaders education and work experience affect the performance of road projects in DCE	2.93	.876	67
Adequate training to leaders affect the performance of road projects in DCE	3.49	.533	67
Leaders ability to motivate employees affect the performance of road projects in DCE	3.37	.599	67
Leaders ability to integrate and coordinate activities affect the performance of road projects in DCE	3.49	.533	67
Leaders ability to provide timely decision affect the performance of road projects in DCE	3.09	.596	67
Leaders power and confidence affect the performance of road projects in DCE	2.99	.615	67
Leaders ability to solve problems will not affect the performance of road projects in DCE	3.33	.533	67
Overall management action affect the performance of road projects in DCE	3.55	.702	67
Communication system among project participants affect the performance of road projects in DCE	3.12	.686	67
The contract type adopted affect the performance of road projects in DCE	3.49	.561	67
Delay to furnish and deliver the site (ROW) affect the performance of road projects in DCE	4.21	.729	67
Delay in progress payment to contractors affect the performance of road projects in DCE	3.51	.704	67
Client Interference during construction affect the performance of road projects in DCE	2.58	.721	67
Clients emphasis on quick construction instead of quality will affect the performance of road projects in DCE	3.73	.510	67
Clients emphasis on low construction cost affect the performance of road projects in DCE	3.85	.609	67
Political influence from authorities affect the performance of road projects in DCE	3.66	.565	67
Noise and air quality of the site affect the performance of road projects in DCE	3.52	.636	67
Level of technological advancement affect the performance of road projects in DCE	3.58	.678	67
Climate condition of the site affect the performance of road projects in DCE	4.13	.903	67

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Design change affect the performance of road projects in DCE	114.48	43.496	.302		.687
Fluctuation in material cost affect the performance of road projects in DCE	114.43	44.310	.218		.693
Waste of materials affect the performance of road projects in DCE	115.30	44.940	.095		.703
Material and equipment cost affect the performance of road projects in DCE	114.61	42.696	.436		.679
Low overhead percentage of project did affect the performance of road projects in DCE	114.99	44.136	.210		.694
Low project labor cost did affect the performance of road projects in DCE	114.96	40.134	.433		.673
Weather condition affect the performance of road projects in DCE	114.09	43.234	.322		.686
Project site management affect the performance of road projects in DCE	114.57	43.552	.354		.685
Delay in claim approval affect the performance of road projects in DCE	114.58	43.580	.367		.685
Long time needed to implement variation order affect the performance of road projects in DCE	115.06	43.239	.357		.684
Long time needed to rectify defects affect the performance of road projects in DCE	114.91	40.810	.586		.666
Low quality of materials and equipment's used in the project construction affect the performance of road projects in DCE	114.84	45.170	.116		.700
Personnel's education and experience affect the performance of road projects in DCE	114.52	45.678	.098		.700
Conformance to specification affect the performance of road projects in DCE	115.06	45.542	.151		.697
Quality assurance trainings and follow-ups affect the performance of road projects in DCE	114.79	44.289	.205		.694

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Leaders education and work experience affect the performance of road projects in DCE	115.33	44.648	.103		.704
Adequate training to leaders affect the performance of road projects in DCE	114.76	45.306	.143		.697
Leaders ability to motivate employees affect the performance of road projects in DCE	114.88	45.228	.128		.699
Leaders ability to integrate and coordinate activities affect the performance of road projects in DCE	114.76	43.972	.334		.687
Leaders ability to provide timely decision affect the performance of road projects in DCE	115.16	45.230	.129		.699
Leaders power and confidence affect the performance of road projects in DCE	115.27	44.502	.211		.694
Leaders ability to solve problems will not affect the performance of road projects in DCE	114.93	44.737	.224		.693
Overall management action affect the performance of road projects in DCE	114.70	44.940	.126		.700
Communication system among project participants affect the performance of road projects in DCE	115.13	45.906	.026		.706
The contract type adopted affect the performance of road projects in DCE	114.76	44.427	.251		.692
Delay to furnish and deliver the site (ROW) affect the performance of road projects in DCE	114.04	45.589	.050		.705
Delay in progress payment to contractors affect the performance of road projects in DCE	114.75	42.768	.364		.683
Client Interference during construction affect the performance of road projects in DCE	115.67	44.618	.154		.698
Clients emphasis on quick construction instead of quality will affect the performance of road projects in DCE	114.52	45.708	.094		.700
Clients emphasis on low construction cost affect the performance of road projects in DCE	114.40	45.790	.055		.703
Political influence from authorities affect the performance of road projects in DCE	114.60	44.608	.224		.693
	Scale Mean if Item	**Scale Variance if Item**	**Corrected**	**Squared**	**Cronbach's**

	Deleted	Deleted	Item-Total Correlation	Multiple Correlation	Alpha if Item Deleted
Noise and air quality of the site affect the performance of road projects in DCE	114.73	45.593	.072		.702
Level of technological advancement affect the performance of road projects in DCE	114.67	44.648	.167		.697
Climate condition of the site affect the performance of road projects in DCE	114.12	43.652	.180		.697

Scale Statistics

Mean	Variance	Std. Deviation	N of Items		
118.25	46.616	6.828	34		