

Addis Ababa University
School of commerce



Assessment of factors affecting construction project performance _
the case of Bole International Airport terminal expansion and Minilik II Referral
Hospital Eye care center construction projects

BY

Habtamu Ayele Dagne

ADVISOR: **Solomon Markos (PhD)**

A Project work Submitted to Addis Ababa University School of Commerce MA in
Project Management Program in Partial Fulfillment of the Requirements for the
Degree of Master of Arts in Project Management

June 2021

Addis Ababa, Ethiopia

Addis Ababa University

School of commerce



Assessment of factors affecting construction project performance _
the case of Bole International Airport terminal expansion and Minilik II Referral
Hospital Eye care center construction projects

BY

Habtamu Ayele Dagne

ADVISOR: **Solomon Markos (PhD)**

A Project work Submitted to Addis Ababa University School of Commerce MA in
Project Management Program in Partial Fulfillment of the Requirements for the
Degree of Master of Arts in Project Management

June 2021

Addis Ababa, Ethiopia

STATEMENT OF DECLARATION

I, Habtamu Ayele, declare that this project work entitled Assessment of factors affecting construction project performance: The case of Bole International Airport terminal expansion and Minilik II Referral Hospital Eye care center construction projects is my own paper work and that it has not been submitted before anywhere either at Masters level or Undergraduate for any award. Any information used from other works has been acknowledged.

By: Habtamu Ayele

Date: -----

Signature: -----

STATEMENT OF CERTIFICATION

This is to certify that Habtamu Ayele has carried out this project work on the topic entitled “Assessment of factors affecting construction project performance: The case of Bole International Airport terminal expansion and Minilik II Referral Hospital Eye care center construction projects” under my supervision. This work is original in nature and it is sufficient for submission for the partial fulfillment for the award of Degree of Masters of Art in Project Management.

Solomon Markos (PHD)

Signature _____

Date _____

**ASSESSMENT OF FACTORS AFFECTING CONSTRUCTION PROJECT
PERFORMANCE: THE CASE OF BOLE INTERNATIONAL AIRPORT
TERMINAL EXPANSION AND MINILIK II REFERRAL HOSPITAL EYE
CARE CENTER CONSTRUCTION PROJECTS**

By: Habtamu Ayele Dagne

Approved by Board of Examiners:

Solomon Markos (PHD)

Advisor

Signature

Date

Examiner (Internal)

Signature

Date

Examiner (External)

Signature

Date

Chair person

Signature

Date

Table of content

Chapter one	1
1. Introduction	1
1.1. Background of the Study	1
1.2. Statement of Problem	3
1.3. Research Questions	5
1.4. Objective of the study.....	5
1.4.1. General objective	5
1.4.2. Specific objective	5
1.5. Significance of the study	6
1.6. Scope of the study	6
1.7 Limitations of the Study	7
1.8. Structure of Research.....	7
Chapter two.....	8
2. Review of related Literature	8
2.1. Theoretical review	8
2.1.1. The Theory of Performance	8
2.1.2. Construction Projects and Performance	9
2.1.3. Performance Measurement Theory	9
2.1.4. Measurement of Project Performance	10
2.1.5. Construction project performance measurement	11
2.1.6. Factors Affecting Performance of Construction Projects	12
2.1.7. Key Performance Indicators' in Construction Projects	14
2.1.8. Organizational Culture and Project Performance	15

2.2. Empirical Review	16
2.3. Conceptual framework	18
Chapter three.....	21
3. Research Methodology	21
3.1. Introduction	21
3.2. Description of Research Area	21
3.3. Research Approach	21
3.4. Research Design	22
3.5. Data Collection Instruments	22
3.6. Sample Size and Sampling Technique	23
3.6.1. Target population	23
3.6.2. Sample size	23
3.6.3. Sampling Technique	23
3.7. Data Measurement	25
3.8. Method of Analysis the Data	25
3.9. Definition of Terms	25
3.10 Ethical Considerations	26
Chapter four.....	27
4. Data analysis and discussion of findings	27
4.1. Research Flow and Sample Description.....	27
4.2. Demographic characteristics.....	28
4.2.1 Respondent representation.....	28
4.2.2 Respondent demographic characteristics.....	28
4.3. Criteria to Measure construction project performance	30

4.4. Performance Related Problems in Building Construction Projects.....	31
4.5. Analysis of factors affecting Performance of Construction Projects	33
4.5.1. Cost related Factors in building construction projects.....	33
4.5.2. Time related factors in building construction projects.....	36
4.5.3. Quality related factors in building construction projects.....	39
4.5.4. Productivity related factors in the selected building construction projects.....	41
4.5.5. Productivity related factors in the selected building construction projects.....	43
4.5.6. Regulatory and Community Satisfaction factors of construction projects.....	46
4.5.7. Health and Safety Factors in building construction projects.....	48
4.5.8. Innovation and Learning Factors in building construction	50
4.6. Key Performance Indicators’ of Building Construction Projects	54
4.7. Discussion	59
CHAPTER 5.....	62
5. CONCLUSION AND RECOMMENDATIONS.....	62
5.1. Conclusion.....	62
5.2. Recommendation.....	63
References	65
Appendices	69

List of Tables

Table 2.1 Factors Affecting the Performance of Construction Projects	13
Table 2.2 Key Performance Indicators and their authors in Construction Projects	15
Table 3.1 Sample Size Determination of the study area	24
Table 4.1 Description of distributed questionnaires response rate.....	27
Table 4.2 The frequency of profile of respondents.....	29

Table 4.3 Criteria to Measure construction performance in building construction projects.....	31
Table 4.4 The relative importance index (RII) and rank of performance related problems.....	32
Table 4.5: RII, rank, frequency and percentage of cost related performance factors	35
Table 4.6: RII, rank, frequency and percentage of time related performance factors.....	37
Table 4.7: RII, rank, frequency and percentage of quality related performance factors	39
Table 4.8: RII, rank, frequency and percentage of productivity related performance factors.....	42
Table 4.9: RII, rank, frequency and percentage of client satisfaction related factors.....	44
Table 4.10: RII, rank, frequency and percentage of Regulatory and Community Satisfaction related performance factors.....	47
Table 4.11: RII, rank, frequency and percentage of Health and Safety related factors.....	48
Table 4.12: RII, rank, frequency and percentage of Innovation and Learning related factors.....	51
Table 4.13: RII, rank, frequency and percentage of Key Performance Indicators'	55
Table 4.14: The Model Summary for respondents' response.....	56
Table 4.15: The analysis of variance (ANOVA) results of respondents.....	57
Table 4.16: The Regression coefficient of factors affecting performance of projects.....	58

List of figures

Figure 2.1: conceptual framework of the reviewed literatures	19
Figure 4.1: Overall RII and rank of project performance problems.....	33
Figure 4.2: Overall RII and rank of cost factors.....	35
Figure 4.3: Overall RII and rank of time related factors.....	38
Figure 4.4: Overall RII and rank of quality factors.....	40
Figure 4.5: Overall RII and rank of productivity factors.....	43

Figure 4.6: Overall RII and rank of client satisfaction factors.....45

Figure 4.7: Combined RII and ranks of regulatory and community satisfaction factors.....47

Figure 4.8: overall RII and rank of health and safety factors.....49

Figure 4.9: Overall RII and rank of innovation and learning factors.....51

Figure 4.10: Overall RII and rank of construction performance indicators.....56

ACKNOWLEDGMENTS

First all, I would like to give my praise to the Almighty of God, who gave me the commitment and patience to pass various obstacles and complete this Project work.

Next, I would like to express my sincere gratitude to my advisor Solomon Markos (PHD) for his constructive comments, corrections and suggestion from the beginning of this project work to the end.

My sincere gratitude also goes to the participants in my survey who returned the questionnaire timely by completing all the questions given at both Bole International Airport terminal expansion and Minilik II Referral Hospital Eye care center construction projects.

I also would like to thank our class representative Hermela G. for her great effort by communicating with the school and informing to us timely.

At last I would like to thank my wife Alem E., who has supported me throughout entire process, by encouraging and motivating me to accomplish this project work, without her effort and contribution my present success would be unthinkable.

ABSTRACT

Construction sector has complexity in its nature since it contains large number of parties as clients, contractors, consultants, shareholders, regulatory bodies and others. In Ethiopia, the number and complexity of building construction projects is increasing from time to time. However, it becomes very difficult to complete projects based on allocated cost, time and quality. The objective of this research is to determine performance related problems of construction, to examine the factors that affect construction project performance and to identify the key performance indicators at Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care center construction project and forwarding recommendation to minimize performance problems. The study was carried out based on literatures review, a questionnaire survey and site observation. A total of 229 questionnaire survey was distributed to 18 owners and 211 contractors' representatives. A total of 194 questionnaire survey was returned 17 (94.44 %) from owners' side, which includes consultants, and 177 (83.88 %) from contractors. Based on the data collected from the samples and questionnaire and analyzed by using percentage analysis method, mean calculation and standard deviations, the finding of the study revealed that the most frequent performance problems that most frequently occur have been cost, time and productivity. The most critical factors that affect performance has been escalation of material prices, Shortage of foreign currency, Occurrence of Communicable disease, Occurrence of Communicable disease and Equipment and machinery cost escalation. All the factors that affect construction performance have been grouped into cost related factors, time related factors, quality related factors, productivity related factors, client satisfaction related factors, health and safety related factors, regulatory and community satisfaction related factors, and innovation and learning related factors. The key performance indicators have been identified as cost, time, productivity and quality. It's expected that the findings of this research will help to improve the performance of the construction industry in the future.

Key words: Construction Project performance, cost, time, quality, construction project

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Modern project management has first evolved in construction and aerospace industry; since the working environment and the kinds of activities in this industry demanded flexible forms of management. The 1950s has been marked the beginning of the modern project management era where main-engineering fields come together to work as one. “When a job requires substantially more resource (people, capital, equipment, etc.) than are normally employed by department or organization, project management systems may be necessary (John, 2004). Project is a complex, non-routine, one-time effort limited by time, budget, resource and performance specifications designed to meet customer requirements (Arslan, 2009).

The construction industry is the sector implementing project management most and involves with erection, repair and demolition of buildings and civil engineering structures in a structured and scientific manner (Bon 1992). According to Navon (2005), construction industry has complexity in its nature since it involves large number of parties such as clients, contractors, consultants, stakeholders and regulators (Shaban, 2008). The sector has also a huge effect in the advancement and attainment of societal development goal. As different literature reviews indicate construction is one of the largest industries and contributes about ten percent of the gross domestic product (GDP) in industrialized countries (Navon, 2005). Other studies by (Ofori, 2006) and (Jekale, 2004) indicated that in many developing countries, major construction activities account for about 78 percent of the total capital assets, 12 percent of their GDP, and more than 50 percent of the wealth invested in fixed assets. Despite the construction industry’s significant contribution to the economy of developing countries and the critical role it plays in those countries development, the performance of the industry still remains dwarf.

Performance of project works became an issue of concern to the Governments, contractors, consultants, project managers and end-users/clients, and it is the main source of problem on the building construction projects of many countries. A number of studies have conducted to examine factors affecting construction project performance in developing countries. Shortage of skills of work force, poor supervision and poor site management, poor workmanship; client

satisfaction, unsuitable leadership; shortage and breakdown of equipment and others contribute to construction delays (Mohammed, 2004).

Construction industry is a major economic growth driver for Ethiopia. Massive government investment in infrastructure and residential building projects is turning the country into one of the continent's highest performing economies. However, the industry suffers from many problems and complex issues in performance as other developing countries. Construction projects in Ethiopia have faced an average delay risk of 38 percent at a high and very high-risk level (ITE Build & interiors, 2014). As a construction project, the selected building construction projects are subjected performance factors and problems that are common in other projects.

In the past construction of buildings had mostly undertaken by local companies, except a relatively small number of big and iconic construction projects. Some local contractors are now taking relatively bigger contracts and of course, participation of the local contracting industry has increased in terms of both the value and number of projects, over the last few years. International contractors are attracted to Ethiopia mainly through a relatively generous incentives and a political commitment by the government, for its economic growth, and probably a relatively good legal system as compared to many other African states. The majority of the international contractors are Chinese companies. Even though, they work mostly on infrastructure constructions; like road and railway constructions, some are now working on the construction of buildings.

In many aspects, building construction projects are successful; however, observations show that there is a difference in the rate of work completion, level of construction quality and cost at completion between Local and International contractors. This research had undergone assessment of factors affecting construction performance of two construction sites i.e. one by local contractor (Nasew construction) and the other by international contractor (CCCC). In this research, the researcher had identified and compared the overall factors, which are affecting the performance of local and international contractors.

The Key performance indicators in construction industry consists of three main groups: time, cost, and quality (DETR, 2000). In the realm of project management, the schedule, cost and quality achievement referred to as the iron triangle. Out of these three aspects, it is the achievement of schedule and cost compliances that the project management is most concerned. This results in a half-hearted attempt to achieve quality at project sites. In order to achieve the schedule and cost objectives, project quality may sometimes overlook. Out of the commonly

used project performance criteria, the quality compliance has come second next to schedule compliance (Johan, 2004).

This paper, aims at examining factors affecting the overall performance of construction projects by applying Key performance indicators as bench mark. It is expected that the study results would assist a construction company to better understand key factors affecting construction performance, and effectively plan for performance improvement.

1.2. Statement of the Problem

Construction industry plays an essential role in socio-economic development of all countries. In Ethiopia, the present state of the construction industry didn't meet domestic and international quality standards and the performance demand expected from the sector (MoWUD, 2006). Because Construction projects comprise processes starting from initiation to completion; it passes several activities in each significant stage to accomplish the project goals and will confront with different bottlenecks (Taber, 2018).

Various authors have identified factors that causes poor performance in construction industries in different countries. Rwelamina & Savile (1994) identified a lack of management expertise and worker participation, and Tam & Harris (1996) added equipment and quality management of the team as a major cause. Atkinson (1999), Love & Li (2000), and Odeh & Battaineh (2002) further identified major causes of performance defects as human error, poor workmanship and contractual relationship underlining on the effect of relationship management on project performance in construction. These studies are conducted in the case of business projects and they fail to include all the key performance indicators.

A number of studies have been conducted to examine factors affecting construction project performance in developing countries. Faridi and El-Sayegh (2006) reported that shortage of skills of man power, poor supervision and poor site management, weak leadership; shortage and breakdown of equipment and others contribute to construction delays in developing countries especially sub-Saharan countries. As Idoko (2008) noted, many construction projects in developing countries face considerable time and cost overruns, fail to fulfill their proposed aim or even totally terminated and abandoned before or after their completion. Previous studies such as (Karim and Marosszeky, 1999; DETR, 2000; Lehtonen, 2001; Samson and Lema, 2002; Kuprenas, 2003; Cheung, 2004; Iyer and Jha, 2005; Navon, 2005; Ugwa and Haupt, 2007) identified that the failure of any project is mainly related to the problems and failure in

performance. Most of these studies were focused on one aspect of performance issues mainly Cost and Time instead of their overall performance.

Different studies have conducted to assess and evaluate the efficiency of construction projects overall performance in Ethiopia. According to Enshassi, (2009) in developing countries like Ethiopia, poor productivity is seen as a major concern in the construction industry. Performance of construction projects are the main source of concern for clients, contractors, consultants and end-users. Feysal Temam, (2018) examined the various types of factors which have a significant negative Impact in the performance of both local and international contractors in Ethiopian building projects. Azeb Getahun, (2016) identified Critical Factors which are affecting the Performance of Local and International contractors like time, cost, quality, client satisfaction and others. According to Hiwot (2012), most of construction projects in Ethiopia are characterized by time delay, cost overrun and poor-quality construction due to poor performance of the contractor and weak stakeholder commitment. I have reviewed many other studies that were conducted on Ethiopia context (Merid, (2016); Shambel, (2018); Fetene, (2008); Tadesse, (2009)) and others but none of them were performed to assess overall factors that affect construction performance.

The researcher has conducted preliminary interview with project managers and site engineers in order to define the practical problems related to the construction projects of Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care center construction project. The researcher interviewed a project manager and two site engineers at Bole International Airport terminal expansion project. The researcher also interviewed a project manager and one site engineer at Minilik II Referral Hospital Eye care center construction. From the preliminary interviews the researcher has conducted, four basic causes for performance problems at the two selected building construction sites are noticed. The first factor the researcher has identified is that variation on costs of construction materials such as cement and reinforcing bars and its availability. The second factor is that the shortage and efficiency of construction machineries. The third factor is that lack of skilled work force; it occurs mainly on Minilik II Referral Hospital Eye care construction site. The fourth factor is that timely delivery of finance and other resources. Therefore, this research tries to examine the above mentioned and many other factors that determine the performance of construction projects.

Construction industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants, stakeholders and others. Construction projects in Ethiopia suffer from many problems and complex issues in performance as a developing country. This thesis is

very important to identify and to evaluate the critical factors affecting the performance of construction projects and then to formulate recommendations to improve performance of construction projects. This study assessed the factors affecting performance and its effect on performance of construction projects in Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care construction project.

This study will fill the gap on present knowledge on the area by examining the overall factors that affect construction performance based on assessment of two construction projects in Addis Ababa and test how they will correlate with overall performance of construction projects.

1.3. Research Questions

- What are the major factors that affect the overall performance of Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care construction project?
- What are the performance problems that occur frequently on Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care construction project?
- What are the key construction performance indicators on Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care construction project?
- What remedial measures are required to improve performance of Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care construction project?

1.4. Objectives of the Study

1.4.1. General Objective

To examine the major factors that control the overall performance of Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care center construction project.

1.4.2. Specific Objectives

- To identify the frequent performance problems that occur on Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care center construction project.
- To identify factors affecting project performance at Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care center construction project

related to major groups of cost, time, quality, productivity, client satisfaction, health and safety, regulatory and community satisfaction, and innovation and learning.

- To analyze how much each of the major groups of performance factors affect performance of construction projects at Bole International Airport terminal expansion and Minilik II Referral Hospital Eye care center construction projects.
- To examine key performance indicators on Bole International Airport terminal expansion project and Minilik II Referral Hospital Eye care center construction project.

1.5. Significance of the Study

The important of this research is expressed in the following ways. First, it may benefit the different stakeholders involving in construction projects in general and particularly for Bole International Airport, terminal expansion project and Minilik II Referral Hospital Eye care construction project related to project performance. Second, it helps owners, contractors and consultants to know the causes and effects of performance problems in construction projects and thirdly to recommend remedial measures to prevent the occurrence of the problems and finally, it serves as a benchmark for further studies.

1.6. Scope of the Study

Due to different constraints such as finance, time and labor, the study is limited in both scope and depth. Accordingly, the study area is limited to Bole International Airport terminal expansion and Minilik II Referral Hospital Eye care construction projects, which are started from the year 2016 G.C. and is under construction process.

Conceptual scope: The research is limited to the most important aspects of project performance factors related to cost, time, quality, productivity, safety and health, Client Satisfaction and Regulatory and Community Satisfaction.

Methodological scope: The researcher selected two building construction projects found in Addis Ababa i.e. Bole International Airport terminal expansion construction and Minilik II Referral Hospital Eye care construction projects. These projects are selected to save time and cost of travel during data collection process. The sources of data will be project members only who are actively participating on the project at the time of data collection and the events at the time of site observation in order to have reliable information.

Geographic Scope: both Bole International Airport terminal expansion construction and Minilik II Referral Hospital Eye care construction projects are found in Addis Ababa and may not represent projects outside Addis Ababa.

1.7 Limitations of the Study

This study was conducted with an objective of examining factors affecting performance of construction projects the case of only two building construction projects in Addis Ababa. Despite a number of construction projects in Addis Ababa, this study has used only two commercial building construction projects. Although different building construction projects were constructed in the city, this study has used only projects that are currently under-construction to easily collect data from the targeted respondents. Other limitation of this study is using questionnaire and site observation as an only instrument to collect the data since interview becomes impossible due to Covid-19 restrictions.

1.8. Structure of Research

This study is organized in five main chapters as follows:

The **first chapter** is about introduction of the study that includes background of the study, problem statement, research questions, objectives of the study, scope of the study, significance of the study and limitation of the study. The **second chapter** is about review of related literatures, which include theoretical review, empirical review and conceptual frame work. The **third chapter** is about methodology of the study which includes description of the study area, research approach, research design, data collection instruments, sampling techniques and sample size determination, data measurement, method of data analysis, definition of terms and ethical considerations. The **fourth chapter** presents data analysis and discussion of findings which includes research flow and sample description, demographic characteristics, Criteria to Measure construction project performance, performance related problems and performance indicators. The **fifth chapter** is about conclusion and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Theoretical review

2.1.1 The Theory of Performance

Performance is a multi-dimensional concept as defined by different authors. On the most basic level, Borman and Motowidlo (1993) distinguished between task and contextual performance. Task performance is an individual's proficiency with which he or she performs a specific activity, which contribute to the organization's 'technical core'. This contribution can be both direct (e.g., the case of production workers), or indirect (e.g., the case of managers or any office personnel). Contextual performance refers to activities which are not relating to the technical core but which support the organizational, social and psychological environment in which organizational goals pursued. Contextual performance includes behaviors such as helping coworkers or being a reliable member of the organization and making suggestions about how to improve work procedure. Performance can be defined as an evaluation of how well individuals, groups of individuals or organizations have done in search of a specific objective (Ankrah and Proverbs, (2005). These objectives vary significantly, but from organizational perspective, they generally revolve around satisfying the key stakeholders such as customers, employees, shareholders, the various suppliers, government and society as a whole.

The Theory of Performance develops and relates six fundamental concepts to form a framework that can be used to explain performance as well as performance improvements. To perform is to generate valuable results. A performer can be an individual or a group of people who produces valuable result. Developing performance is a long journey, and level of performance describes location in that journey. Current level of performance depends generally on six components: these are context, level of knowledge, levels of skills, level of identity, personal factors, and fixed factors. There are three axioms proposed for effective performance improvements. These are a performer's mindset, immersion in an enriching environment, and engagement in reflective practice (Don, 2010).

Performance system consists of the performance policy, Procedures, Organization structure, Processes, Training and performance manual. The performance policy shall be relevant to the organization's goals and the expectations and needs of its customers (Nee, 1996).

2.1.2 Performance Construction Projects

In construction projects, because of the numerous participants who contribute towards the achievement of project objectives, performance has been defined in one sense as a participant's (client, consultant or contractor) contribution to the execution of the task required to complete the project (Mullins, 1995). Many researches have been made on performance of construction projects. Dissanayaka and Kumaraswamy (1999) remarked that one of the principal reasons for the construction industry's poor performance has been attributed to the incompatibility of the chosen procurement system. Thomas (2002) identified the main performance criteria of construction projects as 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. Chan and Kumaraswamy (2002) stated that construction completion time is increasingly important because it often serves as a crucial benchmarking for assessing the performance of a project and the efficiency of the project organization.

2.1.3 Theories Performance Measurement

Mbugua, (1999) have outlined a distinction between performance indicators, performance measures and performance measurement. Based on his study, performance indicators rectify the measurable evidences necessary to prove that a planned effort has achieved the desired outcome. On the other hand, measures are defined as the situation when indicators can be measured with some degree of precision and without any ambiguity. However, when it is not possible to obtain a precise measurement, it is usual to refer to performance indicators. According to Sinclair and Zairi (1995), Performance measures are the numerical or quantitative indicators. On the other hand, performance measurement is a systematic way of evaluating the inputs and outputs in manufacturing operations or construction activity and acts as a tool for continuous improvements. In response to calls for continuous improvement in performance, many performance measurements have emerged in project management literatures. Some examples include: the financial measures (Kangari, 1992), client satisfaction measures (Walker, 1984, project performance measures (Belassiet, 1996) and industry measures (Egan, 1998). According to Rene cordero (1990), performance measurement was classified based on the method of measurement and area of measurement. Performance based on the methods of measurement can be in terms of the technical performance, the commercial performance and the overall performance. The areas of measurement on the other hand are at the planning & design level, the

marketing level and manufacturing level. Lastly, the overall performance is at the level of a firm or strategic business unit.

2.1.4. Project Performance Measurement

performance measurement is intended to help organizations understand how decision-making processes or practices lead to success or failure in the past and how that practice can lead to future improvements (Lyneis, 1999). According to Tangen (2004), performance measurement is complex issue that usually incorporates at least three different disciplines: economics, management and accounting. Lehtonen (2001) stated that performance measurement systems are very important in the construction firms. Navon, (2005) defined performance measurement as a comparison between the desired and the actual performances. He also stated that performance measurement is needed not only to control current projects but also to update the historic database. Such updates enable better planning of future projects in terms of costs, schedules, labor allocation, e.t.c.

Karim and Marosszeky (1999) defined the purpose of key performance indicators as a way of comparison between various projects and enterprises. These authors implemented different representation of values to evaluate time and cost performance such as project characteristics, procurement system, project team performance, client representation' s characteristics, contractor characteristics, design team characteristics, external condition. According to Samson and Lema (2002), the characteristics of emerging performance measurement indicators need analysis of both the organization and environment such as: nature of work, global competition, quality awards, organizational role, external demands and power of it. The indicators should be able to identify causes of problems, address all possible performance drivers, and identify potential opportunities for improvement. Cheung (2004) remarked seven main indicators for performance. these are time, cost, quality, client satisfaction, client changes, business performance, and safety and health.

Ugwu and Haupt (2007) developed and validated Key performance indicators for sustainability appraisal using South Africa as a case study. they used four major levels in a questionnaire to identify the relative importance of Key performance indicators. The main indicators were: economy, environment, society, resource utilization, health and safety and project management and administration.

2.1.5. performance measurement of Construction projects

According to Kingsley (2010), performance indicators present a measurable evidence necessary to prove that a planned effort has achieved the desired result. In other words, when indicators can be measured with some degree of precision and without ambiguity, they are called measures. However, when it is not possible to obtain a precise measurement they are usually referred to as performance indicators. Two models were developed for measuring construction project performance. These are integrated performance index (Pillai, 2002) and key performance indicator (Construction Industry Task Force, 1998).

Integrated Performance Index was developed initially for performance measurement of R&D projects based on their real-life experiences of working on the project management system for the Integrated guided missile development program in India. The model has rectified three project phases and dealt with performance elements such as performance indicators or key factors associated with each phase. The three project phases identified were the project selection phase, the project execution phase and the implementation phase. The usefulness of the integrated performance index is that it can be applied at all the phases of the project life cycle to rank the project for selection, to compare project performance under the execution phase and to act as an input for the management of future projects. The only major problem of the model is lack of clarity in the way the mathematical formulae is used to integrate the identified factors into an integrated performance index. Due to this shortcoming, this model is not well received by practitioners.

Key Performance Indicators (KPIs) were the UK construction industry's response to Egan's report (Construction Industry Task Force, 1998) to measure project performances, based on 10 identified parameters. These consist of seven project performance indicators i.e. construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service; and three company performance indicators i.e. safety, profitability and productivity. According to Karim and Marosszeky (1999), KPIs enable a comparison between different projects and enterprises to identify the existence of particular patterns. Samson and Lema (2002) stated that KPIs are advantageous in order to deliver value to stakeholders. Therefore, companies must be sure for having right processes and capabilities in place. The KPIs also allow to advice which processes and capabilities must be competitively and distinctively applied and which are merely need to be improved or maintained.

2.1.6 Factors Affecting Performance of Construction Projects

Various studies have identified different factors that affect the performance of construction projects but there is no common agreement on the factors. According to Chan & Tam (2000), generally perceived factors that affect quality performance can be grouped into categories of client, project environment, project team leaders, project procedures and project management procedures.

According to Chan and Kumaraswamy (1996), a number of unpredicted problems and changes from original design arise on the process of the construction phase are leading to problems in cost and time performance. They identified that poor site management, unforeseen ground conditions and low speed of decision making involving all project teams are the three major factors causing delays and problems of time performance in domestic building works. According to Okuwoga (1998), cost, quality and time performance has been identified as the major problems in the construction industry worldwide. Dissanayaka and Kumaraswamy (1999) stated that project complexity, client type, experience of team and information flow are highly correlated with the time performance; on the other hand, project characteristics, client characteristics and contractor characteristics are highly correlated with the cost performance.

Kuprenas (2003) advised the need for focused effort by economy managers and construction industry associations to provide the infrastructures required for effective project management and project performance. According to Dissanayaka and Kumaraswamy (1999), the knowledge that would affect potential performance drives project managers to pay special attention to handle performance more effectively. Chan and Kumaraswamy (2002) stated that smooth communication and rapid information flow between managers and participants help to accelerate the building construction process and performance. Kuprenas (2003) studied the influence of the application of a project management based organizational structure, project manager training, repetition of design meetings and design reports on design phase cost performance. The situation of a design team meeting frequency and the level of written reporting of design phase progress were found to be statistically significant in minimizing design phase costs.

The researcher realized that there have been many past studies on cost and time factors of project 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 over the past three decades, while Iyer and Jha (2005) remarked that project performance in term of cost has studied since 1960s.

Belassi and Tukel (1996) have listed groups of construction project performance factors in tabular form as follows:

Table 2.1: Groups of Factors Affecting the Performance of Construction Projects (Belassi and Tukel (1996))

Groups of Performance Factors	Factors
Factors relating to cost	Market share of organization, Cash flow of a project, Profit rate of a project, Material and equipment cost, Project labour cost, Project overtime cost, Cost of rework, Cost of variation of orders, Waste rate of materials, Escalation of material prices, Differentiation of currency prices, presence Incomplete drawing
Factors relating to time	Number of raised change orders from owner, level of project management assistance, ground conditions, speed of decision making, level Project complexity, way of communication, level of Financial constraints, Average delay in claim approval, amount of Average delay in payments from owner to contractors, Site preparation time, condition of resources availability, Time needed to rectify defects, Time needed to implement variation of orders
Factors relating to Quality	Conformance to specification, availability of competent staff, quality of equipment or machineries and raw materials, quality assessment system in organization, quality training or meeting, escalation of material prices, incomplete drawing, Incomplete technical specification
Productivity related Factors	Project size and complexity, management-labour relationship, absenteeism rate of project members, number of new projects per year, sequencing of work according to schedule, local cultural characteristics, number of non-working holidays, climate conditions, Wedges rate, employee's motivation, employee attitudes
Factors relating to Client Satisfaction	Leadership skills of project manager, disputes between owner and project parties, speed and reliability of service to owner, number of rework incidents, information coordination between owner and project

	parties, Conflict, Poor workmanship and incompetence workers
Factors relating to Health and Safety	Reportable accidents rate in the project, application of health and safety factors in the organization, assurance rate of the project, easiness to reach to the site, wastes around the site, Climate condition and Air quality of the site, Noise level on the site area
Regulatory and Community Satisfaction Factors	Site condition, quality and availability of regulatory documentation, Cost of compliance to regulatory requirements, Number of non-compliance regulations

2.1.7. Key Performance Indicators' in Construction Projects

Takim and Akintoye (2002) stated ten key performance indicators of project performance in UK construction industry. These indicators are: seven project performance indicators, i.e. construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service; and three company performance indicators, i.e. safety, profitability and productivity. Most of these indicators can be considered as having results orientated, except for predictability of design cost and time, and predictability of construction cost and time, which can be regarded as procurement orientated, and safety, which can be regarded as process orientated.

Takim and Akintoye (2002) defined the purpose of KPI's as to facilitate a comparison between various projects and enterprises to assess the existence of particular patterns. According to Dissanayaka and Kumaraswamy (1999), various representative values to evaluate time and cost performance are identified such as project characteristics, procurement system, project team performance, client representation's characteristics, contractor characteristics, design team characteristics, external condition. Takim and Akintoye (2002) remarked that the development and application of KPI's can help the project stakeholders to identify dysfunctional procurement processes.

According to Cordero (1990), key performance indicators for construction projects are classified under four main aspects. The first aspect is cost, which includes construction cost, cost of certainty, and client satisfaction on cost. The second aspect is time, which includes construction time, time of certainty, and client satisfaction on time. The third aspect is quality, which includes defects, liability period, and client satisfaction on cost. The fourth aspect is sustainable

development, which includes profitability, partnership, environmental protection and health and safety.

Table 2.2: Summary of Key Performance Indicators and their respective authors in Construction Projects

No	Name of Authors	List of Key Performance Indicators
1	Samson and Lema (2002)	Time for tasks, cost usage, quality attainment, level of client satisfaction, Business performance, and safety and health.
2	Takim and Akintoye (2002)	Cost vs budget, time vs schedule, level of client satisfaction, safety and health, profitability and productivity.
3	Cordero (1990)	Cost aspect, time aspect, client satisfaction aspect, quality aspect, and sustainable development aspect.
4	Wateridge (1998)	Level of Client satisfaction, occurrence rate of defects, profitability, productivity, safety, construction cost and construction time.
5	Egan (1998)	Construction cost, construction time, occurrence rate of defects, level client satisfaction, profitability, productivity, safety.

2.1.8. Effect of Organizational Culture on Project Performance

The culture that an organization practices is important for performance of projects due to a number of reasons. According to Thompson (1993), for a project to be effective, compatibility must exist between the organization's values, its resources and the project environment. On the same study, he also stated that the culture in the organization reflects the way that employees perform tasks, set objectives and administer the necessary resources to achieve these objectives. It also determines the way employees make decisions, think, feel and act in response to the opportunities and threats affecting the project.

According to Eres and Gati (2004), the compatibility between organizational cultural characteristics and project management practices is considered as another important factor in the successful implementation of project management practices. According to Mullins (1993), a strong organizational culture is very important for successful implementation of project management. It was also stated by Deal and Kennedy (1982) that a strong organizational culture sets out the system of informal rules, which determines how people are to behave most of the time during project implementation.

According to Tharp (2005), It has been recognized that organizational culture plays a very important role on project performance outcomes. According to his view, a strong, unique, and appropriate corporate culture of the organization has the ability to:

- Minimize uncertainty by developing a standard way to interpret events and issues;
- Develops a sense of order within the members and everyone knows what is expected;
- Certify a sense of continuity;
- Generate a shared identity and unity of commitment
- Provide a vision of the future around which the company can bring together.

2.2. Empirical Review

Chua, (1999) has developed a hierarchical model for construction project success for various project objectives. He found that, the project performance is affected by four main project aspects; i.e. project characteristics, contractual arrangements, project participants, and interactive processes. Arditi & Gunaydin (1998) find that management commitment to continuous performance improvement, management leadership in promoting high process quality; quality training of all personnel; efficient teamwork to promote quality issues at the corporate level; and effective cooperation between parties taking part in the project are generic factors that affect process quality. Bubshait & Al-Atiq (1999) observed that a contractor's quality assurance system, which ensures consistent quality, is essential in preventing problems and the reoccurrence of problems. His survey also points to the lack of documentation of a quality system for the majority of the contractors.

Bui, (2010) in his research carried out in Vietnam on factors affecting construction project performance realized that major enablers that provide project success are foreign experts' involvement on the project, inspection done by government officials on the project and very close supervision when new construction techniques are implemented. Amusan and Adebile, (2011) studied factors affecting construction cost performance in Nigerian construction sites. They identified from their analysis that factors such as contractor's inexperience, inadequate planning, inflation, incessant variation order, and change in project design were critical for causing cost overrun, while project complexity, shortening of project period and fraudulent practices are also other headaches.

Iyagba, Odusami and Omirin, (2003) studied the relationship between project leadership, team composition and construction project performance in Nigeria. The analysis of the hypotheses led to the conclusion that there was visible correlation between the project managers'

professional qualification, their leadership style, team composition and overall project performance. No significant relationship was found between the project managers' profession and overall project performance. Iyer and Jha (2005) 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 projects. Nyangilo, (2012) did a research on assessment of the organization structure and leadership effects on construction projects' performance in Kenya. He identified that lack of appropriate project organization structures, poor management systems and leadership are the major causes of poor project performance.

Chan and Kumaraswamy (2002) stated that project performance measurement includes assessment of completion time, budget, safety, quality and overall client satisfaction. Kuprenas (2003) also stated that project performance measurement implies improvement of the allocated cost, schedule, and quality in design and construction stages. According to Navon (2005), performance measurement is a comparison between the desired performance and the actual performances of projects. According to Navon (2005), the construction industry performance is influenced by the countries' economy. Despite this complexity, the construction industry plays a significant role in the attainment and achievement of development goals in the society. According to Takin and Akintoye (2004), the speed of the economic development of any country can be measured by the development of the physical infrastructure such as buildings, roads and bridges. According to Chua (1999), Puspasari (2005), Ogunsemi (2006), and Yaman (2007), Successful building construction projects are those projects completed on time, within budget, in accordance with specifications and to stakeholders' satisfaction.

Studies were conducted to examine factors affecting project performance in developing countries. Shortage of skills of manpower, poor supervision, poor site management, unsuitable leadership, shortage and breakdown of equipment among others contribute to construction delays in the United Arab Emirates (Faridi and El-Sayegh, 2006). According to Ajayi (2010), the choice of contractor(s) is a critical factor for the project manager and usually has a significant impact on the success or failure of a project. The performance of a contractor will definitely correlate with the performance of the contract. He further observed that the evaluation of performance has been a challenge for the construction industry for decades. Researchers for the evaluation of project performance have proposed several models and methods. However, most of these procedures according to Ajayi, (2010) limit their analysis to selected measures

such as cost, schedule or labour productivity. Construction performance embraces client's satisfaction, time performance, cost performance, construction quality and sustainable development. Mbachu and Nkando (2007) established that quality and attitude to service is one of the key factors constraining successful project delivery in South Africa.

Mohammad, (2012) identified factors affecting performance of a building construction projects by collecting data through questionnaire from contractors and consultants and analyzed the data through factor analysis method. According to the study, the factors that affect the quality of the projects are characteristics of site layout, skill and experience of site staff, characteristics of design documents, and using equipment, materials, quality and labor management systems and the owner quick response in taking decisions. Type of awarding system and the political environment are also among the factors effecting quality.

Henok Wendafrash (2018) identified factors affecting project performance in condominium projects in Addis Ababa by using time, cost and quality parameters as performance indicators. Data was collected through structured questionnaire from contractors and consultants and analyzed through statistical analysis. According to the study, factors affecting project performance are quality orientation, value of the project, ownership of the project, project time and flexibility of project for changes in environment.

Feysal Temam (2018) identified and compared performance differences of local and international contractors; while giving much emphasis on time, the paper also reviewed cost, quality and client satisfaction. Data was collected using survey questionnaires method. According to the study, the factors are cost related factors, Delay in claim approval, estimation of the project time, The presence of competent project manager, the unavailability of personnel and recruitment of highly experienced and qualified employees and others.

2.3 Conceptual Framework

A conceptual framework developed from a literature review shows the eight perceived factors that could affect project performance. The research will revolve around this seven constructs or independent variables which are time related factors, cost related factors, quality related factors, productivity related factors, client satisfaction related factors, health and safety related factors and Regulatory and Community Satisfaction Factors. Under each of these independent variables

there are more than five influencing factors that affect the project performance or the dependent variable.

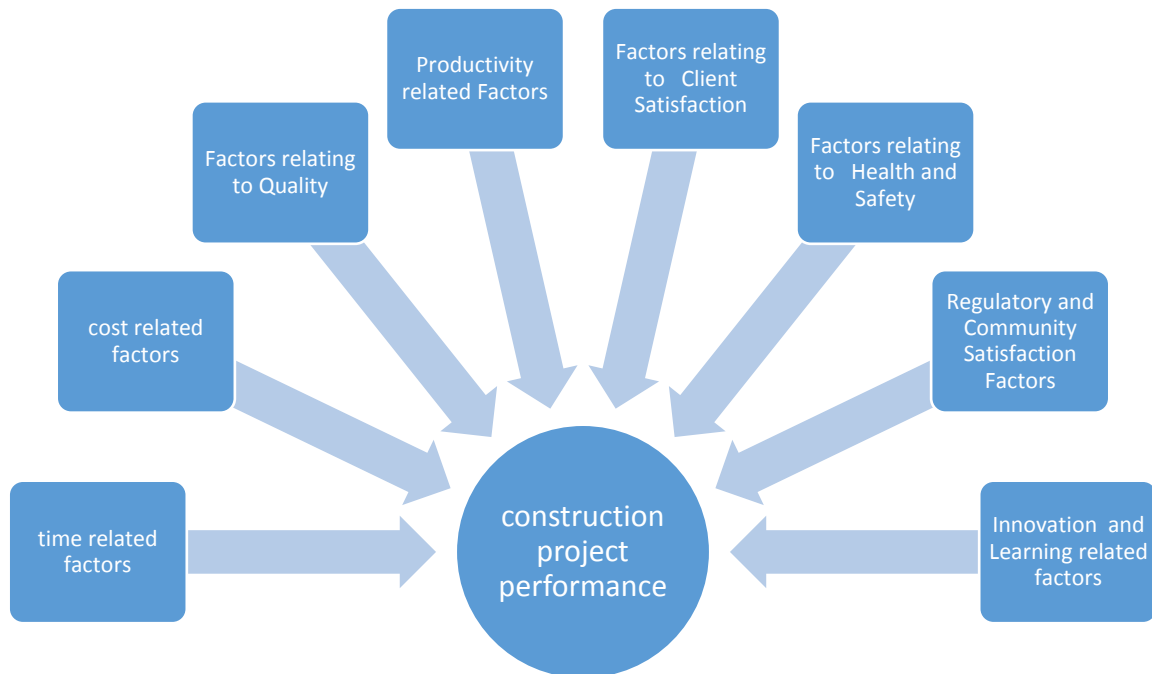


Figure 2.1: conceptual framework: Source: Researchers' Design, 2018

Cost related factors includes market share of organization, cash flow of project, profit rate of project, overhead percentage of project, project design cost, material and equipment cost, project labour cost, project overtime cost, cost of rework, cost of variation orders, waste rate of materials, cost control system, escalation of material prices, differentiation of currency prices, and liquidity of organization. **Time related factors** include site preparation time, planned time for construction, percentage of orders delivered late, time needed to implement variation orders, time needed to rectify defects, average delay in claim approval, average delay in payments from owners to contractors, unavailability of resources, and average delay because of closures leading to materials shortage.

Quality related factors include conformance to specification, unavailability of competent staff, quality of equipment and raw materials, quality assessment system in organization and quality training/meeting. **Productivity related factors** include project complexity, management-labour relationship, absenteeism rate through project, number of new projects / year and sequencing of

work according to schedule, local climate conditions, wedges amount, local cultural characteristics (non-working holidays), employees' motivation and employee attitudes.

Client Satisfaction related factors include leadership skills for project manager, number of disputes between owner and project parties, speed and reliability of service to owner, number of rework incidents, information coordination between owner and project parties. **Regulatory and Community Satisfaction factors** include site condition problems, quality and availability of regulator documentation, cost of compliance to regulators requirements and number of non-compliance regulations.

Health and Safety related factors include reportable accidents rate in project, application of health and safety factors in organization, assurance rate of project, easiness to reach to the site (location of project), wastes around the site, air quality and noise level. **Innovation and Learning related factors** include learning from own experience and past history, learning from best practice and experience of others, review of failures and solving them, work group, training the human resources in the skills demanded by the project.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter will explain all the methods that have been used to gather information for this project work. Methodology describes the practical way in which the whole study will be organized (Oliver, 2004). According to Wallimam (2005), a plan of action must be developed that shows how the problem will be investigated, what information will be collected using which methods, and how this information will be analyzed in order to arrive at conclusions and develop recommendations. The methodology that is adopted in this research provided the procedures that are necessary for obtaining the information needed to structure the research questionnaire, collect data, analyze the collected data, and interpret and present the results. The methodologies that are followed in this study are outlined in the following sections.

3.2. Description of Research Area

The researcher has focused on two building construction sites in Addis Ababa which are selected systematically based on performance problems observed on both sites and other criteria such as the ease for data collection, the types of contractors (local or foreign), the type of owners (governmental or private) etc. The first construction project selected is Bole International Airport terminal expansion project, which is owned by Ethiopian Airlines Group, and the contractor is China Communications Construction Company (CCCC). The second construction project selected is Minilik II Referral Hospital Eye care center, which is owned by Ministry of Health, and the contractor is Nasew Construction.

3.3. Research Approach

The two basic approaches of research are quantitative and qualitative approaches. The former involves the generation of data in quantitative form, which could be subjected to accurate quantitative analysis in a proper and rigorous manner and in the form of a database from which to realize characteristics or relationships (Leedy and Ormrod, 2005). Qualitative approach is a method of collecting and analyzing non-numerical data to understand concepts, opinions, or experiences. Qualitative methods are not good at giving direct answers, but are good at developing more questions, because of consistent use of “soft data” (Higgins, 2009). To improve

the validity of study findings, a combination of qualitative and quantitative methods was used for this research.

3.4. Research Design

Saunders (2007) defines research design as the general plan of how the research questions would be answered. According to Kerlinger (1986), research design is the plan and structure of investigation conceived to obtain answers to research questions or test the research hypothesis. Explanatory and descriptive design were used in terms of research purpose since it aims in finding relationships between different factors in their influence on project performance and implemented both qualitative and quantitative analysis. Explanatory studies deal with causal relationship between the variables, whereas descriptive studies involve observing and describing the behavior of a subject without influencing it in any way (Saunders, 2007).

3.5. Data Collection Instruments

According to Nii Amponsah, (2007), there are two types of data collection instruments, primary and secondary data collection. The primary data that was used in this study is collected through a questionnaire survey and site observation. Questionnaire was appropriate instrument for data collection for this study because it was essential in getting firsthand information from people who are actually involving in the activities of study area. Site observation was performed by preparing activity checklist. Secondary sources of data can be found from different origins, such as government reports, bulletins company's annual reports, publications, journals, books, online data, websites and other internet sources. Similarly, secondary data for this research has originated from literatures including books, Scientific Journals and documents such as legislations, reports, proceedings, etc.

Questionnaire design: Good questionnaire design is a key to obtaining good survey results and warranting a high rate of return (Zikmund, 2000). The questionnaire for this study was adopted from works of two authors (Henok Wendafrash, 2018 and Biyadgign Tagesse, 2017) by applying a significant level of modification. The questionnaire that is designed for this study utilizes the information sourced from the extensive literature review, the global nature of the construction industry and relevance to the two selected construction projects in Addis Ababa. The questionnaires were divided into five sections: Part one, which seeks to establish general details of the respondent, Part two, which contains Questions that measure construction project performance, Part three, which contains Performance Related Problems in Building Construction

Projects, Part four, which contains factors affecting performance of construction projects, part five, which is about Key Performance Indicators' Building Construction Projects and Part six, which contains respondents' judgment on overall performance of the executed construction projects.

3.6. Sample Size and Sampling Technique

3.6.1. Target population

The population of the study comprises the contractors, owners and consultants involving in the construction projects; as all participants of the project who are involving in the two selected construction projects during study time was considered. Therefore, the target population for this study are all active participants of the two projects both from contractors and owners' side i.e. site engineers, project managers, artisans, laborers, consultants' etc. The size of the target population i.e. project team members of both projects is 534 (395 from Bole International Airport Terminal expansion project and 139 from Minilik II Referral Hospital Eye care center construction project).

3.6.2. Sample size

Determining respondents and sample size is one of the most important parts of the method section. There are different ways of determining sample size from a given population. According to Fowler (1984) there is no a single right way for the determination of sample size. In this research, the questionnaires have been distributed to engineers & other professionals who know the concerned construction projects during the specified time. The sample size is determined based on the following Slovin's sampling formula.

$$n = \frac{N}{[1 + N \cdot e^2]} \dots\dots\dots \text{Equation 3.1}$$

Where:

- ✚ N = total number of populations
- ✚ n = number of sample size
- ✚ e = error margin / margin of error, a 95% confidence level will be taken and e = 0.05

3.6.3. Sampling Technique

A two-step process was used in which the population has been partitioned into strata as owner and Contractors. The strata are mutually exclusive and collectively exhaustive in that every population element should be assigned to only one stratum and no population elements should be

omitted. A proportionate stratified simple random sampling technique was used for selecting the respondents from each group.

$$n = N / [1 + N * e^2]$$

$$n = 534 / [1 + 534 * (0.05)^2]$$

$$n = 229,$$

Therefore, the number of respondents that was selected from both projects is 229 project members.

Table 3.1: Sample Size Determination of the study area

population	Bole Airport Terminal			Minilik II Hospital			total
	Contractor	Owner	total	Contractor	Owner	total	
Target population	368	27	395	124	15	139	534
Sample size	157	12	169	54	6	60	229

The respondents were proportionally computed from each category. Accordingly, 12 owners from Bole Airport Terminal site and 157 contractors from Bole airport terminal site were selected. Similarly, 6 owners from Minilik II Hospital site and 54 contractors from Minilik II Hospital site were selected. Therefore, 211 contractors and 18 owners were selected to the questionnaire.

In the targeted sites the respondents have been stratified in contractors and owners. In the case of contractors, project managers were purposively selected because they have better knowledge about the factors that affect the project performances and they directly involved in the performance indicators. After determining the sample size, respondents were randomly selected in each site. Therefore, this study has used stratified, purposive and simple random sampling methods or multi stage sampling method to select respondents from the selected projects.

3.7. Data Measurement

In order to be able to select the appropriate method of analysis, the level of measurement must be understood. In this research, ordinal scales have been used. Ordinal scale is a ranking or a rating data that normally uses integers in ascending or descending order. The numbers assigned to the agreement or degree of influence (1, 2, 3, 4, and 5) do not indicate that the interval between scales are equal, nor do they indicate absolute quantities. They are merely numerical labels.

3.8. Method of Analysis the Data

The relative importance index method (RII) have been used to determine and rank the performance problems, the factors that affect project performance and key performance indicators in building construction projects and all have been analyzed by the programme MS-Excel.

The relative importance index will be computed as (Cheung, 2004; Iyer and Jha, 2005; Ugwu and Haupt, 2007): using equation 3.2

$$RII = \frac{\sum w}{AXN} \dots\dots\dots \text{equation 3.2}$$

Where:

- ✚ RII = relative importance index,
- ✚ W =the weight given to each factor by the respondents and ranges from 1 to 5
- ✚ A = the highest weight = 5
- ✚ N = the total number of respondents.

The most commonly used methods to measure the relationship between variables are Spearman Rank’s Correlation Coefficient method, regression analysis method and Pearson’s correlation. The researcher has used regression analysis method because it’s often used for the estimation of relationships between a dependent variable and one or more independent variables. It can be utilized to assess the strength of the relationship between variables and for modeling the future relationship between them (David A. Freedman, 2009). Multiple linear regression analysis was applied for this study, which is essentially similar to the simple linear model, with the exception that multiple independent variables are used in the model, to know owners, consultants and contractor’s perceptions of project performance related problems, factors that affect project performance and the key performance indicators of the selected construction projects in Addis Ababa.

3.9. Definition of Terms

Key performance indicator (KPI): Is a type of performance measurement, which evaluates the success of an organization or of a particular activity in which it engages.

Time overruns Is the extension of time beyond planned completion dates.

Cost overruns: Is the difference between the original cost estimate of project and actual construction cost on completion of works.

Project: is an activity to meet the creation of a unique product or service and thus activities that are undertaken to accomplish routine tasks cannot be considered projects (Mullins, 1995). For this research project is constructions that are done on the two selected sites.

Construction: Construction of Bole International Airport, terminal expansion project and Minilik II Referral Hospital Eye care construction project.

Owner: Organizations for whom the construction projects are being undertaking i.e. Ethiopian airlines group and Minilik II referral hospital.

Contractor: A natural or juridical person under contract with an owner to construct the construction projects.

Performance: The accomplishment of a given construction projects against the contractual cost, time and quality standards.

Consultant: is a professional (also known as Expert, Specialist, see variations of meaning below) who provides advice and further purposeful activities in an area of specialization.

3.10 Ethical Consideration

Before starting the data collection, permission from organizations was requested. Moreover, during the distribution of the questionnaire, respondent's awareness creation was made about the purpose and the benefit of the study along with their full right to refuse or accept the participation. The respondents` were told their response would be kept confidential and their identity shall not be exposed. Every person involved in the study was entitled to the right of privacy and dignity of treatment, and no personal harm will be caused to subjects in the research. Information obtained was held in strict confidentiality by the researcher. All assistance, collaboration of others and sources from which information was drawn were acknowledged.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF FINDINGS

In this chapter, results have been presented and discussed to address the research questions and objectives. This chapter focuses on analysis of data collected by a questionnaire and site observation from Bole International Airport Terminal expansion and Minilik II Referral Hospital eye care center construction projects. As a part of the study, this chapter presents about the results of data collected through structured questionnaire from the contractors and consultants of the projects, and discussion about the results. The main aim of this section is providing the reader with general information about research process and analyzing the quality of the sample which confirms the reliability of research. This analysis is based on both quantitative and qualitative data obtained from the respondents (Appendix 1).

4.1. Research Flow and Sample Description

Data collection for this research was done by distributing questionnaires to those project managers, site engineers, office engineers and consultants on Bole International Airport Terminal expansion and Minilik II Referral Hospital eye care center construction projects. The questionnaires are distributed by printing 229 questioners and 194 of these professionals replied and returned by reminding again and again. From this data, the response rate is equal to 84.7%; which is considered as acceptable response rate for this type of research. Characteristics of the samples collected proved that responses obtained from the individuals could be extremely helpful in order to answer the research questions.

Table 4.1: Description of distributed questionnaires response rate

description	Bole Airport terminal expansion			Minilik II Hospital eye care center		
	distributed	collected	percent	distributed	collected	percent
Owner	8	7	87.50	4	4	100
Contractor	157	133	84.71	54	44	81.48
Consultant	4	4	100	2	2	100
Total	169	144	85.21	60	50	83.33

Sample description provided above deals with several important issues closely related with the purpose of the current research. First of all, it helps the researcher to support general validity and reliability of data collected to test the research hypotheses. Even being statistically unreliable, the data collected contains responses of highly experienced project managers which worked in companies of different size and operated in different parts of Ethiopia and other countries. Moreover, all the respondents deal with building construction projects. Therefore, such a sample would provide relevant data in order to answer research questions and explore the building construction industry of Ethiopia.

Secondly, sample parameters might be used in further analysis of project performance factors from different perspectives. The Impact of various factors on Bole International Airport Terminal expansion and Minilik II Referral Hospital eye care center construction projects might be different depending on the size of the company and its origin. Therefore, sample description will be used as a basis for in depth analysis data in the incoming parts.

This section comes to finalize findings on groups of construction project performance factors on Bole International Airport Terminal expansion and Minilik II Referral Hospital eye care center construction projects. It aims to clarify a priority of factors for the construction industry based on results of questionnaire completed by project practitioners on Bole International Airport Terminal expansion and Minilik II Referral Hospital eye care center construction projects. Starting from a general description it dives into details of eliminating possible tendencies and interrelations from different perspectives. An indication of dominative and supplementary groups of factors is considered as a desirable outcome of this part and will be a platform for a next step.

4.2. Demographic characteristics

4.2.1 Respondent representation

The overall response rate was 84.7% which is sufficient to get acceptance of the relative importance of project performance indicators. According to Zikmund, (2000), a survey response rate of 50% or higher should be considered excellent in most circumstances. A high response rate is likely driven by high level of motivation to complete the survey, or a strong personal relationship between the researcher and the respondents.

4.2.2 Respondent demographic characteristics

Demographics is characteristics of a population such as race, gender, age, education, profession,

occupation, marital status and others. In this research, the below table clarifies some of the demographic characteristics of questionnaire respondents.

Table 4.2: The frequency of profile of respondents

Description	Bole Airport terminal expansion		Minilik II Hospital eye care center		Total
	Frequency	Percent	Frequency	Percent	
Type of Organization					
owner	7	4.86	4	8.00	11
contractor	133	92.36	44	88.00	177
consultant	4	2.77	2	4.00	6
Total	144	100	50	100	
Job title of the respondent					
Project Manager	29	20.13	8	16.00	37
Site Engineer	74	51.39	20	40.00	94
Office Engineer	24	16.67	10	20.00	34
Other	17	11.81	12	24.00	29
Total	144	100	50	100	
Years of experience of the respondent					
Less than 1	8	5.55	3	6.00	11
1 to 5	26	18.06	15	30.0	41
6 to 10	85	59.03	22	44.00	107
More than 10	25	17.36	10	10.00	35
Total	144	100	50	25.77	
Number of executed projects					
1 to 2	12	8.33	5	10.00	17
3 to 5	54	37.50	19	38.00	73
More than 5	78	54.17	26	52.00	104
Total	144	100	50	100	

From the above table, it shows that the respondents are very much related to construction work in order to respond to the questionnaire, most of the respondents are experienced to provide relevant data on factors affecting construction performance (94.45% of Bole Airport terminal expansion project staffs and 94% of Minilik II Hospital eye care center construction project staffs have experience of more than one year). 91.67% of Bole Airport terminal expansion project staffs and 90% of Minilik II Hospital eye care center construction project staffs conducted three or more construction projects in previously. This will be ideal to get relevant information on factors affecting construction progress in the two selected organizations.

4.3. Criteria to Measure construction project performance

The relative importance index will be computed as (Cheung, 2004; Ayer and Jha, 2005; Ugwu and Haupt, 2007): using equation

$$RII = \frac{\sum w}{AXN} \dots\dots\dots \text{from equation 3.2}$$

RII = relative importance index,

W =the weight given to each factor by the respondents and ranges from 1 to 5

A = the highest weight = 5

N = the total number of respondents.

For instance, feed backs collected from respondents of the questionnaire about ‘**On time completion of the project**’ as a criterion to measure construction performance in building construction projects is computed as:

Number of respondents replayed “very low” = 0

Number of respondents replayed “low” = 5

Number of respondents replayed “medium” = 39

Number of respondents replayed “high” = 109

Number of respondents replayed “very high” = 41

Therefore, Average the weight given to the factor by the respondents =

$$\frac{0*1+2*5+3*39+4*109+5*41}{194} = 3.96 \rightarrow RII = 3.96/5 = 0.791$$

Therefore, RII for “on time completion of the project” is found 0.791.

The table below has presented the RII, rank, frequency and percentage of respondent’s feedback on measures of construction performance based on the representative numbers listed below:

1= very low, 2= low, 3= medium, 4= high and 5= very high

Table 4.3: Criteria to Measure construction performance in building construction projects

Measures of construction performance	RII	Rank	1 & 2		3		4 & 5	
			Frequency	%	frequency	%	frequency	%
On time completion of the project	0.791	1	5	2.57	39	20.10	150	77.31
Completion with allocated budget	0.729	2	11	5.67	50	25.77	133	68.55
Performing with specified quality level	0.682	3	15	7.73	73	37.62	96	49.48
Fulfilling Client Satisfaction	0.644	4	19	9.79	83	42.78	92	47.42
Achieving project members Health and safety	0.589	6	48	24.74	85	43.81	61	31.44
Fulfilling Regulatory and community satisfaction	0.634	5	21	10.82	81	41.75	92	47.42
Promoting Innovation and Learning of employees	0.517	7	57	29.38	96	49.48	41	21.13

As shown in the above table “On time completion of the project” has the highest rank with RII of 0.791 and “Completion with allocated budget” is the second ranked with RII of 0.729 to Measure construction performance in building construction projects. On the other hand, “Promoting Innovation and Learning of employees” is least ranked with RII of 0.517, that means it has low influence to measure construction performance in building construction projects.

4.4. Performance Related Problems in Building Construction Projects

There are eight main groups that affect the performance of construction projects for their successful completion. The results of this part of study provides an indication of the relative importance index, rank, frequency and percentage of questionnaire responses on performance related problems at Bole International Airport Terminal expansion and Minilik II Referral Hospital eye care center construction projects. The following table shows summary of performance problems ranking according to RII and frequency of responses with their percentage.

The numbers on the table are to represent:

1= Never, 2= Sometimes, 3= Usually, 4= Frequently and 5= Most Frequently

Table 4.4: The relative importance index (RII) and rank of performance related problems

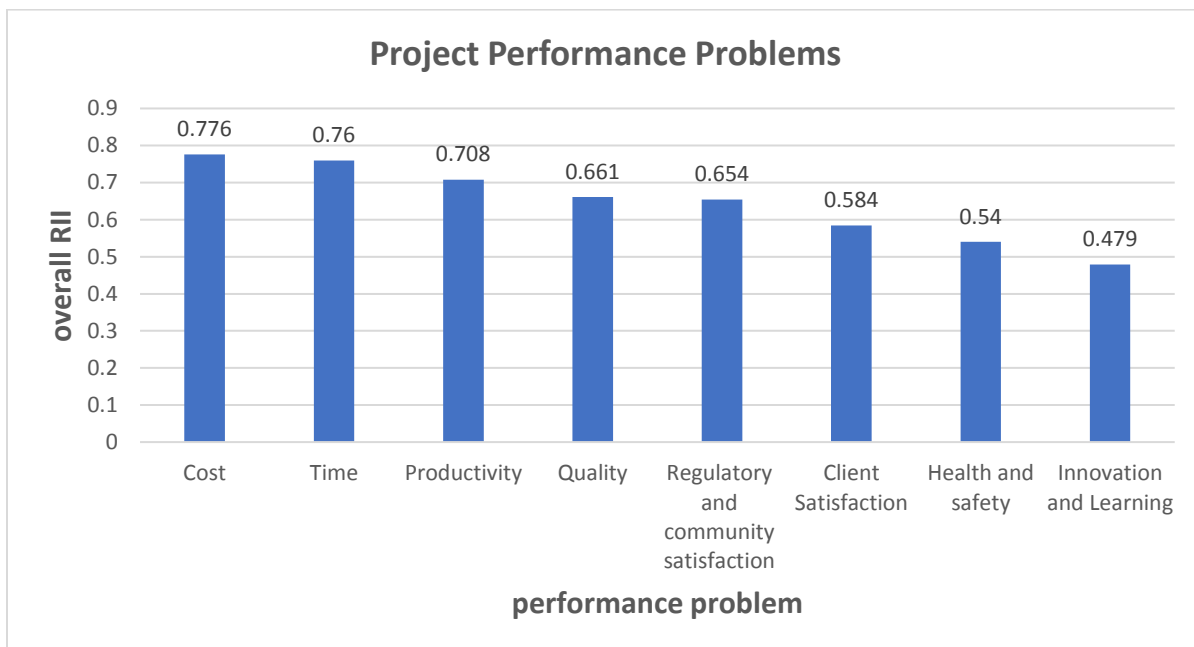
Construction Performance Problems	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Cost	0.776	1	14	7.22	31	15.98	149	76.80
Time	0.760	2	16	8.24	32	16.95	146	75.26
Quality	0.661	4	24	12.37	58	29.90	112	57.73
Regulatory and community satisfaction	0.654	5	26	13.40	61	31.44	107	55.15
Client Satisfaction	0.584	6	36	18.56	85	43.81	73	37.63
Health and safety	0.540	7	45	23.19	95	48.96	54	27.83
Innovation and Learning	0.479	8	58	29.90	94	48.45	42	21.64
Productivity	0.708	3	23	11.85	37	19.07	134	69.07

Based on the overall relative important index and rank shown on the above table, cost, time and productivity respectively are the top ranked factor groups that affect the performance of construction projects in Bole Airport terminal expansion and Minilik II Hospital eye care center. Relative importance index (RII) was used to analyze the data collected to assess the factors affecting performance of construction projects.

From the overall result shown on figure 4.1, the major performance problems which have been occurred on the projects are cost and time with a RII of 0.776 and 0.760 respectively. These is due to variation orders from owner, escalation material prices, shortage of construction materials on the market and the time taken to import materials from foreign countries. Following to cost and time; productivity (0.708), quality (0.661), Regulatory and community satisfaction (0.654) and Client Satisfaction (0.584) are the next ranked major performance problems. The reasons for these are labor skills, poor supervision, quality of equipment's, delay during project execution and incomplete documentation on the project office, wastes around the site which interrupt the movements of people near the site.

The least, but the important performance problems have been Health and safety (0.540) and innovation and learning (0.479). The problems related to health and safety performance are, awareness of labor about the advantage of the use of safety equipment's and there have not been first aid medication services on the project site, health and safety application system and others. Related to innovation and learning performance; the problems are there is no skill training for the labors demanded by them, there are no modern equipment's and technologies applied on the project. Even for the available modern equipment's and technologies on the project, there is no well experienced person to operate.

Figure 4.1: Overall RII and rank of project performance problems



4.5. Analysis of factors affecting Performance of Construction Projects

The results of this part of study provide an indication of the relative importance index, rank, frequency and percentage of respondents' feedback for the questionnaire provided on factors affecting the performance of construction projects in Bole International Airport Terminal expansion and Minilik II Referral Hospital eye care center construction projects. On the next section of the study presents Eight groups of factors that affect performance of construction projects.

4.5.1. Cost related Factors in building construction projects

Thirteen factors were identified from different literature reviews that affect the performance of cost. Based on the relative importance index (RII) and rank of the critical ones on selected

building construction projects are discussed. Table 4.5 and figure 4.2 below show the results of participants' response frequency with its percentage and rank based on overall RII of factors affecting cost performance.

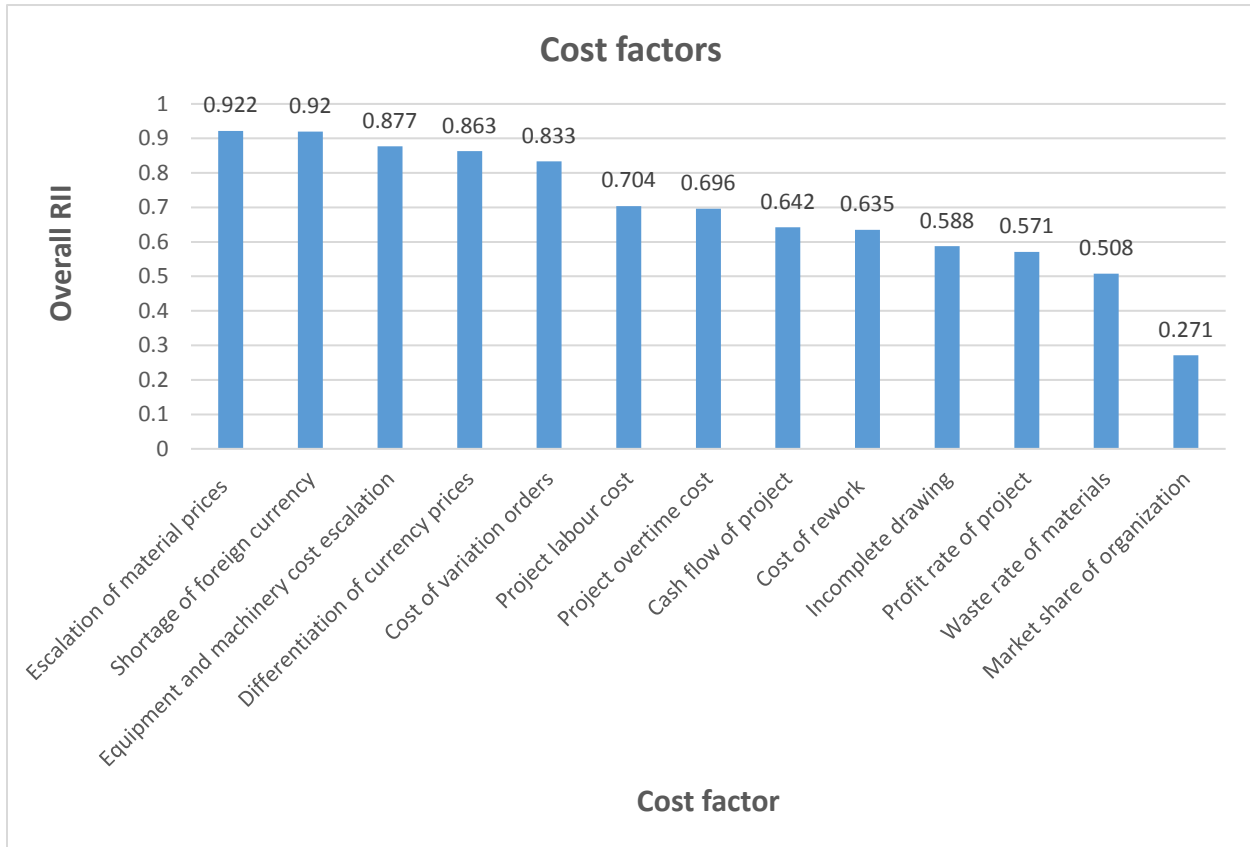
The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.5: The relative importance index (RII), rank, frequency and percentage of cost related performance factors

cost related performance factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Market share of organization	0.271	13	153	78.86	38	19.58	3	1.56
Cash flow of project	0.642	8	34	17.53	85	43.81	75	38.65
Profit rate of project	0.571	11	41	21.13	92	47.42	61	31.44
Equipment and machinery cost escalation	0.877	3	7	3.61	22	11.34	165	85.05
Project labour cost	0.704	6	11	5.67	31	15.98	152	78.35
Project overtime cost	0.696	7	14	7.21	30	15.46	150	77.32
Cost of rework	0.635	9	17	7.73	35	18.04	142	73.20
Cost of variation orders	0.833	5	9	4.64	24	12.37	161	82.99
Waste rate of materials	0.508	12	42	21.64	97	50.00	55	28.35
Escalation of material prices	0.922	1	0	0	15	7.73	179	92.26
Differentiation of currency prices	0.863	4	6	3.09	21	10.82	166	85.56
Incomplete drawing	0.588	10	36	18.55	89	45.87	69	35.56
Shortage of foreign currency	0.920	2	0	0	17	8.85	177	91.23

Figure 4.2: Overall RII and rank of cost factors



Based on the overall relative important index (RII) and rank as shown on figure 4.2, the critical and top ranked factors of cost performance are discussed below. Escalation of material prices (0.922) became the most important factor of cost performance. This is because of escalation of material prices are affects the liquidity of projects and cost performance of projects. The cost of construction materials are increases from time to time because of a limited supplier, factories, shortage of raw materials and cost of transportation from foreign countries.

Shortage of foreign currency (0.920), Material and equipment cost escalation (0.877), differentiation of currency exchange (0.863), cost of variation orders (0.833), project labor cost (0.704) became the critical factors next to escalation of material prices. Shortage of foreign currency is the major bottleneck for construction projects in recent times. Since most of the inputs for building construction are imported, it needs huge amount of foreign currency. Thus, shortage of the required amount of foreign currency charges additional cost due to delay of tasks and other cost escalations. Materials and equipments cost affect the liquidity and project cost performance. Variations orders from owners related to design change, increase of labor cost and material and equipment cost are leads to the increments of project cost. This is due to problem of

assumptions during planning stage. Project labor cost affects the cost performance of project because labor costs are one of the main inputs for project cost.

Differentiation of currency exchange is affecting profit rate of the project and cost performance. Contractors have been suffered from differentiation of currency prices because of economic and political situation of the country. Cash flow are also affecting the project budget and project cost performance, because cash flow can give an important evaluation for the cost performance at any stage of project. Restrictions of cash flow by national bank had a huge impact on project performance since most of the market exchange in the country are through hand to hand cash transaction.

The critical factors of cost performance from the selected case studies are project over time cost, escalation of materials prices other than cement, reinforcement and fuel, shortage of materials, material and equipment cost, cost of variation orders, additional works, problem in planned cost, cash flow of the project, profit rate of the project, design and technical matters and too much number of test orders for HCB.

4.5.2. Time related factors in building construction projects

Time related project performance factors are factors that determine the duration of the project work with reference to the estimated time during the project planning phase. There were identified thirteen factors of time performance in construction projects. These factors were identified from the literature reviews and site observations by the researcher. Based on the RII and rank given by the respondents, the critical factors are discussed briefly. Table 4.6 and figure 4.3 below show the results of participant's response with RII, rank from RII, frequency of response with its percentage of factors affecting time performance.

Based on the overall RII and rank shown on figure 4.3, delay of payments from owners to contractors with RII equals to (0.852) has been identified the most critical factor that affects the time performance of construction projects on the selected sites. This factor influences the completion time of the projects directly and which intern affects project performance. If payments are not available as planned through project duration, the project will suffer from problem of time and cost performance. And it also affects the whole performance of projects. Any payment which needed by the contractor should be paid on time to assure the contractor to execute the project within the schedule.

Site preparation time (0.837) have been the second major time performance factor of construction projects. Mostly the time needed to prepare the site is more than the expected due to different circumstances such as right-of-way issues. Low speed of decision making (0.821), financial constraints (0.806), effective communication (0.770) and the time needed to implement variation orders (0.757) also have been decisive factors of project time performance.

The numbers on the table are to represent:

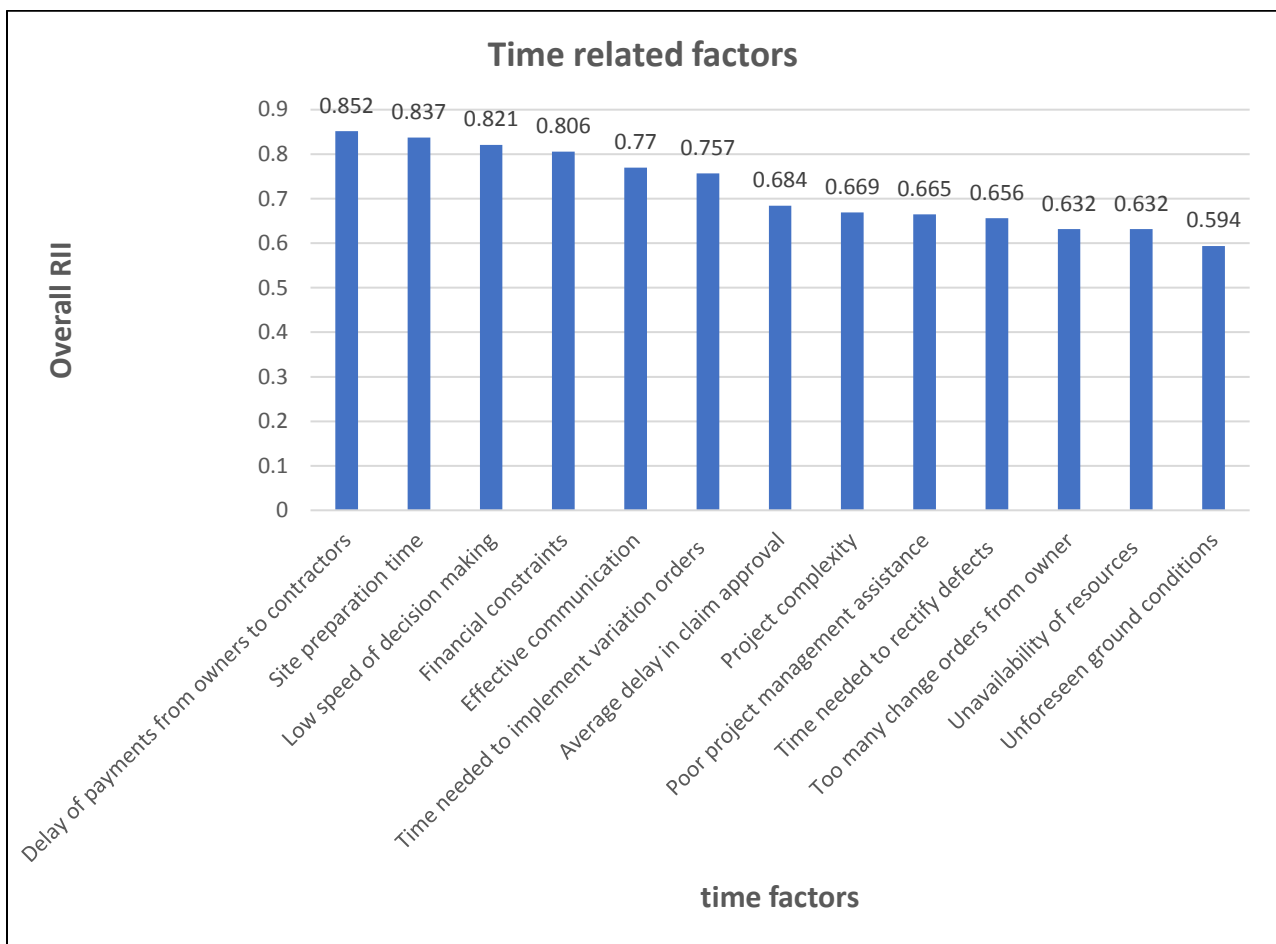
1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.6: The relative importance index (RII), rank, frequency and percentage of time related performance factors

Time related performance factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Too many change orders	0.632	11	32	16.49	71	36.98	91	46.91
Poor project management system	0.665	10	29	14.94	68	35.05	97	50.00
Unforeseen ground conditions	0.594	13	43	22.16	77	39.69	74	38.14
Low speed of decision making	0.821	3	10	5.15	25	12.89	159	81.95
Project complexity	0.669	8	24	12.37	79	40.72	103	53.09
Lack of good communication	0.770	5	12	6.19	33	17.01	149	76.80
Financial constraints	0.806	4	8	4.12	28	14.43	158	81.44
Average delay in claim approval	0.684	7	22	11.34	76	39.18	96	49.48
Delay of payments from owners to contractors	0.852	1	6	3.09	18	9.28	170	87.63
Site preparation time	0.837	2	11	5.67	23	11.86	160	82.47
Unavailability of resources	0.632	11	37	19.07	84	43.30	73	37.63
Time needed to rectify defects	0.668	9	34	17.52	81	41.75	79	40.72
Time needed to variation orders	0.749	6	26	13.40	65	31.44	103	53.09

Low speed of decision making by different hierarchies of project stockholders had a great impact on project time performance. When a certain decision is required to be made in each step of the project, it should be made as soon as possible. If it doesn't happen at that time, its effect on project time performance is visible and negative. Financial constraints of the project have a great influence on time performance of the project by delaying the purchase and payment of key project inputs. The presence of effective communication is the key tool to undergo any construction project efficiently and can interrupt the progress of the project if there is no smooth communication.

Figure 4.3: Overall RII and rank of time related factors



The number of change orders from owners to the contractors directly affects time performance of construction projects. This is due to change orders will interrupt the schedule of the project and sometimes suspend the project due to incomplete design changes which affects the sequence of the project activities. the time required to implement these variations of orders will affect the project time performance. This is consequence of that some variations consume or require more

time than the first planned activities. As a result of such interruptions, the project stockholders will suffer time and cost performance problems due to the time needed to implement these change orders.

4.5.3. Quality related factors in building construction projects

Quality related factors of project are the factors that affect the quality of the construction compared to specified quality standard on project charter. From different literatures reviews, there were nine factors that affect the quality performance of construction projects. Table 4.7 and figure 4.4 below shows the results of participants overall RII and rank of factors affecting quality performance. Frequency of respondents and its percentage is also presented in the below table.

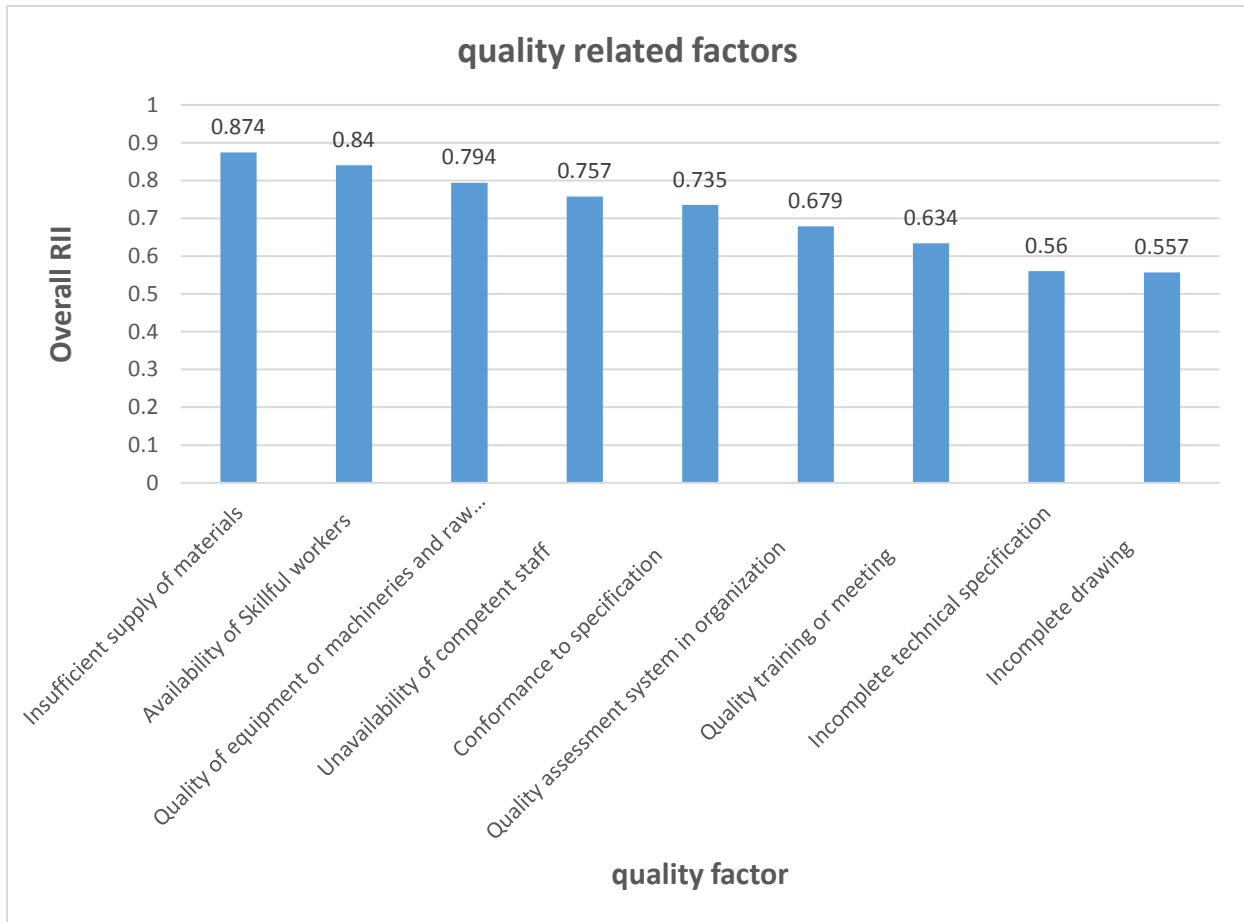
The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.7: The relative importance index (RII), rank, frequency and percentage of quality related performance factors

quality related performance factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Conformance to specification	0.735	5	16	8.24	54	27.83	124	63.91
Supply of materials	0.874	1	2	1.03	14	7.73	178	91.75
Availability of competent staff	0.757	4	20	10.31	49	25.25	125	64.43
Quality of equipment or machineries and raw materials	0.794	3	19	9.79	44	22.68	131	67.52
Quality assessment system in organization	0.679	6	28	14.43	67	34.45	99	51.03
Quality training or meeting	0.634	7	38	19.58	75	38.66	81	41.75
Minimizing Incomplete drawing	0.557	9	47	24.22	80	41.23	67	34.54
Complete technical specification	0.560	8	49	25.26	82	42.27	63	32.47
Availability of Skillful workers	0.840	2	4	2.06	21	10.82	169	87.11

Figure 4.4: Overall RII and rank of quality factors



Based on figure 4.4 above, insufficient supply of materials with RII of (0.874), availability of skillful workers RII of (0.840), quality of equipment or machineries and raw materials RII of (0.794) and unavailability of competent staff RII of (0.757) have been the top four factors that affect quality performance of construction projects.

According to figure 4.4 above, insufficient supply of materials is the most important factor that affects project quality performance. In recent time, finding sufficient amount of construction materials such as cement and reinforcing steel become very difficult and greatly affected quality of construction works. Due to insufficient supply of some material inputs, non-standard proportion of materials are applied which intern affects quality performance of construction projects.

availability of skillful workers is the second important factor that affect the quality performance of selected construction projects. Based on the data collected by the questionnaire and shown on the above figure, unavailability of competent staff is a major factor that affect quality performance of construction projects at the two selected construction sites. Most of the staffs

(labor) that are available on the market are semi-skilled and un-skilled. These incompetent staffs mainly affect the quality of the construction project.

The materials, equipments and machineries used in any project can greatly affect the quality of the work performed. In Ethiopia most of the available materials are produced by a limited number of producers with a little variation in quality. When the price of materials escalates from the contract price, unless otherwise price adjustment is made on the contract, the quality of the materials used on the project would greatly affect by the escalation. This is due to the contractor wants himself to be free from lose; he would use some low-cost materials and quality performance of the project affected.

According to the response of participants of the questionnaire Conformance to specification is the other major factor that affects quality performance of projects in the construction industry. When the project is done with deviation from the specified quality of materials and design, it leads to low quality performance. Thus, the result shows deviation from specification has been common and series issue by affecting construction quality at the selected construction projects.

4.5.4. Productivity related factors in the selected building construction projects

Productivity in construction projects is average amount of task performed per individual in a certain period of time. It is also the amount of product gained from a given amount of resource. There are eleven factors that affect productivity performance of construction projects that were identified from different literature reviews. Table 4.8 below shows results of the RII, rank, frequency and percentage of factors affecting productivity performance of Bole Airport terminal expansion project and Minilik II Hospital eye care center construction project. Based on the overall RII and rank shown on the figure 4.5 the discussions are made.

The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.8: The relative importance index (RII), rank, frequency and percentage of productivity related performance factors

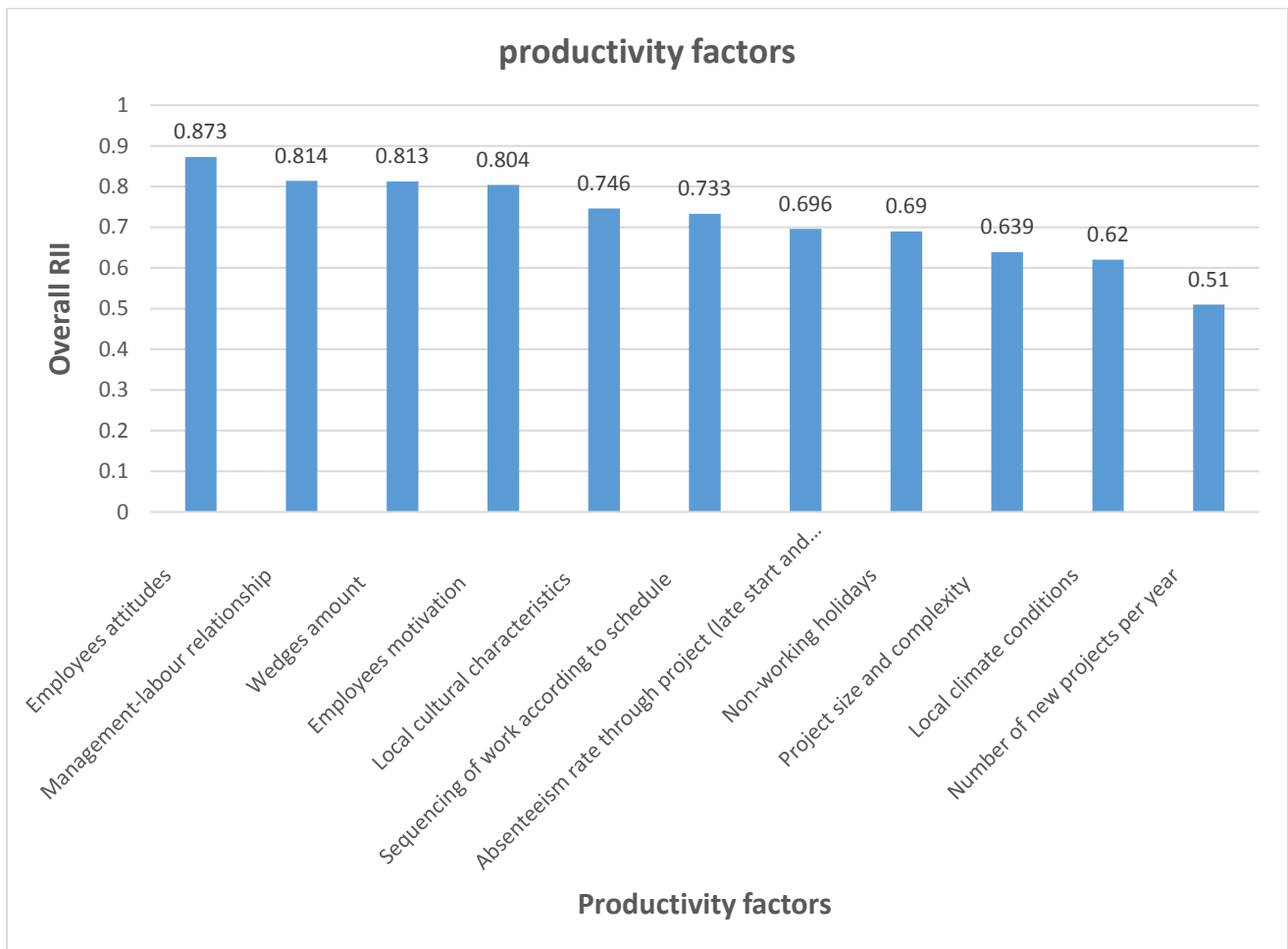
Productivity related performance factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Project size and complexity	0.639	9	23	11.85	78	40.21	93	47.94
Management-labour relationship	0.814	2	7	3.61	20	10.31	167	86.08
Absenteeism rate through project	0.696	7	22	11.34	70	36.08	102	52.58
Number of new projects per year	0.510	11	51	26.29	88	45.36	55	28.35
Sequencing of work according to schedule	0.733	6	17	8.76	64	32.99	113	58.24
Local cultural characteristics	0.746	5	16	8.24	61	31.44	117	60.31
Non-working holidays	0.690	8	25	12.89	65	33.51	104	53.61
Local climate conditions	0.620	10	39	20.10	85	43.81	70	36.08
Wedges amount	0.813	3	10	5.15	23	11.85	161	82.98
Employees motivation	0.804	4	12	6.19	22	11.34	160	82.47
Employees attitudes	0.873	1	3	1.55	19	9.79	172	88.66

Figure 4.5 below shows that employee attitudes with RII of (0.873), management-labour relationship with RII of (0.814), wedges amount with RII of (0.813) and employee motivation with RII of (0.804) have been the major factors that affect the productivity performance of construction projects.

The attitudes of employees on the project mainly affects the productivity performance of the project. Employees' attitude for their work is great determinant of productivity of work i.e. positive attitude promotes good productivity and negative attitude lowers productivity. Management-labour relationship is also the main determinant of productivity performance of construction projects. When there is smooth relationship between management and labour, construction project performance rapidly grows and productivity of labor increases without any

additional reinforcement. Therefore, the management should have smooth relationship with its staffs in order to promote productivity of resources available.

Figure 4.5: Overall RII and rank of productivity factors



Based on the data presented in table 4.8 above, the amount of wedges the company pays for its staff greatly affects productivity of the project. When the amount of wedge is high with respect to the skill of the employee and his/her experience, productivity of the project is also higher. Labors those have more salary are usually more motivated than less salary labors And because of this difference on salary the productivity of projects will be affected. Motivated employees are more productive than unmotivated employees in any type of work and any level of skill. The motivation of staffs in construction projects greatly affects productivity performance.

4.5.5. Client Satisfaction Factors in building construction

There have been five factors that affect client satisfaction performance of projects which were identified from literatures reviews and site observations. Table 4.9 and figure 4.6 below show the

results of individual's response frequency with its percentage and rank based on overall relative importance index of factors that affect client satisfaction performance.

The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

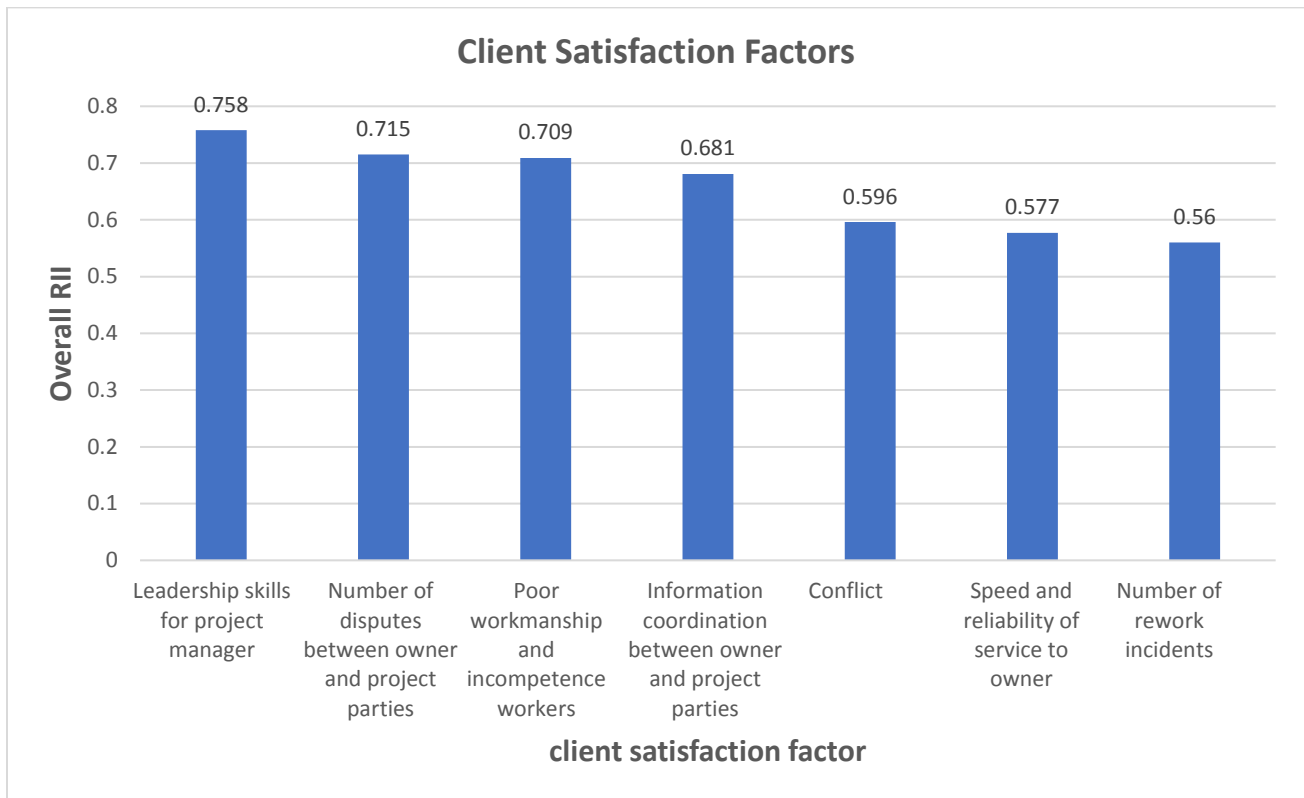
Table 4.9: The relative importance index (RII), rank, frequency and percentage of client satisfaction related performance factors

client satisfaction related performance factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Leadership skills for project manager	0.758	1	21	10.82	37	19.07	136	70.10
Number of disputes between owner and project parties	0.715	2	27	10.91	42	21.65	125	64.43
Speed and reliability of service to owner	0.577	6	46	23.71	89	45.87	59	30.41
Number of rework incidents	0.560	7	48	24.74	90	46.39	56	28.86
Information flow between owner and project parties	0.681	4	31	15.98	58	29.90	105	54.12
Conflict	0.596	5	43	22.17	87	44.84	64	32.99
Poor workmanship and incompetence workers	0.709	3	28	14.43	57	29.38	109	56.19

As shown on the figure 4.6 below, Leadership skill for project manager with RII of (0.758) has been the first ranked and the most critical factor which affects the performance of client satisfaction of construction projects. Leadership skill for project manager is the most important factor that affect the construction project performance because client satisfaction depends up on it. When the leadership skill of the project manager is good, the success rate of the project is

high, which intern increases the satisfaction of the client. The reverse is also true i.e. when leadership skill of the project manager is low, clients of the project will be dissatisfied.

Figure 4.6: Overall RII and rank of client satisfaction factors



The number of disputes between owner and project parties has been the second factor which affects the performance of client satisfaction with RII of (0.715). Disputes between the owner and contractor and the owner and consultants affects the relationship between them and the degree of client satisfaction will be affected.

Poor workmanship and incompetence workers with RII of (0.709) have been the third critical client satisfaction performance factors next to number of disputes between owner and project parties. The existence of poor workmanship and incompetent staff on the project site greatly affects the client satisfaction. This is an important factor of client satisfaction since it affects the quality of the project and service life of the project. Conflicts between contractors to labors and labors themselves on the project site will also greatly affect the degree of clients' satisfaction. Information coordination between the owner and project parties (0.681) is the other factor that affects client satisfaction performance of projects. When there is good coordination of information between owner and project parties, the performance of the project rises in some extent.

Based on the data collected from the selected construction projects through site observation: speed of delivering the project to the owner, number of claims submitted from the contractor and performance of contractor has been the main factors affecting the performance of client satisfaction on projects.

According to questionnaire responses, Leadership skill for project manager, number of disputes between owner and Poor workmanship and incompetence workers respectively are the major factors that affect client satisfaction performance at Bole Airport terminal expansion project; while Poor workmanship and incompetence workers, number of disputes between owner and Poor workmanship and incompetence workers and Leadership skill for project manager respectively are the major factors that affect quality performance at Minilik II Hospital eye care center construction project. These shows both projects have the same major factors that affect its client satisfaction performance but its ranks are reversed.

4.5.6. Regulatory and Community Satisfaction related factors in building construction projects

From literatures reviews and site observations, there were four factors identified that affect the regulatory and community satisfaction performance of construction projects. Table 4.10 and figure 4.7 below, show the overall RII of participants and rank of these factors based on their influence on Regulatory and Community Satisfaction performance of projects. The table below also presented respondents frequency of response for each importance level. The critical factors are discussed below based on the overall RII and the top ranked factors.

As indicated by figure 4.7 below, Quality and availability of regulatory documentation with RII of (0.81) has been the most critical factor which affects the performance of regulatory and community satisfaction on construction projects. In Ethiopia, there is no clearly defined and readily available regulatory documents. This leads to violation of a certain rules and regulations during the progress of the project, which intern affects the quality of the project. This factor is the most important one for all parties.

The figure below also shows that cost of compliance to regulators requirements has been the second most important regulatory and community satisfaction performance factor with RII of (0.629). The amount of cost of compliance (conformity) which paid to regulatory bodies and the compensation cost paid for the properties of land greatly affect the degree of satisfaction of regulators and community and also this affects the cost performance of project.

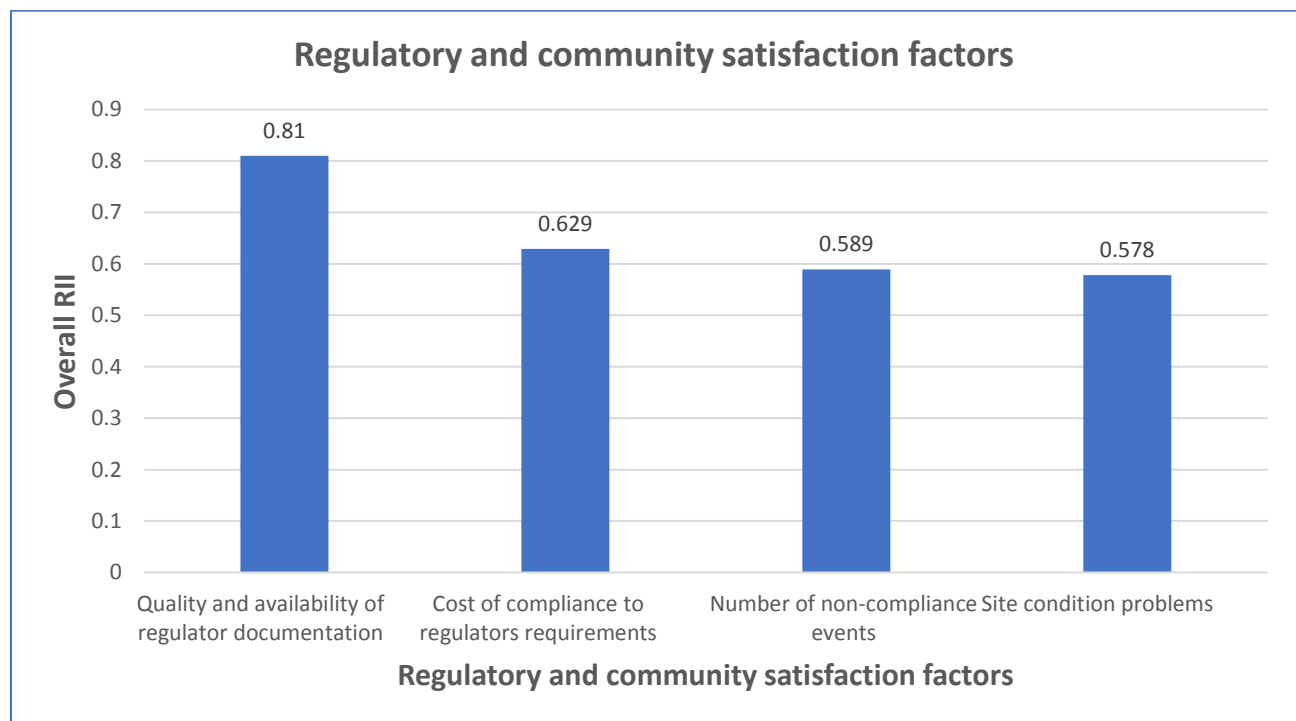
The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.10: The relative importance index (RII), rank, frequency and percentage of Regulatory and Community Satisfaction related performance factors

Regulatory and Community Satisfaction related factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Site condition	0.578	4	41	21.13	91	49.90	62	31.96
Quality and availability of regulatory documentation	0.810	1	8	4.12	30	15.62	156	80.41
Cost of compliance to regulators requirements	0.629	2	32	16.49	78	40.21	84	43.30
Number of non-compliance events	0.589	3	40	20.62	93	47.93	61	31.44

Figure 4.7: Combined RII and ranks of regulatory and community satisfaction factors



The Number of non-compliance events with RII of (0.589) has been the third critical factor which affects the performance of regulatory and community satisfaction on the selected construction projects. The more increase in non-compliance events will be the more factor which affect the degree of regulatory and community satisfaction on the project. This will affect the overall project performance.

4.4.7. Health and Safety Factors in building construction projects

There are eight factors of health and safety performance that were identified from the literature’s reviews and site observations. Table 4.11 and figure 4.8 below show the results of RII and rank of factors affecting health and safety performance at Bole Airport terminal expansion project and Minilik II Hospital eye care center construction project. The table also shows the frequency of response for each importance level and its percentage.

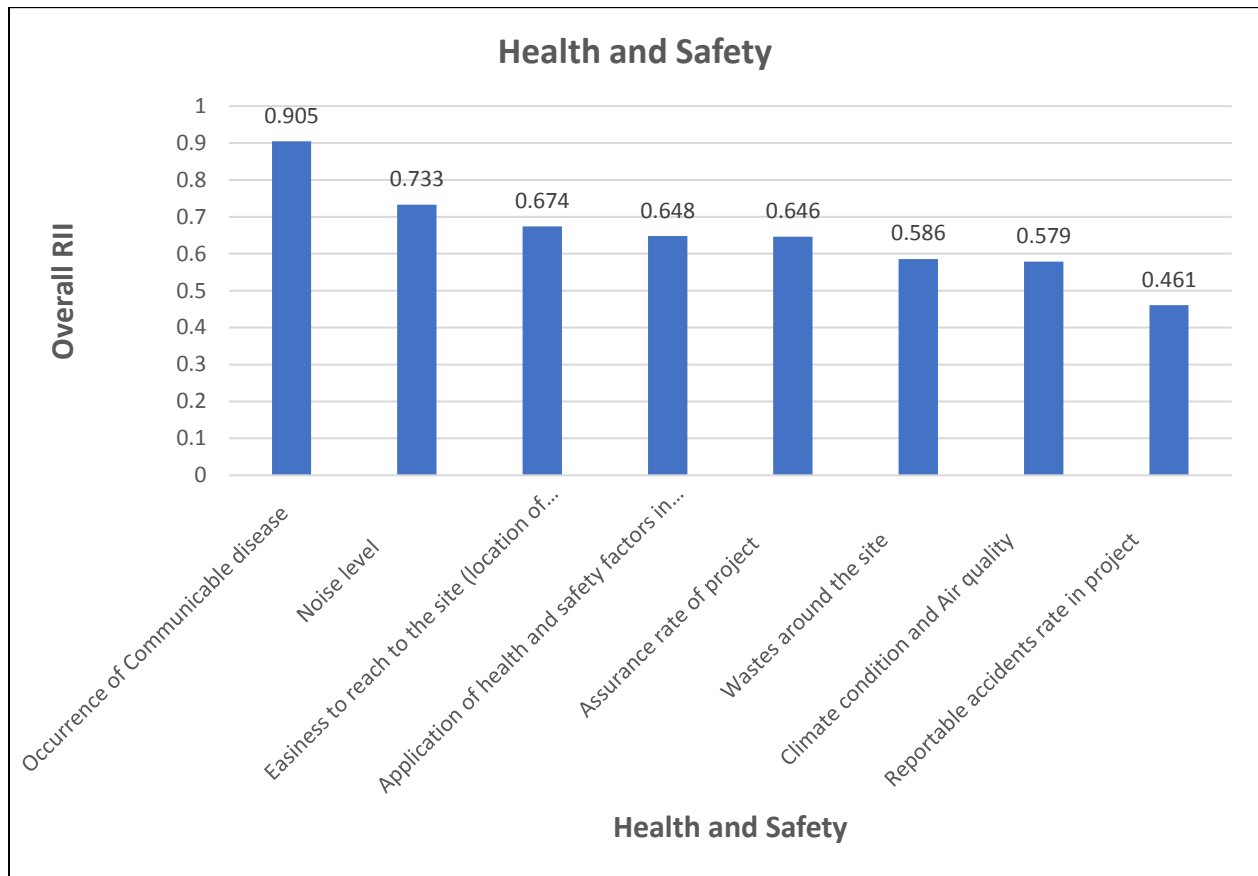
The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.11: The relative importance index (RII), rank, frequency and percentage of Health and Safety related performance factors

Health and Safety related performance factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Reportable accident rate	0.461	8	69	35.57	77	39.69	48	24.74
Application of health and safety factors in organization	0.648	4	39	20.10	74	38.14	81	41.75
Assurance rate of project	0.646	5	37	18.78	78	40.21	79	40.72
Easiness to reach to the site	0.674	3	35	18.04	71	36.59	88	45.36
Wastes around the site	0.586	6	42	21.64	92	47.42	60	30.92
Climate condition	0.579	7	46	23.71	88	45.36	60	30.92
Noise level	0.733	2	30	15.46	61	31.44	103	53.09
Occurrence of Communicable disease	0.905	1	1	0.52	17	8.76	176	90.72

Figure 4.8: overall RII and rank of health and safety factors



As illustrated on the figure 4.8, occurrence of communicable disease with RII of (0.905), noise level (0.733), easiness to reach to the site (0.674) and application of health and safety factors in organization (0.648) has been the top ranked health and safety performance factors on building construction projects. Based on the data collected, the occurrence of communicable disease like that of covid-19 virus had a great impact on the performance of the projects. The application of preventive actions to such communicable diseases on the construction projects decreases the occurrence of problems related to health and safety. The occurrence of covid-19 becomes the major factor that influences the performance of construction projects for more than a year. Therefore, the implementation of covid-19 preventive measures has a great impact on health and safety performance on building construction projects.

Easiness to reach to the site (location of the site) is the other major factor that determines the health and safety performance on building construction projects. When the location of the site is not easily accessible, it affects the productivity of the project negatively. Therefore, assuring

good access to the location of the site encourages for having better health and safety performance on building construction projects.

Based on site observations and questionnaire response, the noise level of equipment and machineries on the site directly affects the health and safety of workers, especially workers working with near the equipment and machineries. When the level of noises at the site is high, it will decrease the level of communications between workers and this will affect the productivity of workers on the site. This is due to communications between workers will greatly affect the productivity of them. Thus, the noise level on the site is a major factor that affects the health and safety performance of building construction projects.

The application of health and safety factors on projects will decrease the occurrence of problems related to health and safety and it will improve the awareness of the workers. This factor has a major effect on performance of projects because it affects the overall safety system of projects. Assurance rate of project with RII of (0.646) has been the other critical factor affecting the performance of health and safety on building construction projects. Assurance is a type of insurance in which money is paid out after an agreed period of time when somebody dies. Assurance (guarantee) rate of project affects the safety and cost performance of projects.

As noticed by the researchers site observation from the selected case studies, neglecting covid-19 preventive measures, workers' lack of awareness to safety, improper using of safety equipment's, problems in bracing of formworks and scaffoldings have been the major factors that affects health and safety performance on the projects.

4.5.8. Innovation and Learning Factors in building construction

From the literature reviews and site observations analyzed, there were five factors that affect innovation and learning performance at the selected construction projects. Table 4.12 and figure 4.9 below show the results of participants overall RII and rank of factors affecting innovation and learning performance of the two selected construction projects. The table below also presents the frequency of responses for each importance level and its percentage. Based on the overall RII shown on figure 4.9, the discussions are made.

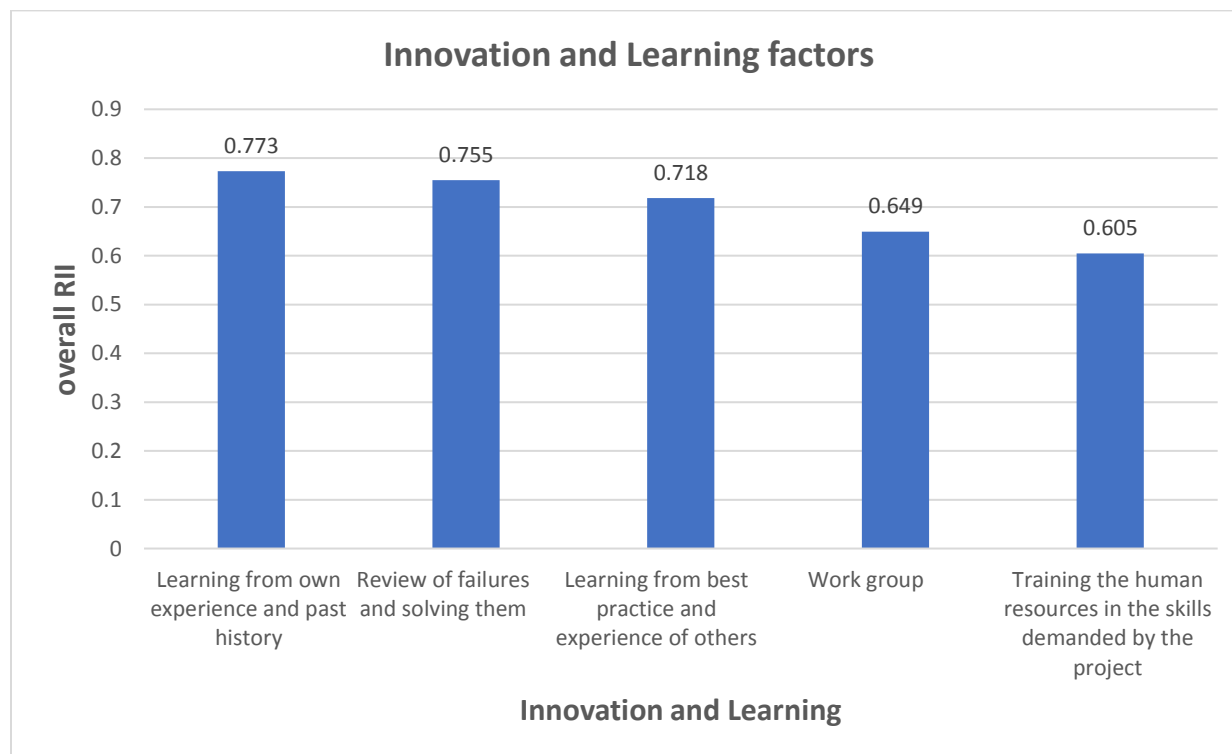
The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.12: The relative importance index (RII), rank, frequency and percentage of Innovation and Learning related performance factors

Innovation and Learning related performance factors	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Learning from own experience	0.773	1	14	7.22	26	13.40	154	79.38
Learning from others success	0.718	3	19	9.79	49	25.26	126	64.94
Review of failures and finding solution for the failure	0.755	2	16	8.25	38	19.58	140	72.16
Work group	0.649	4	29	14.94	65	33.51	100	51.54
Training of human resources	0.605	5	32	16.49	72	37.11	90	46.39

Figure 4.9: Overall RII and rank of innovation and learning factors



As shown in figure 4.9 above, learning from own experience and past history (0.773) has been the most critical factor that affects innovation and learning performance of projects. learning from own experience and past history improves performance of construction projects. It can also

improve and develop the performance of current and future projects. Taking the practice and experience of own past projects will make ourselves to minimize risks related to safety, health, time, cost and quality performance of projects.

Figure 4.9 shows that review of failures and solving them with RII of (0.755) have been the second critical factor which affects the innovation and learning performance of a project. Once failures occurred in a project, reviewing, solving and protecting them before happening again will improve the cost, time and quality performance of projects. This factor also will enhance project performance and will satisfy the project stakeholders towards innovation and learning.

The Figure above also shows that learning from best practice and experience of others (0.718) has been the second critical factor that affects innovation and learning performance of projects. Learning from best practice and best experience of others will improve performance of projects. It can also improve and develop the innovation and learning performance of current and future projects. Taking the best practice and experience of best organizations will make others organizations to minimize risks related to safety, health, time, cost and quality performance of projects.

From all the above groups of factors ten critical factors are identified and discussed by the researcher. Escalation of material prices is ranked first with an average RII of 0.922. The main reason is that every construction material's price is escalated uncontrollably and it becomes the major obstacle for most construction projects. Due to price rise of construction materials, out of budgeting becomes a common phenomenon and the cost performance of projects are greatly affected. Price escalation also affects quality of construction projects since the contractors tend to use low quality products with relatively lower cost. The main cause of material price escalation is due to devaluation of birr and shortage of hard currency that have direct and indirect impact in construction projects especially material and equipment prices. Increase in materials prices affect both the owner and the contractor which in turns leads to projects will be finished with poor output and poor overall performance of the project. The result is compatible with Enshassi (2009), since escalation of material prices affects the liquidity of owners and the profit rate of contractors, which intern results in cost and time overrun.

Shortage of foreign currency is the second major factor that affects the performance of overall construction projects. In recent years, finding foreign currency becomes very difficult task for every importer in the construction sector. Due to foreign currency shortage, it becomes difficult to find construction materials and machineries which intern greatly affects the overall

performance of construction projects. this result agrees with Lim (2005) as this factor has strong effect on schedule & cost performance of projects.

Occurrence of Communicable disease is the third major factor that determines the overall performance of construction projects. Within the last two years, Covid-19 virus becomes the major communicable disease that affects the timely progress of construction projects. It also affects the health and safety performance of construction projects by exposing the project members to sever health problems. This result agrees with Koushki, P. A. & Kartam, N., (2004) as this factor has strong effect on overall project performance.

Equipment and machinery cost escalation is the other major factor that determines overall performance of construction projects especially cost performance of projects. due to shortage of foreign currency and escalation of exchange rate, the price of equipment and machineries also escalated. This price escalation leads to cost overrun of projects and deviation from schedule of construction projects due to usage of more labor-intensive products. This result agrees with Lim (2005) as this factor has strong effect on schedule & cost performance of projects.

Insufficient supply of materials is also a major factor that affect the overall performance of construction projects. This is due to the fact that any insufficient supply of materials on time or quantity will delay the schedule and result in increased overall cost. This result agrees with Cho Y. J., Lee J. W., (2012) as this factor has strong effect on project schedule & cost performance of projects.

Employees attitude is the main factor affecting the overall performance of construction projects. A company which have a good employee attitude by far outperforms that of with bad employee attitude. Having positive attitude on one's own work increases productivity and work satisfaction, which intern develops client and community satisfaction by the progress of the work. Therefore, creating positive employee attitude develops the higher overall performance of construction projects. This result is in agreement with UNRWA. (2006) as this factor has strong effect on overall project performance.

Differentiation of currency prices is a major phenomenon happening in day to day activities of the society in the recent three years. The value of Ethiopian Birr devaluates more than three times with in the last five years, which strongly affects project schedule & cost performance of projects by creating unpredictable price of good and services. Therefore, differentiation of currency prices seriously affects the overall performance of construction projects based on the

data found from the two selected sites. This result is in compatible with Adnan Enshassi, (2010) as this factor affects strongly on project performance since it affects strongly time & cost overruns.

Delay of payments from owners to contractors is the key factor that affects performance of construction projects. If the required payment of the project is not done at each stage of the project, shortage of resources may occur on the project. This lack of resources to proceed the project leads to schedule and cost overrun, which is the major cause of low overall project performance. Many projects suffer time overrun. This result agrees with Lim (2005) as this factor has strong effect on project schedule & cost performance of projects. Ofori (1984) also revealed the effect of chronic delay in the payments of contractors on their performance at construction projects.

Unavailability of Skillful workers is also the top ten ranked factor that affect the performance of construction projects. This is due to the fact that, especially in humanitarian projects, skill full people don't want to travel to sites with only basic facilities, inconvenient environment and usually higher expenses of living. Working with the available but not qualified workers is common phenomena that compromises quality, cost and time. This result agrees with Adnan Enshassi, (2010) as this factor strongly affects project performance because it affects strongly time & cost overruns.

Site preparation time for construction projects is the other important factor which affects the overall performance of construction projects. Having extended amount of site preparation time leads to incurring of additional costs and facing of project delay. This is due to the possibility of schedule delay, which intern leads to additional cost of equipment, labor, material price increment and project delay cost. This result agrees with Lim (2005) as this factor has strong effect on schedule & cost performance of projects.

4.6. Key Performance Indicators' of Building Construction Projects

Indicators of performance of construction projects are standards assigned to be met after the successful completion of the project. When the project meets expectation of this indicators, it indicates good performance of a project. All the factors in the above tables have been analyzed based on their groups assigned and average RII calculated to rank the group based on their RII.

The numbers on the table are to represent:

1 = Very Low Important, 2 = Low Important, 3 = Medium Important, 4 = High Important, 5 = Very High Important.

Table 4.13: The relative importance index (RII), rank, frequency and percentage of Key Performance Indicators' for construction projects

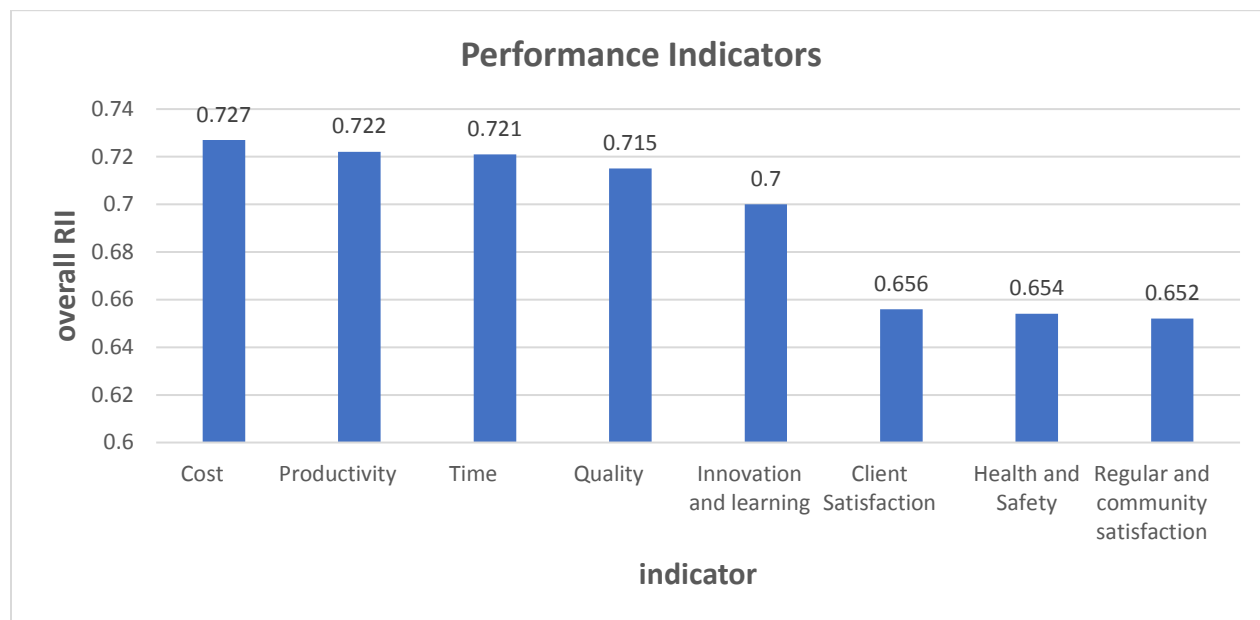
Key Performance Indicators	RII	Rank	1 & 2		3		4 & 5	
			frequency	%	frequency	%	frequency	%
Cost	0.727	1	12	6.19	58	29.89	124	63.91
Time	0.721	3	14	7.22	57	29.38	123	63.40
Quality	0.715	4	11	5.67	63	32.47	120	61.86
Productivity	0.722	2	9	4.63	61	31.44	124	63.91
Client Satisfaction	0.656	6	18	9.28	73	37.63	103	53.09
Regulatory and community satisfaction	0.652	8	17	8.76	77	39.69	100	51.54
Health and Safety	0.654	7	15	7.73	76	39.18	103	53.09
Innovation and learning	0.700	5	10	5.15	64	32.99	120	61.86

According to table 4.13 and figure 4.10 above, cost is the main indicator of project success with RII of (0.727) on the selected building construction sites. The result shows that, when a project achieves a better cost performance implies good overall project performance. A project with poor cost management have lower project performance since cost is the main indicator of project success. Therefore, completing of a project with allocated budget is a good indicator of higher project performance.

Based on the above data, productivity is the second most important indicator of construction project performance. Achieving maximum result with the minimum available resources is an outcome of good productivity performance of projects, which intern is a good indicator of better overall project performance. When the productivity of the project work is high, it results in good time, cost and other performance indicators. Thus, a construction project's productivity is a major indicator of overall performance of construction projects.

As the data collected implies that, Time is the third major indicator of construction project overall performance on the two selected projects. Timely completion of projects is the major goal sated at the beginning of the project and if it is not achieved, the project is considered as unsuccessful. The amount of delay a project faces is an additional cost for both the contractor and the owner. It also influences the client’s satisfaction on the project. Therefore, completion time is a major indicator of overall project performance.

Figure 4.10: Overall RII and rank of construction performance indicators



SPSS V25 was used to analyze the regression and analysis of variance to assess the factors affecting performance of construction projects. This analysis has helped the researcher to understand how the typical value of the dependent variable changes when any of the independent variables changed, while other independent variables held fixed. The results are stated as in the below table.

Table 4.14: The Model Summary for respondents’ response

Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	Durbin-Watson
1	0.863 ^a	0.745	0.739	0.409	1.548
a. Predictors (Constant): Cost related factors, time related factors, Productivity related factors, Clients satisfaction related factors, Health and safety related factors, Regulatory and community satisfaction related factors, Innovation and learning related factors, and Quality related factors					
b. Dependent Variable: Overall Project Performance					

The factors R^2 has the value of 0. 0.745 and expressed that 74.5% of the variation of performance of construction projects at Bole International Airport terminal expansion and Minilik II Hospital eye care center construction can be explained by the variables taken into consideration. The adjusted correlation ratio shows that 0.739 of the total variation. this due to the regression line, given the number of degrees of freedom. The multiple correlation coefficients(R), with a value of 0.863, represent the correlation ratio indicating the existence of link between construction performance and its main factors. This is a satisfactory result to understand that the independent variable has effect on the dependent variable.

Multiple linear regression model assumes the residuals are independent of one another (Ugwu and Haupt, 2007). The Durbin-Watson statistic is used to test the presence of serial correlation among the residuals. The value of the Durbin-Watson statistic ranges from 0 to 4. As a general rule, the residuals are not correlated if the Durbin-Watson statistic is approximately 2, and an acceptable range is 1.50 to 2.50. From the table above, we can also understand that the assumption of independence of residuals is meet.

Table 4.15: The analysis of variance (ANOVA) results of respondents

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	89.67	8	11.21	74.28	.011 ^b
Residual	17.15	104	0.165		
Total	106.82	112			
a. Dependent Variable: Overall Project Performance					
b. Predictors: (Constant), Contractors related factors, External environment, Project procedures, Clients related factors, Project characteristics related factors, Contractual relationship, Labor and material related factors					

The regression analysis tries to explain the extent to which the independent variables (factors affecting the performance of construction projects) predict the value of dependent variables (performance of construction projects). Analysis of variance (ANOVA) uses F-tests to statistically assess the equality of means when we have three or more groups. The term F-test is based on the fact that these tests use the F-statistic to test the hypotheses. An F-statistic is the ratio of two variances and it was named after Sir Ronald Fisher. Variances measure the dispersal of the data points around the mean. Higher variances occur when the individual data points tend to fall further from the mean (Jim Frost, 2020). The value of test F (74.28) in the ANOVA table,

the model reaches significance level (sig. =.011, $p < 0.05$), shows the regression model is valid and can be used to analyze the dependency between variables. Hence, the hypothesis that the independent variables will significantly explain the variance in the dependent variables is accepted.

Table 4.16: The Regression coefficient of factors affecting performance of construction project

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	β	Std. Error	Beta			Tolerance	VIF
(Constant)	-.569	.384	-1.623	-1.623	.046		
Project cost related factors	-.207	.062	-.156	-2.281	.015	.379	2.368
Project time related factors	-.193	.099	-.149	-2.197	.018	.355	2.145
Project quality related factors	.178	.059	.184	2.016	.032	.351	2.036
productivity related factors	.426	.071	.442	4.520	.013	.303	3.632
Client satisfaction related factors	.198	.064	.189	2.263	.019	.405	2.253
Health and Safety related factors	.359	.075	.334	3.964	.009	.377	3.496
Regulatory and community satisfaction related factors	.165	.068	.147	1.953	.006	.327	1.978
Innovation and learning related factors	.123	.057	0.114	1.358	.024	.386	1.594

The data on the above table showed that VIF values for all variables became less than the tolerable value, i.e. 10. Tolerance value of all variables also became above 0.1 which indicates that this model is free from multi col-linearity problem between the dependent variables.

As observed from table 4.16, all the independent variables have statistically significant relationship with the dependent variable since their p-values are below the alpha level which is 0.05. Considering the standardized beta coefficients, the strongest predictor of the dependent variable (performance of construction projects) is productivity related factors with 0.426 value.

The regression analysis support that all except cost related factors & time related factors groups were positively related to performance of construction project in the same direction. That is the

standard beta coefficients (β) gave a measure of the contribution of each variable to the dependent variables. A large value indicates that a unit change in this independent variable has a large effect on the dependent variable.

therefore, from the above table the researcher drives the model as follows;

$$Y = - 0.569 - 0.207X_1 - 0.193X_2 + 0.178X_3 + 0.426X_4 + 0.198X_5 + 0.359X_6 + 0.165X_7 + 0.123 X_8 + \varepsilon$$

More specifically, the variables specification was specified as follows:

Y = Level of overall performance of construction projects.

X₁... X₈ = the factors affecting the performance of construction Projects.

X₁= cost related factors, X₂= time related factors,

X₃= quality related factors, X₄= productivity related factors, X₅= client satisfaction related factors, X₆= health and safety satisfaction related factors, X₇= regulatory and community satisfaction related factors and X₈ = innovation and learning related factors

4.3. Discussion

The first thing that must be discussed here is the overall fitness of the model; this fact has been confirmed by different types of statistical results. The first method is the ANOVA test that produced a P-value of 0.011 which is below the alpha level, i.e. 0.05. This result shows the overall independent variables have statistically significant relationship with that of the dependent variable (Performance of construction projects).

The Coefficient of Correlation (R), which simply measures the degree of linear association between the dependent variable and the independent variables jointly i.e. 0.863 means, there is a strong relationship between the independent variables as a whole. The adjusted R square (Coefficient of Determination), can be defined as the proportion of the total variation or dispersion in the performance of construction projects (dependent variable) that was explained by the variation in the independent variables in the regression (Gujarati, 2004). So, with adjusted R Square value of 0.739, meaning, 73.9% of the variation in construction performance is explained by the linear relationship with all the independent variables. The corollary of this is that only 26.1% of the variation in construction performance is unexplained by the relationship. Thus, when adjusted R square is high it means that the independent variables included in the study play an important part in affecting the dependent variable. Generally, the regression model developed under the study can be considered as a good fit or predictor of construction

performance of Bole International Airport terminal expansion and Minilik II Hospital eye care center construction projects.

The individual influences of the independent variables can be explained by their respective β coefficients. As per the regression result, the construction performance and productivity related factors have the strongest positive relationship. One-unit increment in improving productivity related factors can have about 42.60% improvement on performance of construction projects. This collaborates with the views of Dozzi, (1993), Clarison Hill O., (1989) and Hedayat Ghavan, (2011) who found in their respective studies that increasing the productivity related factors would have a positive impact on construction performance. They noted that high experience and qualifications of personnel involved in a construction project will provoke the project parties to implement their project goals professionally leading to best performance of quality, time, cost, productivity and safety of the project.

The second highest coefficient variable under the study was Health and Safety related factors and according to the regression result, it has a positive relationship with the construction performance. A one-unit increment on this variable will result about 35.9% increment on construction performance. These ideas were shared in the study by Dissanayaka and Kumarsamy (1999) that the Health and Safety related factors enable a significant contribution to the success of a project.

The third variable was Client satisfaction related factors, which has a positive relationship with the construction performance with β value of 0.198. this implies that one-unit increase in improvement of Client satisfaction related factors results about 19.80% increase in construction performance. This finding also got along with that of Dissanayaka and Kumarsamy, (1999) that stated on their respective findings that the Client satisfaction related factors affect performance of construction projects.

The fourth factor under the study was Project quality related factors, and this factor has a positive relationship with the construction performance with one-unit increment in improvement of Project quality related factors will result about 17.8% increase in construction performance. The findings under the study of Zairi M. (1995), examined factors affecting the performance of a construction project.

The fifth factor under the study was Regulatory and community satisfaction related factors, and this factor has a positive relationship with the construction performance with one-unit increment

in improvement of Regulatory and community satisfaction related factors will cause about 16.5% increase in construction performance. The findings under the study of Amusan and Adebile, (2011), regulatory and community satisfaction is very important at the very beginning of the project to carefully consider all factors when selecting the compatible approach for a construction project. This is because each system has its own feature and peculiarity to be respected and fulfilled that will have effect on the project performance.

The sixth factor identified under this study was Innovation and learning related factors, which has a positive relationship with the construction performance with β value of 0.123. this implies that one-unit increase in improvement of Innovation and learning related factors results about 13.30% increase in construction performance. This finding also got along with that of Anderson F. and Manseau A., (1999) that stated on their findings that the Innovation and learning related factors effect on performance of construction projects.

The seventh factor under this study was Project cost related factors, and this factor has a negative relationship with the construction performance with β value of -0.207. This result implies that, one-unit increment in problem associated with Project cost related factors will produce about 20.7% decrease in construction performance. The findings under the study of UNRWA (2006) stated that local construction projects suffered from poor performance especially poor contractor performance for many reasons, such as the unavailability of materials and price escalation of materials and equipments. Any problem associated with this will have negative effect on construction performance and due to this minimizing cost related problems will boost performance of construction projects.

The final factor considered in this study was Project time related factors, and as per the regression result, it has a negative relationship with the construction performance where a one-unit increase in Project time related factors would impact about 19.3% decrease in construction performance. This finding supports the findings under the study of Shambel G. and Dixit P., (2018) that the factors affecting Time performance have visible impact on performance of construction projects. Therefore, the factors that will increase project duration have negative impact on project performance of construction projects.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

This research was conducted in Bole International Airport terminal expansion construction and Minilik II Referral Hospital Eye care construction projects with the main aim of identifying factors affecting the performance of its construction projects, ranked this factor and seen their relation with the performance of construction projects. Based on the objectives and findings of the study, the following conclusions are drawn.

Seventy factors were identified and merged under eight groups. These groups are project cost related factors, project time related factors, project quality related factors, project productivity related factors, health and safety related factors, client satisfaction related factors, regulatory and community satisfaction related factors and innovation and learning related factors. Escalation of material prices, Shortage of foreign currency, Occurrence of Communicable disease, Equipment and machinery cost escalation, Insufficient supply of materials, Employees attitudes, Differentiation of currency prices, Delay of payments from owners to contractors, Availability of Skillful workers and Site preparation time were ranked the top ten most important performance factor by the respondents of the questionnaire. This result is in line with many previous studies.

Escalation of material prices has been the most critical factor that leads to project cost overrun and affect cost performance of the project. Shortage of foreign currency have also a great impact on the project cost performance. There have not been sufficient resources in the project sites to accomplish the projects on the schedule and the critical factors which affect the time performance of the projects have been delay of payments from owners to contractors and financial constraints of contractors are the major one. Unavailability of quality materials and equipment or machineries has been seen as the critical quality factors. Most of the construction projects didn't have competent staff to achieve the quality of the projects and also contractors have problems of performance to conform the specifications of quality. Generally, the main factors for each group have been identified based on the relative importance index rated by respondents of the questionnaire.

The regression analysis produced a maximum P-value of 0.046 which is below the alpha level, i.e. 0.05. This shows that the overall independent variables (project cost related factors, project time related factors, project quality related factors, project productivity related factors, health and

safety related factors, client satisfaction related factors, regulatory and community satisfaction related factors and innovation and learning related factors) have statistically significant relationship with that of the dependent variable (Performance of construction projects). 74.5% of the variation in Bole International Airport terminal expansion construction and Minilik II Referral Hospital Eye care construction projects performance is explained by the linear relationship with all the independent variables.

As per the regression result, the productivity related factors ($\beta=0.426$), health and safety related factors ($\beta=0.359$) and client satisfaction related factors ($\beta=0.198$) have a strong positive linear relation. while project cost related factors and project time related factors result in negative relationship. This shows that improving productivity related factors will have higher positive effect on performance of construction projects. This is aligned with previous studies. The result also showed cost related factors and time related factors result in negative relationship with performance of construction. This implies that all increment in these factors will reduce the overall performance of construction projects.

As per researcher's site observation, Bole International Airport terminal expansion construction project has better performance and up-to-dated machineries than Minilik II Referral Hospital Eye care construction project. The former under-go construction for 24 hours a day which helps to achieve better project time performance.

5.2. Recommendation

It is necessary for construction stakeholders to identify their weakness of performance in order to solve and overcome the problems. In accordance with the findings of this research, the following recommendations are suggested:

It is advisory for construction owners to purchase the construction materials necessary for the project as earlier as possible to minimize the impact of construction material cost escalation.

Owners should facilitate payment to contractors on time, in order to minimize problem of delay, disputes, unnecessary costs and claims.

All managerial levels should actively participate on sensitive and important decision-making process of the projects. Uninterrupted coordination and communication between project stakeholders are required through project life cycle in order to solve problems and develop project performance diary and it is recommended to minimize disputes between all the project participants.

When the available time for the project is small, it is advisory to work with two or three shifts i.e. working for twenty-four hours a day. This will help in balancing quality & available time of the project. It also promotes proper utilization of the available machineries and tools.

Preparing skilled workers available in all locations at both office and site solves associated problems on construction management, quality of work, cost control and time management. This accompanied by sufficient supply of materials on time and in a quantity, way will improve construction project performance. In order to attract new skilled workers and keep the available, the management needs to have some form of incentives to outstanding workers recognize their contribution for the success of projects.

Contractors should limit the number of projects that can be performed at a time based on their available resources. Moreover, contractors should analyze business environment risk in their cost estimation in order to overcome delay because of construction materials shortage. A well-established systems motivation, ethics development and safety should be applied for improvement of productivity performance of construction projects.

Construction project organizations should develop application of health and safety procedures and awareness creation of workers on the importance of using safety equipment. they are also recommended to minimize wastage of resources in order to improve cost performance. Project participants are recommended to give more attention for sequencing of work according to schedule.

Contractors that consumes large amount of construction materials should work closely with domestic industries of construction materials like that of cement factories and rebar steel manufacturing industries in order to maximize their manufacturing potential. This will avoid factors related to foreign currency shortage and exchange rate variation.

It is recommended for future researchers to develop performance measurement framework and modeling system in order to measure performance of construction organizations and projects.

References

- Abu Shaban S.S., (2008), Factors Affecting the Performance of Construction Projects in the Gaza Strip. The Islamic University of Gaza, Palestine.
- Anderson, F., Manseau, A., 1999, A systemic approach to generation/transmission/use of innovation in construction activities, paper presented to the third International Conference on Technology Policy and Innovation: Global Knowledge Partnership – Creating Value for the 21st century.
- Arslan, C. (2009). Anger, self-esteem, and perceived social support in adolescence. *Social Behavior and Personality: An international journal*, 37(4), 555-564.
- Arslan, G., Kivrak S., “Critical Factors to company success in the construction industry”, *International Journal of Human and Social Sciences*, 4(8), 561-564, 2009
- Belassi, W. & Tukel, O. I. (1996), a new framework for determining critical success/failure factors in projects, *International Journal of Project Management*.
- Chan Daniel w. m. and Kumaraswamy Mohan M., (2002), Compressing construction durations: lessons learned from Hong Kong building projects, Department of civil and structural engineering, university of Hong Kong, Hong Kong
- Cheung, (2004), Cheung, S. F., & Chan, D. K.-S. (2004). Dependent Effect Sizes in Meta-Analysis: Incorporating the Degree of Interdependence. *Journal of Applied Psychology*, 89(5), 780–791.
- Cordero, R. (1990), the measurement of innovation performance in the firm: an overview. *Research Policy*., *International Journal of Project Management*.
- David A. Freedman, (2009), *Statistical models theory and practice*, 2nd edition
- Deal, T. E. & Kennedy, A. A. (1982), *corporate cultures: the rites and rituals of corporate life*, Reading, Mass., Addison-Wesley Pub. Co.
- Dissanayaka Sunnil M. and Kumaraswamy Mohan M., (1999), Comparing contributors to time and cost performance in building projects, *Building and Environment*. In Hong kong building projects
- Dissanayaka and Kumarsamy, (1999), "Evaluation of factors affecting time and cost performance in Hong Kong building projects", *Engineering, Construction and Architectural Management*, Vol. 6 No. 3, pp. 287-298.
- Don Elger, 2010, *Theory of Performance*, University of Idaho (also available at www.webpages.uidaho.edu).
- Dozzi, S.P. (1993), “Productivity in construction”, National Research Council, Ontario
- Egan, J. (1998), *Rethinking construction: report of the construction task force on the scope for improving the quality and efficiency of UK construction*, Department of the Environment, Transport and the Region, London.

Faridi, A. and El-Sayegh, S. (2006). Significant factors causing delay in the UAE construction industry, *Construction Management and Economics*, 24(11): PP. 1167-1176.

Fetene 2008 (causes and effects of cost overrun on public building construction projects in Ethiopia) Msc Thesis Addis Ababa University, Faculty of Technology.

Gujarati, (2004), *Basic econometrics*, Fourth edition

Henok Wendafrash, (2018) Factors affecting the performance of construction projects: a case of 20/80 condominium projects in Addis Ababa.

Higgins, (2009), Sustainable Experiential Education for the 21st Century, *Journal of Experiential Education*

Iyer K.C. and Jha K.N., (2005), Factors affecting cost performance: evidence from Indian construction projects, *International Journal of Project Management*.23 (4)-283-295

Jekale, W, “Performance for public construction projects in developing countries: Federal road and educational building projects in Ethiopia. Norwegian University of Science & Technology” 2004

John M.Nicholas (2004), *project management for business land engineering. Principles land practice 2nd edition* Loyola University Chicago.

Kerlinger, F.N. (1986) *Foundations of Behavioral Research*. 3rd Edition, Holt, Rinehart and Winston, New York.

Kingsley Afre N., (2010), *Construction Professionals Perspective on the Criteria for Rating Contractor Performance in the Ghanaian Construction Industry*, Kwame Nkrumah, University Of Science And Technology, College Of Architecture And Planning Department Of Building Technology, Kumasi.

Kuprenas, John. (2003). Project Management Actions to Improve Design Phase Cost Performance. *Journal of Management in Engineering - J MANAGE ENG*. 19.10.1061/ (ASCE) 0742-597X (2003)19:1(25).

Leedy,P.D. and Ormrod,J.E.(2005), *Practical Research: planning and design*.8thEd.New Jersey : Pearson Prentice Hall.

Mbachu, J. And Nkando, R. (2007). Factors constraining successful building project implementation in South Africa, *Construction Management and Economics* 25(1): 39-54.

Merid Taye, 2016, *Assessment of Time and Cost Overruns in Construction Projects*, IGNIU thesis

Ministry of Work and Urban Development (MoWUD).(2006).*Urban development policy*. Addis Ababa

Mohammed B. (2004), *Causes of Contractors’ Failure in Saudi Arabia*, *Construction Contracting*.

Navon Ronie, (2005), Automated project performance control of construction projects, Automation in Construction.

Nii Amponsah A., (2007), An Investigation in to the Impact of Culture on Construction Project Performance, Thesis submitted to the university of Wolverhampton for the degree of doctor of philosophy (Phd)

Nyangilo, A. O. (2012). An assessment of the organization structure and leadership effects on construction projects' performance in Kenya: a case study of public building projects within Nairobi region, Thesis. University of Nairobi.

Ofori, G. (2006) “Construction Industry in Developing Countries: A research Agenda”, Journal of Construction in Developing countries, Vol.11, No. 1, pp.51-62.

Ogunsemi, D. R. (2006). Predicting the Final Cost of Construction in Nigeria. The Quantity Surveyor, PP. 3-6.

Odeh AM, Battaineh HT. (1999) Causes of construction delay: traditional contracts. International Journal of Project Management 2002; Vol. 20: PP. 67–73.

Okuwoga A. A., (1998), Cost time performance of public sector housing projects in Nigeria, article in habital international 22(4), 389-395

Oliver, (2004), In ‘Implementing the Social Model of Disability, The Disability Press, pp. 18-31

Pillai, A. S., Joshi, A., Rao, K.S. (2002). Performance measurement of R&D projects in a multi-project, concurrent engineering environment. International Journal of Project Management, Vol. 20: PP. 165-177

Puspassari, T.R. (2005). Factors causing poor Performance of Construction Projects. An Unpublished Master Project Report, submitted to the Faculty of Civil Engineering, University of Technology, Malaysia.

Reichelt Kimberly and Lyneis James, (1999), The dynamic of project performance: Benchmarking the drivers of cost and schedule overrun, European management journal.

Saunders, M., (2007), Research Methods for Business Students. 4th Edition, Financial Times Prentice Hall, Edinburgh Gate, Harlow.

Shambel G., Dixit P., 2018, Factors influencing Time and Cost Overruns in Road Construction Projects: Addis Ababa, Ethiopian Scenario: Review paper, International Research Journal of Engineering and Technology (IRJET)

Sinclair D., Zairi M. (1995), Effective process management through performance measurement Part III, Business Process Reengineering and Management Journal, Vol 1. No. 3, PP. 50-56

Tadesse Ayalew, (2009), Causes and Effects of Variations in Ethiopian Federal Road Projects, MSc thesis, Addis Ababa University, Civil Engineering Department.

Takim R. and Akintoye A., (2002), Performance Indicators for Successful Construction Project Performance, School of Built and Natural Environment, Glasgow Caledonian University, City Campus, Glasgow.

Tangen Stefan, (2004), Professional practice performance measurement: from philosophy to practice, *International Journal of Productivity and Performance Management*, Vol. 53, No. 8, PP. 726-737

Ugwu, O. and Haupt, T. (2007) Key Performance Indicators and Assessment Methods for Infrastructure Sustainability—A South African Construction Industry Perspective. *Building and Environment*, 42, 665-680.

Walker, A. *Project Management in Construction*. Oxford, Blackwell, (1984)

Walliman, N. (2005). *Your research project: A step-by-step guide for the first-time researcher* (2nd ed.). London: Sage Publications Ltd.

Yaman, H. (2007). A building cost estimation model based on functional elements. *Publication of Istanbul technical University*, A/2(4): PP. 73-87.

Zikmund, W.G. (2000). *Business research methods*. 6th ed. Orlando, US: Dryden Press.

Zikmund, (2000), Zikmund, W.G. (2000) *Business Research Methods*. 6th Edition, The Dryden Press, Fort Worth

APPENDIXES

EXAMINING THE DETERMINANTS OF CONSTRUCTION PROJECTS

PERFORMANCE: The case of Bole International Airport Terminal expansion project and Minilik II Referral Hospital Eye care construction project

(Questionnaire)

Dear Respondents,

I am currently working a research on examining the determinants of construction projects performance in Bole International Airport Terminal expansion project and Minilik II Referral Hospital Eye care center construction project for my MA in Project Management study in Addis Ababa University school of commerce.

To successfully undertake this research, it is mandatory to look into the issues from different perspectives by involving professionals who have experience in the construction sector within the above stated construction projects. In this respect, you are the one who can give the correct and necessary information. Hence, I kindly request you to complete the accompanying questionnaire.

I would like to confirm you that your response will be kept strictly confidential and it will be used exclusively for the purpose of this research. Besides, your quick response is vitally important in order to finalize the research timely and I would appreciate if you return the completed questionnaire within five days.

Thank you very much for your time and cooperation and looking forward to receiving your response.

Yours Sincerely,

Habtamu Ayele

Post Graduate Candidate, MA in Project Management

School of Graduate Studies, Addis Ababa University

Part One: General Information: Please add (X) as appropriate:

1. Type of Organization:

Owner Contractor Consultant

2. Job title of the respondent:

Project Manager Site Engineer
Consultant Office Engineer
Others (specify) _____

3. Years of experience of the respondent:

Less than 1 year from 1 to 5 years
From 6 to 10years Over 10 years

4. Company Size (Number of labors or employees)

Less than 50 from 50 to 100

From 100 to 250 More than 250

5. company's scope of operations:

Worldwide

Addis Ababa wide

Different regions of Ethiopia

Part Two: Questions that measure construction project performance

Below are measure of construction project performance in building construction projects. From your experience, please express your opinion on influence in building construction projects performance based on the representative numbers listed below. (Please tick the appropriate box).

1= very low, 2= low, 3= medium, 4= high and 5= very high

S/N	construction project performance	1	2	3	4
1	On time completion of the project				
2	Completion with allocated budget				
3	Performing with specified quality level				
4	Fulfilling Client Satisfaction				
5	Achieving project members Health and safety				
6	Fulfilling Regulatory and community satisfaction				
7	Promoting Innovation and Learning of employees				

1. Please briefly tell us what in your understanding makes project successful

2. Please briefly describe a project which was a success in your organization

3. Do you know the goal of your project /organization/ you are currently working?

A) Yes B) No

4. For the above question if your answer is yes please specifying the goal of the project.

5. How do you know about the goal of the project?
- a) From project charter
 - b) From contract document
 - c) From joint meeting of contractor, consultant and client
 - d) From media
 - e) From other sources ----- (please specify the source)

Part three: Performance Related Problems in Building Construction Projects

Below are numbers of performance related problems in building construction projects. From your experience, please express your opinion on rate of occurrences in building construction projects based on the representative numbers listed below. (Please tick the appropriate box).

1= Never, 2= Sometimes, 3= Usually, 4= Frequently and 5= Most Frequently

S. N.	Performance Problems	Rate of Occurrences				
		1	2	3	4	5
1	Cost					
2	Time					
3	Quality					
4	Regulatory and community satisfaction					
5	Client Satisfaction					
6	Health and safety					
7	Innovation and Learning					
8	Productivity					

If any other, please specify.....

Please specify the reasons on the rate of occurrences on the above performance problems.

- 1. Cost: _____
- 2. Time: _____
- 3. Quality: _____
- 4. Productivity: _____
- 5. Client Satisfaction: _____
- 6. Regular and community satisfaction: _____
- 7. Health and Safety: _____
- 8. Innovation and Learning: _____

Part Four: Factors Affecting the Performance of Building Construction Projects

Below are numbers of factors affecting the performance of construction projects. From your experience, please express your opinion on the importance of the following as factors that

affecting performance of building construction projects in university projects based on the associated numbers given here. (Please tick the appropriate box).

1=Very Low Important, 2= Low Important, 3= Medium Important, 4=High Important, 5=Very High Important.

Groups/Factors	1	2	3	4	5
(1) Cost factors					
Market share of organization					
Cash flow of project					
Profit rate of project					
Material and equipment cost					
Project labor cost					
Project overtime cost					
Cost of rework					
Cost of variation orders					
Waste rate of materials					
Escalation of material prices					
Differentiation of currency prices					
Incomplete drawing					
If any other, please specify					

Groups/Factor	1	2	3	4	5
(2) Time factors					
Too many change orders from owner					
Poor project management assistance					
Unforeseen ground conditions					
Low speed of decision making					
Project complexity					
Effective communication					
Financial constraints					
Average delay in claim approval					
Average delay in payments from owners to contractors					
Site preparation time					
Unavailability of resources					
Time needed to rectify defects					
Time needed to implement variation orders					
If any other, please specify					

Groups/Factor	1	2	3	4	5
(3) Quality factors					
Conformance to specification					
Unavailability of competent staff					
Quality of equipment or machineries and raw materials					
Quality assessment system in organization					
Quality training or meeting					
Escalation of material prices					
Incomplete drawing					
Incomplete technical specification					
If any other, please specify					
(4) Productivity factors					
Project size and complexity					
Management-labor relationship					
Absenteeism rate through project (late start and early exists)					
Number of new projects per year					
Sequencing of work according to schedule					
Local cultural characteristics					
Non-working holidays					
Local climate conditions					
Wedges amount					
Employees motivation					
Employees attitudes					
If any other, please specify					
Groups/Factor	1	2	3	4	5
(5) Client Satisfaction factors					
Leadership skills for project manager					
Number of disputes between owner and project parties					
Speed and reliability of service to owner					
Number of rework incidents					
Information coordination between owner and project parties					
Conflict					
Poor workmanship and incompetence workers					
If any other, please specify					
(6) Regulatory and community satisfaction factors					

Site condition problems					
Quality and availability of regulator documentation					
Cost of compliance to regulators requirements					
Number of non-compliance events					
If any other, please specify					
(7) Health and Safety					
Reportable accidents rate in project					
Application of health and safety factors in organization					
Assurance rate of project					
Easiness to reach to the site (location of project).					
Wastes around the site					
Climate condition and Air quality					
Noise level					
If any other, please specify					
Groups/Factor	1	2	3	4	5
(8) Innovation and Learning					
Learning from own experience and past history					
Learning from best practice and experience of others					
Review of failures and solving them					
Work group					
Training the human resources in the skills demanded by the project					
If any other, please specify					

Part five: Key Performance Indicators’ Building Construction Projects

Based on the occurrence of performance related problems you filled under part two, below are numbers of key performance indicators of building construction projects. From your experience, please fill the effect of these occurrences on project performance to determine the key performance indicators of building construction projects in the selected projects on the following rating numbers. (Please tick the appropriate box).

1=Very Low, 2=Low, 3=Medium, 4=High, 5=Very High

S.N.	Key Performance Indicators'	1	2	3	4	5
1	Cost					
2	Time					
3	Quality					
4	Productivity					
5	Client Satisfaction					
6	Regular and community satisfaction					
7	Health and Safety					
8	Innovation and learning					

If any other, please specify

Part Six: Overall performance of Construction Projects on the selected sites

<i>Description</i>	<i>Very Good Performance (5)</i>	<i>Good Performance (4)</i>	<i>Moderately Performance (3)</i>	<i>Low Performance (2)</i>	<i>Poor Performance (1)</i>
Perceived Overall executed construction project performance by considering the above factors					