



Adama Science and Technology University
School of Architectural and Civil Engineering

Department of Civil Engineering

**FACTORS AFFECTING COST AND TIME PERFORMANCE OF CONSTRUCTION
PROJECT IN ETHIOPIA**

(CASE OF: PUBLIC BUILDING PROJECTS IN ADDIS ABABA)

By DAGIM GIDISSA DADI

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ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY
SCHOOL OF CIVIL ENGINEERING AND ARCHITECTURE
DEPARTMENT OF CIVIL ENGINEERING

TITLE: FACTORS AFFECTING COST AND TIME PERFORMANCE OF
CONSTRUCTION PROJECT IN ETHIOPIA
(CASE OF: PUBLIC BUILDING PROJECTS IN ADDIS ABABA)

A thesis submitted to School of Civil Engineering and Architecture, in partial fulfillment of the requirements for the Degree of Master of science in civil engineering

In construction management

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Advisor: Dr .Girmay Kahssay

DECLARATION

I declare that this thesis entitled” **FACTORS AFFECTING COST AND TIME PERFORMANCE OF CONSTRUCTION PROJECT IN ETHIOPIA (CASE OF: PUBLIC BUILDING PROJECTS IN ADDIS ABABA)** “is my original work. In addition, this thesis was not, copied, and presented for a degree in any other university and that all the source of material used in this thesis has been, duly acknowledged.

Declared by:

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Place: Adama, Ethiopia

Signature

Date



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By: Dagim Gidissa Examined and Approved by

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DEDICATION

I dedicate this thesis work to the memory of my dear friend, Amsalu Getachew Jalu,

ACKNOWLEDGEMENT

First of all I will like to thank the almighty God for all things he has done in my life .it is also my pleasure to express my deep appreciation to my advisor Dr. Girmay Kahssay for his invaluable and dedicated supervision and advice from the beginning to the end of the research.

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ACRONYMS AND ABBREVIATION

BCWP: Budget Cost Work Performed

CPI: Cost Performance Index

GDP: Gross domestic product

SV: Schedule Variance

ACWP: Actual Cost Work Performed

BC: Building Contractor

BCWS: Budget Cost Work Scheduled

EV: Earned value

Ec.: Ethiopian Calendar

GC: General Contractor

GTP: Gross Transformation Plan

RII: Relative Importance Index

SPI: Schedule Performance Index

ECoTMPA: Ethiopian Construction Technology and Management Professional Association,

EEA: Ethiopian Economic Association

EMoUDC: Ethiopia Ministry of Urban Development and Construction

NBK: National Bank of Ethiopia

ECSU: Ethiopian Civil Service University

NRC: National Research Council

ABSTRACT

Cost and time performance is the fundamental criteria for success of any project. Unfortunately, construction industry in Ethiopia has been, regarded as industry facing poor performance leading to failure in achieving effective time and cost. As result most public building project in Ethiopia face time and cost overrun.

The main object of this study was to identify factor affect cost and time performance of construction project in Ethiopia in case of public building construction project in Addis Ababa .before identifying the major factors affecting cost and time performance , to achieve this objective different research method was used. On the first line, assessment was, made, to verify existence of problem of cost and time performance problem by desk study of some building construction project. Due to some limitation, only assessment of time performance was done based on the result there is problem of poor time performance in all construction projects. In addition, by deep review of different literature, associated with title, identifying factor affecting cost and time performance was, done; finally, a total of 26 factors affecting cost performance and 37 factors grouped under seven major group affecting time performance was, identified. .

The identified factors are organized and summarized in questioner incorporate respondent to rate on the factors using five level Likert scale , the questioner are both closed ended and open ended type .finally questioner was distributed to 41 consultants and 71 contractors, from distributed questioner 31 and 47 valid questioner was returned from consultants and contractors, respectively . Using Relative importance index, was used for data analyze.

From the research finding the first top ten contributing factors affecting cost performance was. Inflation of construction material; Design problem (Frequent design change); Inaccurate quantity estimation (excess quantity during construction); Lack of cost planning/monitoring during pre-and post-contract stage; Cash flow and financial difficulty faced by contractor; Cost under estimation; Lack of appropriate planning and scheduling of work; Additional cost due to variation work; Poor performance of sub-contractor, and Improvement to standard drawing during construction stage

In addition, the first top ten contributing factors affecting time performance was. Ineffective planning and scheduling of project by contractor; financial inability /financial arrangement for the project by client; Late in reviewing and approving design documents by consultants;

Difficult in financing project by contractor; Poor site management and supervision by contractor; Shortage of construction material on site; Mistake and discrepancies in design documents; Unclear and inadequate details in drawing; Delay in approving major change in the scope of work by consultant; and Delay in progress/ interim payments by owner to contractor.

Based on the group of factors affecting time performance rank from one to seven was : Consultant Related Factors ,Contractor Related Factors ,Project and Design Related Factors ,Client Related Factors ,Material Related Factors, Equipment and labor Related Factors ,External Related Factors.

Key word: Cost performance; Time performance;

CHAPTER ONE

1.1 Introduction

Construction industry is a very important industry that plays a vital role in the social-economic growth of a country. Economically it contributes significantly in the improvement to the overall GDP of country (Memon, 2013). In addition, Construction industry has an important contribution to the Ethiopian economy, as its demonstrated by its share in the GDP (EEA, 2008). Ethiopia has executed competitive tendering for selection of suppliers and effective delivery of project with predictable cost and time through achieving value for money across the whole cycle of the project. In Ethiopia the construction sector as registered a remarkable growth, there has been increased investment on the development of various infrastructure project among the major development construction of road infrastructure projects, condominium, house are some of the example more specifically public infrastructure project accounts the significant portion of the investment outlay on construction activity (EMoUDC, 2012). According to Fetene, (2008) public construction projects in Ethiopia are parts of the country's development initiative .it shared considerable amount of the country, scares financial resource. Also public construction projects' consume an average annual rate of nearly 60%, of the government's capital budget cited in Fetene, (2008) However, poor performance of the industry in delivering project with allocated budget, time and required quality is still prevailing fact (ECoTMPA, 2013)

A number of studies have also conducted to examine factors affecting on construction project performance. According to Shaban (2008); average delay because of closures and material shortage; availability of resource as planned through project duration; leadership skills for project manager; escalation of material price; availability of personals with high experience and qualification; and quality of equipment and raw materials in project, are the most important factors affecting the performance of construction projects. Agreed by owners, consultants and contractors

Construction project performance fails in different case. There are many constructed project fail in time performance, other fail in cost performance and other fail in other performance like quality, environmental, health and safety, productivity (Shaban, 2008).

The most important cause of cost overrun in Ethiopia where found to be according to Fetene , (2008) inflation or increase in the cost of construction material, poor planning and coordination

,change orders due to enhancement required by client and excess quantity during construction. According to Abubeker, (2005) main cause for time and cost overrun in road project ,delay to furnish and deliver the site, financial problem and improper planning ,delay, supplementary agreement, adversarial relations among stake holders, and budget shortfall of project owner.

The main aim/objective of this research was, to identify the factors affecting cost and time performance of construction project in Ethiopia, case of public building construction projects in Addis Ababa.to achieve this objective both qualitative and quantitative research approaches' was used. The major research methodology used in this research was, desk study, questioner and Relative Importance Index method for ranking of factors. In addition, research forward recommendation, of how to improving cost and time performance based on finding.

1.2. Statement of the Problem

The construction industry is vital for the development of any nation. In many ways, the pace of the economic growth of any nation can be, measured by the development of physical infrastructure, such as buildings, roads and bridges (Takim and Akintoye, 2002).it is true for Ethiopia, construction industry in Ethiopia play very significant role in economic development. The sector registered remarkable growth, over the last 11 year there has been increased investment on the development and expansion of various infrastructure project, among the major developments construction of road infrastructure real estate developments, and condominium housing project are some of the example (EMoUDC, 2012). The growth or development of the construction industry in Ethiopia, is very fast when compared to other sector however, Construction projects often suffer with poor performance in terms of time overrun, cost overruns and quality defect in most of building construction project.

The major problem facing the present state of construction industry performance in Ethiopia according to (EEA, 2008), (ECoTMPA, 2013), report and research done by Fetene, (2008).

- ✓ The completion of the project with expected time of completion and;
- ✓ Fail to finish the project within a specified budget

1.3. Research Question

The major research question attempts to answer in this research based on the above statement of problem are:

1. What are factors affecting cost performance of public building construction project in Addis Ababa?
2. What are factors affecting time performance of public building construction project in Addis Ababa?

1.4. Research Objective

General objective

The main objective of this research is to analyze the factors affecting cost and time performance of construction project in Ethiopia case of public building construction project.

Specific objective

1. To assess the cost and time performance of public building construction project in Addis Ababa.
2. To identify the factors affecting the cost and time performance of public building construction projects in Addis Ababa.
3. To recommend the ways to improve the cost and time performance ,based on research finding

1.5. Significance of the Study

Since the poor performance of cost and time of construction project is major and chronic problem, which is high impact on the development of construction industry. The major and first solution to overcome this problem was identifying and analyses the major factors leading the construction project in poor performance of cost and time. on the behalf of solution ,the major significance of this research is attempt to identify and analysis the major factors affecting cost and time performance of public building construction project in Addis Ababa, and finally provide recommendation, how to improve the cost and time performance in public building construction project . Based on this the research finding will enable/ give information for those stakeholder which is participating in construction industry, to overcome the problem of poor performance of cost and time performance in the future project.

1.6. Delimitation /Scope of the Research

The scope of the research is limited to the following point.

- ❖ The research was limited only to, identifying and ranking Factors that cause project result in poor cost and time performance.
- ❖ The research is also limited to only public building construction project, does not include private construction.
- ❖ Since type of public building construction project in Addis Ababa cover, construction of hospital project, educational building, different administration office building, sport related, green area construction projects and housing project. Due to the program uniqueness and project delivery system the research, exclude the housing construction project.
- ❖ Only local contractor and consultant organization that takes part in current construction project in public building construction project.
- ❖ Under the current state of public construction project, in Addis Ababa consultant firm take in the project was from both Government side and private consultant. in the case of Addis Ababa there is ten sub city in each sub city there is construction department with dual responsibility, i.e. acting as consultant and client, due to this the research was exclude client condition ,and in case of private consultant the research consider all consultant participating in current construction project due to small number.
- ❖ The specific objective of the research was assessment of cost and time performance public building construction project in Addis Ababa. to achieve this desk study was done ,during assessment of project the data collected was, all the project are under construction for this reason only time performance of the project is assessed ,in case of assessment cost performance, since the project is under construction it's difficult to assess the performance. Due to this, the scope of the desk study was limited to time performance only.

1.8. Thesis Organization

The research was, organized into five main chapters, which summarized below

Chapter one:

- ✓ Introduction of the study ,statement of the problem , description of project area , research question to be answered ,objective of research ,significance of the study ,delimitation / scope of research and thesis organization

Chapter Two: Literature review

Chapter three: Research Methodology comprise,

- ✓ The major research approach used, research population and sampling method, sampling size determination, data measurement, data collection method both primary and secondary data, data analysis method .

Chapter Four: Data analysis and discussion

- ✓ Include data processing, presentation and discussion

Chapter Five: conclusion and recommendation:

- ✓ In this chapter conclusion of research from the result obtained from the data analysis
- ✓ Finally, recommendation

CHAPTER TWO

LITERATURE REVIEW

2.1 Construction Industry Development

The construction industry is sector of the economy, which is responsible for the planning, design, construction, maintenance and eventual demolition of buildings and works (Rohaniyati, 2009). Construction encompasses all civil engineering works and all types of new building projects (including housing), as well as the maintenance and repair of existing facility.

A construction in simple word is a process of constructing something by human for one purpose or another. It may be a road, bridge, dam, a private residence, an airport, commercial building, etc. (Addis , 2014) further define construction is the process the requirement and utilization of capital ,specialized personnel, materials and equipment on specific site in accordance with drawings, specifications and contract documents prepared to serve the purpose of a client . According to concise oxford dictionary-tenth edition definition, “construction is the action or process of constructing the industry of erecting buildings” and building is a structure with a roof and walls.

Construction industry has complex in its nature because it contains a large number of parties such as clients, contractors, consultants, stakeholders, regulators and others.

2.1.1 Construction Industry in Ethiopia

The Ethiopian economy continued to registered growth .Real GDP expanded by 10.3 percent in 2013/14, compared to the GTP target of 11.2 percent for 2013/14. This remarkable growth mainly attributed was to service sector (51.7 percent), agricultural sector (21.9 percent) and industrial sector (26.4 percent). construction industry ,on the other hand ,contributed more than half (53.1 percent) to industrial sector growth and 7.6 percent to GDP growth ;implying that construction sector is currently the leading industry due to expanding in the construction of roads ,railways ,dams and residential house in the country. (NBE, 2013/14)

The construction industry trend in the past ten years shows a yearly growth rate of 12.43 % cited on (Zinabu & Getachew, 2015)

2.1.2 Construction in Addis Ababa

Addis Ababa, although it accounted for 3.4% and 18.3% of the country, total and urban population, respectively contributed to 2.5% of the aggregate urban GDP, and 9.9 % of the national GDP.

The construction sector's shares taken together city output (10%) is slightly higher than that of the government sector (9%).about 50% of the construction-related GDP originates from Addis Ababa. Significant increases in the number of public and private construction project across cities have contributed to expansion of employment in the sector. Public construction include the, building government office ,school and health facility as well as regional universities ,which are financed by the government .it also construction of condominium houses under IHDP as well as intra –urban road and drainage infrastructure. Private construction, on the other hand, largely involved building houses while, in large cities, it also included hotels, hoping and office complexes and, to a certain extent, educational and medical facilities (MUDHCo & ECSU,2015)

2.2 Challenge Facing Constriction Industry

The major constraints, problem weakens with poor performance hampering the performance and development of the construction industry, according to (MUDHCo, 2012). low quality of the local contractors and consultants due to weak resource base and inadequate experience ,inadequate and erratic work opportunities ,inappropriate contract package of works which favor foreign firms in door funded projects, low public investment in infrastructure projects and over dependence on donor funding ,inefficient and non-transparent procurement systems corruption and financial mismanagement in public /private sectors. And lack of supportive institutional mechanisms in terms of financial credit facilities ,equipment for hire and professional development ,unfavorable donor conditionality which tend to marginalized local construction enterprises, poor working environment ,including low standards of safety and occupationally hazards on construction sites and weak and non-facilitative polices and regulatory framework ,low productivity and quality low technological base.

2.3 Introduction to Construction Cost and Time

2.3.1 Construction Cost

Project cost been defined as the amount of commitment in terms of money that is required to produce a construction product such as building (Abubeker, 2005).

According to, Abeselom, (2008) construction cost is production cost, which is composed of two category, Indirect, and Direct cost. Direct costs are those costs that can be, correlated to specific activity or a work –item, and all other costs that are, incurred to accomplish an activity but cannot be, correlated directly, and are indirect costs. Tadesse (2006) also define: the cost of any construction project comprise direct costs; are all costs that can be specifically booked with an activity in project, which include the direct cost of material, labor as well as equipment's and subcontractors. The other categories of cost are indirect costs, are all costs, which can not's be directly booked under a specific activity in construction project but which include but required to keep the whole project operational, mainly include the head office and site overhead costs.

2.3.2 Construction Time

Time is often the most important objective of all. Time is an irreplaceable resource.as cited on (John & Will, 2000) that time is an extremely important issue in construction also further define together with cost and quality; a primary objective of project management and major criterion by which the success of a project is judge. In construction time is duration required to complete the project, which include from project start to end or contract completion time.

2.4. Project Time and Cost Management

A project success defined as meeting goals and objectives as prescribed in the project plan. A successful project means that the project has accomplished its technical performance, maintained its schedule and remained within budgetary costs. (Frimpong, 2003)

According to Thabiso,(2013) project success depends on five outcomes of project management, has to be, constructed within the expected duration of the project, within budget, with the right quality and in the right environment and needs to be, achieved safely.

A project is a collection of activities to achieve a specific objective. Project management involves planning, monitoring and control.

Project management is the work methods that are used to control and manage activities in project. Project management involves the application of knowledge, skills tools and techniques in project activities to meet the project objectives (Karisson, 2011). All management work is, based on processes as initiating, planning, executing, controlling and closing (PMBOK, 2013)

2.4.1Project Cost Management

Project cost management, has a broader view of life cycle costing, and incorporates the effect of project decision on the cost of using, maintaining and supporting the product service or results of the project (Abeselom, 2008)

Also Potts ,(2008) define Cost management is the process, which is necessary to ensure that the planned development of design and procurement of project is such that the price for its construction provides value for money and is within the limits anticipated by the client.

According to (PMBOK, 2013) definition- Project cost management is primarily concerned with the cost of the resource needed to complete project activity. Project cost management should consider the effect of project decisions on the subsequent recurring cost of using, maintaining, and supporting the product, service, or result of the project.

Further, also define Project cost management includes the process involved in planning, estimating, budgeting, financing, funding, and controlling costs so that the project is, completed within the approved budget.

Project cost management processes, which include the following (Lock, 2004)

Estimating cost-the process of developing an approximation of the monetary resource needed to complete project activity.

Determining Budget-the process of aggregating the estimated costs of individual activities or work package to establish an authorized cost baseline.

Control costs-the process of monitoring the status of the project to update the project budget and managing changes to the cost baseline.

2.4.2 Project Time Management

In project management, time management together with cost management is the most visible area. Cited on (Lok & Abdul, 2015). The initial objectives of time management are to control time and prepare schedules, networks and so on. (Mackenzie, 1990) time management is the function of required to maintain appropriate allocation of time to the overall conduct of project through the successive of its natural life-cycle, (i.e. concept, development, execution and finishing) by means of the process of time planning, time estimating, time schedule, and schedule control

(PMBOK, 2013) Project time management includes the processes required to manage timely completion of the project. The process involved in time management is

Plan schedule management –the process of establishing the policies, procedures, and documentation for planning, developing, managing, executing and controlling the project schedule

Define activity-the process of identifying the specific action to be performed to produce the project deliverables.

Sequencing activities: the process of identifying and documenting relationship among the project activities

Estimate activity resource –the process of estimating the type and quantity of material, human resource, equipment, or supplies required to perform each activity

Estimate activity durations –the process of estimating the number of work periods needed to complete individual activities with the estimated resources.

Develop schedule –the process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model.

Control schedule –the process of monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.

2.5 Construction Cost and Time Performance

2.5.1 Performance Management

Performance management is the process of planning, implementing, monitoring and improving the efficiency and effectiveness of the organization, its agencies and its internal units and individual's staff.

According to Kaviya & Hema, (2015) Performance management is a continuous process of identifying, measuring and developing performance in organizations by linking each individual's performance and objectives to the organization's overall mission and goals. It is also the process of creating a work environment or setting in which people are enabled to perform to the best of their abilities. The performance of a successful project team is measured by three factors; technical success according to agreed project objectives; performance on project schedule (finish on time), performance on budget (finished within financial constraint)

2.5.2 Time Performance

Time is an irreplaceable resource. Job that missed its target date is late and that, unfortunately, is that cost tends to follow time and grow with time, project that is finished late usually also overruns its budget (Lock, 2004).

Time performance is very important for construction projects to be complete on time, as the clients' users, stakeholders and the public usually look at project success from the macro view where the first criteria for project success appeared to be the completion time. Lim and Mohamed, (2000), in general the timely completion of a construction project is seen as a major criterion of project success by client.

The element of time could indicate to project, that the project was not running as smoothly as scheduled. Furthermore, the ensuring timely delivery of projects is one of the important needs of clients of the construction industry. Construction time the commencement of site work to the completion and handover of a building to the client (Lee Syuhaida and Mohammad, 2014).

2.5.3 Cost Performance

Cost is one of the major considerations throughout the lifecycle of a project .unfortunately, most of the projects failed to achieve project completion with the estimated cost (Memon, 2013).

(Reuben & Olusegun, 2014) Cost performance is an emerging problem to both the client and project contractors. To the client if cost issues are not properly addressed it may lead to cost overrun and to the contractor if cost issues are not properly addressed it may lead to project delay.

2.5.4 Measurement of Project Cost and Time Performance

The purpose of performance measurement is to help organizations understand how decision-making processes or practices led to success or failure in the past and how that understanding can lead to future (NRC, 2005). Measuring the performance of any construction project in terms of success or failure though looks simple, is in fact a very complex process (Jha & Iyer, 2005)

Project performance can be measured and evaluate using large number of performance indicators that could be related to various dimensions(groups)such as time ,cost ,quality ,client satisfaction ,client changes ,business performance, health and safety .time ,cost and quality are, however ,the three predominate performance evaluation dimensions. Performance measurement in construction focuses on project performance in terms of time, cost and quality as cited on Huan et al ,(2010). In addition, (Kamrul & Indra, 2010) project completion within time, cost and scope, and maintaining quality throughout are very common dimensions of success factors mentioned by project management professional bodies and research community.

According to Joe crossett and Kyle Schneweis, (2011) define cost and time performance measures as:

Cost performance measure definition -percent of states' completed contracts for which the final cost is at or below the original bid award amount.

Schedule performance measure definition -percent of states' completed contracts for which either the contract's final completion date is the same as or earlier than the originally

schedule completion date or the number of working days used is equal to or less than the originally authorized number of working days.

A common way of measuring the cost and time performance of project is through use of earned values management that uses two indexes.

EVM involves calculating three key values for each activity (Potts, 2008)

1. The planned value (PV): formerly known as the budgeted cost of work schedule (BCWS)-that portion of the approved cost estimate planned to be spent on the given activity during a given period :
2. The actual cost (AC): formerly known as the actual cost of work performed (ACWP)-the total of costs incurred in accomplishing work on the activity in a given period. The actual cost must corresponded to whatever was budgeted for in the PV and earned value (EV)
3. The earned value (EV): formally known as the budget cost of work performed (BCWP)-the value of work actually completed.

These three values are combined to determine at that point in time whether or not work is being accomplished as planned .The most commonly used measure are the cost variance and the schedule variance :

Cost variance (CV) =EV-AC

Schedule variance (SV) = EV-PV

The index used to measure performance

The schedule performance index (SPI) =BCWP/BCWS or EV/PV

If SPI=1 the project is on schedule

If SPI<1 the project is behind schedule

The cost performance index (CPI) =BCWP/ACWP or EV/AC

If CPI >1, the project is under cost

If CPI<1, the project over cost

If CPI=1, the project on cost

2.6. Factors Affecting Cost and Time Performance

Time and cost performance of construction project is very important in achieving project performance. Globally, none performance of construction projects in terms of cost and time has been a subject of concern among construction stakeholders (Reuben & Olusegun, 2014). Based on this Many researches and article have been carried out to examine factors affecting construction cost and time performance.

The study, which is, conducted in Akure, Nigeria by Bablola, (2015), factors influencing the performance of construction projects. A questioner survey conducted and forty' six (46) factors were identified through literature review and grouped under eight major category. According to the result, the top ten significant factors influencing the performance of construction projects identified. Escalation of material prices, insufficient supply of materials, motivating skills of the project team leader, quality control of materials, consultant's commitment to ensure construction work done according to specification, delay of progress payment, project team leaders experience, technical skill of the project team leader, overall management actions and economic environment.

Malaysian construction industry was also significantly facing with the poor performance of construction time and cost. Research which Aftab et al (2012) conduct, on investigate common causes affecting time and cost performance through structured questionnaire survey identify the following cause. Design and documentation issue, financial resource management, project management and contract administration, contractor site management, information and communication technology, material and machinery resources, labor(human) resource and external factor are major factor affecting cost and time performance.

. Research conducted in India on factors affecting cost and time performance by (Subramanian & Shanmugapria, 2013). According to the study, Material market rate ,contract modification, high level of quality requirement ,project location ,depend on the fresher to bear the whole responsibility, rework of bad quality performance, often changing sub-constructor's company, lack of technical skill, lack of experience in similar projects, shortage of experienced staff and labor. and high quality of work required, labor strike, lack of sub-contractors skill, unclear specification, owner delay in freeing the contractors financial payment, incomplete drawing, equipment shortage poor productivity of material and labor, poor scheduling of labor and material for work, poor documentation and

No detailed written procedures are identified factors affecting cost and time performance in construction project in India.

According to Auma, (2014) the performance of construction projects in Kenya is poor as time and cost. Performance of projects are likely to escalate with time ,with magnitude of over 50% of the initial contract duration and of the projects likely to escalate in cost with a magnitude over 20% of contract amount.

A research that is, conducted in Ghana on cause of delay and cost overrun in construction of groundwater projects in developing countries by Frimpong, (2003). Identify the major cause for delay and cost overrun are. Planning and scheduling deficiencies, deficiencies in cost estimates prepared, inadequate control procedures, delay in work approval, waiting for information, mistake during construction ,delay in inspection and testing of work ,cash flow during construction ,frequent breakdowns of construction plant and equipment. And shortage of technical personnel, labor shortages, monthly payment difficulties, poor contract management, shortage of materials, contractor's financial difficulties, low bid, material procurement. And imported materials, late delivery of material and equipment, escalation of material prices, slow decision making, inflation ,difficult in obtaining construction material at official current prices, ground problem, bad weather, and unexpected geological condition, are major attributing factor for the cause of delay and cost overrun.

Samir, (2008) Carried out research to find out factors affecting the performance of construction project in Gaza Strip. Sixty-three factors identified and categorized in to 10 groups, evaluated and ranked from owners, consultants and contractors perspectives. The most important factors agreed by owners ,consultants and contractors where: average delay of because of closures and material shortage, availability of resource as planned through project duration, leadership skills for project manager, escalation of material prices, availability of personals with high experience and qualification, and quality of equipment's and raw materials in project.

The construction industry in Ethiopia has faced problems in delivering projects without time and cost overrun, the problem are caused by according to Mehari, (2016) is increased cost of production, delays in delivering construction products, poor planning and coordination ,incidence of waste, poor design quality, personnel issues ,and financial problem and equipment.

2.6.1 Factors Affecting Cost Performance

Completion of construction project with intended budget is, frequently seen as major criteria of project success by clients, contractors, and consultants and related stakeholders (Zinabu & Getachew, 2015). Construction industry now –a-days is facing severe problem of poor cost management resulting in huge amount of cost overrun. The problem of poor cost management and overrun in project cost is serious issue in both developed and developing countries (Hameed, 2013).

Cost overrun is situation where by a project incurs expenses in excess of its expected costs outlined in the budget for the project (Reuben & Olusegun, 2014).

as cited on Aftab,et al (2012) cost overrun considered as the difference between actual cost of project and its cost limit, occurs when the resultant cost target of project exceed its cost limits where cost limit of a project refers to the maximum expenditures that the client is prepared to incur on a completed building project.

Mukuka et al, (2014) study identified a number of important factors, which cause projects cost overruns. Such as fluctuation of prices of material, cash flow and financial difficulties faced by the contractor, poor site management and supervision, lack of experience. And schedule delay also extension of project, additional cost, budget shortfall, adversarial relationship between participants of the project, delayed payments to contractors, poor quality workmanship and dissatisfaction by project owners and consequently by end user as the major effect of cost overruns.

(Gomez, 2012) Suggested list of critical success factors that influence cost performance in construction projects in the UK. The factor identified are, Project manager competency, constructor's competence, client commitment to getting the job done, good relationship between project parties ,accuracy of plans and initial information ,adequate specifications, early involvement of the contractor, accurate selection of form of contract, client's involvement and feedback, availability of funding, initial identification of all the risks, and architect's competency.

Also other research conducted by Olawale, (2010) on Main cause of cost overrun in the UK construction project as. The identified cause are, design changes, risk and uncertainty associated with projects, inaccurate evaluation of project's time, nonperformance of subcontractor and nominated suppliers, complexity of works, conflict between project parties, discrepancies in contract documentation, contract and specification interpretation ,

Inflation of prices, financing and payment for completed works, lack of proper training and experience of project management. In addition low skilled manpower, unpredictable weather conditions, dependency on imported materials, lack of appropriate planning, unstable interest rate ,fluctuation of currency/exchange rate, weak regulation and control, project fraud and corruption ,unstable and government police .

(Jha & Iyer, 2005) Carried out research to find out the factors affecting the cost performance in Indian construction project, thorough questionnaire survey on the important success and failure attributes. according to the study the important success attribute factor are, Effective monitoring and feedback by project manager and project team members coordinating ability and report of project manager with top management, positive attitude of project manager, and project participants, and project manager's technical capability. In addition, the important failure attributes are poor human resource management and labor strike, negative attitude of project manager, and project participants, and inadequate project formulation in the beginning.

Research, which conducted in India by Subramanian & Shanmugapria, (2013) identified the factors that affect cost –overrun, by labeling the factors in eight groups. Financial groups, construction parties, construction items group, environmental group, and political group, materials group, labor and equipment group, and owners' responsibility group. Material market rate, contract modification, high level of quality requirement, project location, depends on the fresher has to bear the whole responsibility. and rework of bad quality performance, often changing sub-contractor's company, lack of technical skill, lack of experience in similar projects, shortage of experienced staff and labor, high quality of work required , labor strike ,lack of sub-contractors skill, unclear specification, owners delay in freeing the contractor financial payment, and incomplete drawing Equipment shortage, poor productivity of material and labor, poor scheduling of labor and material for work, and poor documentation and no detailed written procedure.

The study done by (Zinabu & Getachew, 2015) to identify the top five factors that causes cost overrun in construction projects are ,poor planning, fluctuation of price of materials, poor productivity ,inflationary pressure and project financing.

The most common causes of cost overrun are: supplementary agreement, price fluctuation of construction materials particularly cement, reinforcement bar fuels, and asphalt; change order s or variation due to enhancement initiated by client,

Excess quantity during construction, unexpected ground condition, mistakes during planning, design and contract documents preparation.

2.6.2. Factors Affecting Time Performance

Factors affecting time performance are factors that lead to construction projects not being finish (completed), according to planned schedule. According to Aftab et al, March (2012) Time overrun can be defined as late completion of works as compared to the planned schedule or contract schedule, occurs when the progress of contract falls behind its schedule program.

(Sambasivan & Soon, 2007) These cause were categorized in to the following eight major groups

- ✓ Client related causes :finance and payment of completed work ,owner interference ,slow decision making ,unrealistic contract duration and requirements imposed
- ✓ Contractors related causes :subcontractors ,site management ,construction methods, improper planning ,Mistakes during construction stage, inadequate contractor experience
- ✓ Consultant related causes: contract management ,preparation and approval of drawings, Quality assurance/control ,waiting time for approval of tests and inspection
- ✓ Material related causes :quality of material ,shortage in material
- ✓ Labor and equipment category causes: labor supply ,labor productivity ,equipment availability and failure
- ✓ Contract related causes: change orders, mistakes and discrepancies in contract document
- ✓ Contract relationships related causes :change orders, mistakes and discrepancies in contract document
- ✓ Contract relationships related causes: major disputes and negotiations, inappropriate overall organizational structure linking to the projects and lack of communication between the parties.
- ✓ External causes : weather condition ,regulatory changes ,problems with neighbors and unforeseen site condition

From the identified cause the ten most important cause where identified by the study: contractors improper planning, contractor's poor site management, Inadequate contractor experience, Inadequate client's finance and payment for completed work, Problems with sub-contractors, Shortage in material, Labor supply, Equipment availability and failure, Lack of communication between parties, and mistakes during the construction stage.

Research that was conducted in Saudi Arabia by Al-Hejji, (2006) on time performance of different types of construction projects , to determine the cause of delay in construction project ,seventy –three cause of delay where identified and grouped in nine group by the researcher.

Project Related Cause: Original contract duration is too short, legal disputes b/n various parts, inadequate definition of substantial completion, Ineffective delay penalties, Types of construction contract, Types of project binding and award (lowest bidder)

Owner Related Cause :Delay in progress payments by owner, Delay to furnish and deliver the site to the contractor by the owner, Change order by owner during construction ,Late in revising and approving design document by owner, Delay in approving shop drawings and sample materials ,Poor communication and coordination by owners and other parties. In addition, Slowness in decision-making process by owner, Conflict between joint-ownership of the project, Unavailability of incentives for contractor for finishing ahead of schedule, Suspension of work by owner.

Contractor Related factor :Difficulties in financing project by contractor, Conflicts in sub-contractors schedule in execution of project, Rework due to errors during construction ,Conflict b/n contractor and other parties (consultant),Poor site management and supervision by contractor, Poor communication and coordination by contractor with other parties ,Ineffective planning and scheduling of project by contractor. In addition Improper construction methods implemented by contractor, Delays in sub –contractors work, Inadequate contractor's work, Frequent change of sub-contractors because of inefficient work, Poor qualification of contractor's technical staff, and Delay in site mobilization.

Consultant Related: Delay in performing inspection and testing by consultant ,Delay in approving major change in the scope of work by consultant ,Inflexibility (rigidity)of consultant, Poor communication /coordination between consultant and other parties, Late in reviewing and approving design documents by consultants ,and Conflicts between consultant and contractor.

Design Related Cause : Mistake and discrepancies in design documents, Delays in producing design documents, Unclear and inadequate details in drawing ,Complexity of project design, Insufficient data collection and survey before design, Misunderstanding of owner's requirements by design engineer ,Inadequate design –team experience, and Un-use of advanced engineering software.

Material related cause: Shortage of construction materials in market, Change in material types and specifications during construction, Delay in material delivery, Damage of sorted material while they needed urgently, Delay in manufacturing special building materials, late procurement of materials, and late in selection of finishing materials due to availability of many types in market.

Equipment related cause: Equipment breakdowns, Shortage of equipment, Low level of equipment –operator's skill, Low productivity and engineer, inadequate experience of consultant efficiency of equipment, Lack of high –technology mechanical equipment.

Labors related cause: Shortage of labors, unqualified workforce, Nationality of labors, Low productivity level of labors, and Personal conflicts among labors.

External Factor: Effect of subsurface conditions, Delay in obtaining permits from municipality, Hot weather effect on construction activity, Rain effect on construction activities, Unavailability of utilities in site, Effect of social and cultural factors, Traffic control and restriction at jobs site. Additionally, Accident during construction, Differing site condition, Change in government regulations and laws, Delay in providing service from utilities, Delay in performing final inspection and certification by third parties.

Research, which was, conducted by Doloi et.al (2012) Construction project delay in India through questionnaire and personal interview as research method. Factors analysis and regression modeling were used to examine the significant of the delay factors .from factors analysis , identified the most critical factors of construction delay were identified as :lack of commitment ;inefficient site management ;poor site coordination ;improper planning ;lack of clarity in project scope; lack of communication ;and substandard contract. Regression model indicates slow decision from owner, poor labor productivity, architects' reluctance for change and rework. According to (Henry, Dan, & Ruth , 2013) the five most important causes of delays in construction projects in Uganda's public construction projects where found to be: change of work scope, delayed payments, poor monitoring and control, high cost of capital, political instability/insecurity and due to mistakes in construction.

(Mezher, Lee, & Lee, 1998) Carried out research to find out, the factors affecting time performance Cause of delay in the construction industry in Lebanon. A total of, 64 cause of delay where identified through research in which client, constructors and consultant were undertaken the study. All three parties generally agreed on the ranking of the major category of delay factors, owners had more concerned with regard to financial issues, while constructors ranked contractual and finally consultant firms ranked.

Other research that is, conducted by Endale, (2016) on major cause of delay in construction of 40/60 saving houses project in Addis Ababa. identified ten major cause: let material supply, financial difficult faced by the contractor, problem of electric supply, problem of water supply, equipment and availability, delayed payment to contractors, Poor site management, Ineffective planning and scheduling, late design review and approval, and slowness in decision making process.

6.7. Mitigation Measure to Improve Cost and Time Performance

Mitigation measure to improve cost performance according to Aftab et al,(2012), Effective strategic planning, Proper project planning and scheduling, Effective Site management and supervision, Frequent progress meeting ,Proper emphasis on past experience, Use of experienced subcontractors and suppliers, Use of appropriate construction method ,Use up to date technology utilization, Clear information and communication channels. Also Frequent coordination between the parties, Perform pre-construction planning of project tasks and resource, Developing human resources in the construction industry, Comprehensive contract administration, Systematic control mechanism, Improving contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors.

Mitigation measure to improve time performance according to Aftab et al, (2012): Proper planning work, Committed leadership and management ,Send clear and complete message to worker to ensure effective communication, Hire skilled workers to achieve good progress, avoid quality of work ,more rectification and double handling, Close monitoring ,Training and development of all participant to support delivery process. And Focus on the quality, cost and delivery of the project, Use new construction technology, Adoption of tools and techniques i.e. value management, lean thinking ,total quality management, Provide knowledge/training to unskilled workers based on their scope of work, Fully utilize the construction team, Focus on client's need and Measure performance against other projects.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter discusses the research design and methodology used in acquiring the information to answer the research question. It specifically represents, describe research approach and research design. Research population Sampling technique, sample **size determination**, research measurement, data collection methods both primary and secondary data and finally present data analysis methods

3.2 Research Approaches

In consideration of the major and specific objective of the research, the major research approach used in this research was both qualitative and quantitative approaches with the aim to identify the major factors affecting cost and time performance of construction project in Ethiopia (case of public building projects in Addis Ababa). In addition, desk study was conducted to assess the cost and time performance of some building construction projects which is constructed in Addis Ababa to know whether there is existence or not ,poor performance in relation to cost and time.

3.3. Research Population

The research population for the study was, those building projects constructed under the supervision of Addis Ababa city construction bureau and those project under the supervision of Addis Ababa Sub-city. In current a total of 51-construction project are under construction In Addis Ababa public building projects. The summary of project type and number are, presented below in Table 3.1

Factors Affecting Cost and Time Performance of Construction Projects in Ethiopia (Case of: Public Building Projects in Addis Ababa)

Table 3-1 Number and Type of Under Construction Public Building Project in Addis Ababa

	Project type	Total number
1	Sub city Office building project	8
2	Green Area construction work	8
3	Sport facility construction work	6
4	Police office project	2
5	Education bureau ,TVET college construction work	8
6	Hospital construction	4
7	Construction work of trade and industry office	3
8	Different type construction work	12

Source: Addis Ababa city construction bureau

3.4 Sampling Design

Sample design is definite plan for obtaining a sample from a given population .it refers to the techniques or the procedure the researchers would adopt in selecting items for the sample. Due to large size of population, simple random sampling technique used to select representative from the entire population. In simple random sampling, specified sample size has the same chance of being, selected as any other sample of the same size Ronald, (2007).

Since targeted population is finite that means the population in this research are public client, and those local consultants and contractors companies registered in Ethiopia participating in public building construction project in Addis Ababa. The sampling design used in this research probability sampling (random sampling).under this sampling design, every item of the population has an equal chance of inclusion in the sample. Reasons, for using random sampling techniques are:

- ✓ It gives each element in the population an equal probability of getting into the sample; and all choice is independent of one another.
- ✓ It gives each possible sample combination an equal probability of being chosen

3.4.1 Sampling Size Determination

Since the major target, population in this research was Public building Construction project In Addis Ababa. Currently a number of public building construction project are under construction in Addis Ababa, using random sampling 71 questioners was, distributed to contractors participating in 51-construction site.

In case of client and consultant, in current (during research period), public building construction projects in Addis Ababa, there is the construction department in ten sub-cities. In each sub-city, has the duty of design, supervision and contracts administration. That means each department is acting as consultant and client, in addition Addis Ababa city construction bureau is also take part in construction project as consultant and a contract administration, in general there is no client representative. In addition, limited number of private consultant firm participating in construction project and all are, considered in the research. In general there is 10 sub-cities in Addis Ababa, since the number as not large, randomly three questioner was distributed for each sub-city (construction department) supervising projects under the sub-city , total of thirty-three questioner, and nine questioner distributed to private consultant involved in current construction projects.

3.5. Research Measurement

To indicate the center of the effect of each of the factor on factors affecting cost and time performance, the survey respondents asked to take an appropriating rating on the scale against each identified factors that reflected their opinion on the important level.

Using summated scale (or a Likert -type Scale), the respondent is, asked to various degree of opinion, and attitude a respond to each item of the factors affecting cost and time performance in terms five degrees .the five points are.

TABLE 3-2 LIKERT –TYPE FIVE SCALE

1	2	3	4	5
Not significant (N.S.)	Slightly significant(S.S)	Moderately significant (M.S)	Very significant(V.S)	Extremely significant (E.S)

3.6 Method of Data Collection

The measure data collection method used in this research to achieve the research objective and research question, was both primary data and secondary data.

3.6.1 Primary Data

Since the general objective of the research was identifying analyzing factors affecting of cost and time performance of public building construction project. The research is also assess the performance of public building construction projects in Addis Ababa Since the research is descriptive and survey type, the methods used in collecting the primary data was thorough desk study and questionnaires.

3.6.1.1 Desk Study

The primary Data used for desk study was, collected from Addis Ababa city construction bureau. In Addis Ababa, city construction bureau 51 different building construction projects were under construction as presented above in Table-3.1. According to the data, the status of the building project was under construction and some project was partial completed with project progress of 15%-100%

Since all the project is under construction, for the purpose of this research the project that is selected for desk study was those project status is above 90% .The number of select project for the analysis presented in Table: 3-3

Table 3-3 Number of Building Project Selected For Desk Study by Project Type

No,	Project type	Total number	Number of project with progress with >90%
1	Sub City Office Building Project	8	5
2	Green Area Construction Work	8	5
3	Sport Facility Construction Work	6	2
4	Police Office Project	2	0
5	Education bureau ,TVET college construction work	8	3
6	Hospital Construction	4	3
7	Construction Work of Trade and Industry Office	3	0
8	Different Type Construction Work	12	5

Source: Addis Ababa City Construction Bureau, 2009 E.c

3.6.1.2. Questionnaire

Questionnaire is the simplest and time saving method to collect data effectively from a huge number of respondents. When properly constructed, a questionnaire used, as a scientific instrument to obtain data from a large number of individuals. Thorough structured questionnaires questions are formulated from the identified variables; the questionnaires are designed to gather data from professionals that were involved in public building projects in Addis Ababa in side of client/consultant and contractor. A major advantage of the questionnaire is that data obtained on large numbers of participants quickly and relatively inexpensively.

Generally, the questionnaires for this study consist of four Sections:

Section A –this section is general about respondent profile comprise, type of organization, job title of the respondent in the organization, year experience in construction industry and number projects of public project participated in the last five year

Section B- under this section a total of 26 hypothesized factors affecting cost performance was present.

Section C- under this section a total of 37 hypothesized factors affecting time performance, which is group in to seven major groups.

Section D-this section is the last part of the questioner, which allows the respondent to write their own opinion about factors affecting both cost and time performance.

3.6.2 Secondary Data

Secondary data means data that are already available i.e. they refer to the data which have already been collected and analyzed by some one else. The major secondary data that used in this research is those published and unpublished data. Under published data books, progress report, reports and publication of professional association, reports prepared by research scholars, universities are, used in this research, and under unpublished data are that found in unpublished biographies, journals.

3.7 Pilot Study

Pilot study of questioner is achieved by a scout sampling ,which consisted of 8 questioner .this questioner is distributed to expert engineer such as project manager, site engineer /office engineer and university lecturers .they have a strong practical experience in construction industry field. The main result of obtained from pilot study:

- ✓ Total about questioner was redesign.
- ✓ Factors and sentences should be modified
- ✓ Some factors and sentence should be modified to give clear meaning and understanding
- ✓ Factors affecting time performance were group in seven major factor
- ✓ Some factors replaced with equivalent meaning
- ✓ Repeated factor which have the same meaning was modified
- ✓ Some factor that found in different study, which conducted in other country, is not practical or associated to situation of construction project in Ethiopia eliminated.

3.8. Method of Data Analysis

3.8.1. Data Analysis

Both descriptive and inferential statistics (correlation) employed in the data analysis. The data collected from the survey analyzed using, the Relative Importance Index method (RII). Used to, determine relative significance and ranking of factors affecting cost and time performance. (Lee,Syuhaida and Mohammad , 2014), (Ade ,Aftab ,Ismail and Ahmad , 2013) (Shaban, 2008) use, relative importance index computed as

$$RII = \sum_{i=1}^5 w_i X_i / A * N$$

Where;

RII=relative importance index

W=Weighting given to each factor by respondent and its range from 1 to 5

X=frequency of ith response given for each cause

A=highest weight

N=total number of participant

3.8.2. Measures of Relationship

The Spearman (rho) rank correlation coefficient was, used for measuring the relationship in ranking between two groups of respondents scoring for various factors. For this research, correlation was found between, Consultant versus contractor respondent, on the ranking given on the factors affecting cost and time performance. To achieve this result obtained from through method of Relative importance Index used.

The Spearman (rho) rank correlation coefficient for any two groups of ranking is, given by the following formula: (Kothari, 2004)

$$\text{Spearman's coefficient of correlation (or } r) = 1 - [6 \sum d^2 / n(n^2 - 1)]$$

Where:

Rho (pcal): Spearman's rank correlation coefficient;

Di: the difference in ranking between each pair of factors; and

n= number of pairs observations.

The value of the Spearman (rho) rank correlation coefficient varies between -1 and +1. For the case of this research, (1)-perfectly positively correlated, [1, 0.3]-positively correlated, [-0.3, 0.3] no correlation, [-1,-0.3] negatively correlated, (-1) - perfectly negatively correlated

Statistical package for social sciences (SPSS) and Microsoft excel, analytical tool used for data analysis

Chapter Four: RESEARCH RESULTS AND ANALYSIS

4.1. Introduction

This chapter comprises of research findings and analysis. Data, which is collected using desk study and questioner, were analysis on the bases of research objective and research questions. The first parts of this chapter present the analysis of desk study based on the data, which obtained from cost, and time performance of construction to. Then on next part analysis and finding of data which is abstained through questioner that comprise of three parts. The first comprise general about the respondent information ,second part 26 factors which is identified as factors affecting cost performance ,was analyses based on the respondent rate on the level of Likert scale 1-5 and using RII and analysis and discussion . Third part present analysis of data, which obtained by questioner on factors affecting time performance from consultants and constructors' respondents.

4.2. Analysis of Desk Study

The specific objective of this research was assessment of cost and time performance of public building construction projects in Addis Ababa .to achieve this objective desk study was done to check water there is existence of poor performances of cost and time . For the assessments of time performance this total of 22 construction project was identified with the status >90%, when the data was collected. Based on the desk study result all building construction project takes above expected time of completion. This shows the problem of poor performance of time in all projects.

The major data item used for the analysis: project type, contract date, contract amount in birr, total contract date to complete the project, and project completion date and **actual time performance**. The summery are, presented in the **Table 4.1**below

Factors Affecting Cost and Time Performance of Construction Projects in Ethiopia
(Case of: Public Building Projects in Addis Ababa)

Table 4-0-1 List of Public Building Construction Projects' For Disk Study

No	Projects	Contract Date	Contract Amount	Total Contact Date To Completion The Project	Project Completion Date	Time overrun
1	Yeka sub city administration building	12/8/2004	240606342.9	558	15/4/2006	198%
2	Bole sub city administration building	1/12/2004	227128479.2	558	14/8/2006	160%
3	Akakai Kaliti sub administration building	19/8/2004	229013805.3	558	26/05/2006	169.17%
4	Gulale sub city administration building	29/10/2004	202757841.7	558	7/6/2006	167.20%
5	ECA Green area	10/8/2005	45080517.16	540	15/03/2007	120.37%
6	Ethio kuba Green Area	15/08/2005	9436556.71	120	22/01/2006	2.59year
7	Akaki Kality Green Area	19/10/2005	33775634.21	540	22/01/2006	197.7%
8	Birhan Building	10/10/2005	26403169.09	180	3/5/2006	1.74year
9	Holland Embassy green area	3/3/2006	38317768.9	365	15/04/2007	170.13%
10	Different sport Construction	14/10/2005	15279367.78	240	10/7/2006	375%
11	Sport cafeteria	3/11/2006	4119572	120	9/6/2007	371.6%
12	Tegbared TEVT	9/5/2004	53937897.34	365	16/05/2005	>3 year
13	Kotebe university office building	10/10/2005	8988609.15	180	4/5/2006	1.74year
14	General winget	19/01/2007	6967881.75	365	25/02/2008	183.56%
15	Ras Desta Hospital	25/10/2006	8418048.5	160	1/1/2007	456.25%
16	Minilke 1 st memorial hospital building project	1/6/2004	183317362	540	15/06/2006	271..2%
17	Medical college	22/10/2007	2390769.82	180	14/05/2008	125.5%
18	Justice office building	8/10/2003	666,380,79.39	540	25/04/2005	248.14%
19	Environmental protection authority office building	28/10/2004	435,102,03.37	485	20/03/2006	208.24%
20	Gulele	24/11/2005	36514891.15	365	20/03/2006	276.7%
21	Laboratory building	18/11/2006	13482080.45	180	11/7/2007	296%
22	city model building	30/10/2007	2039452.23	180	15/10/2007	244.4%

Source: Addis Ababa city construction bureau (November, 2009E.c)

4.3 Part 2-Questioner

4.3.1 General Respondent Information

4.3.1.1. Types of Organization

The major data collection method used to achieve objective of this research was a questioner survey, is distributed to consultants and contractors professional, and participated in public building project in Addis Ababa. Total of, 113 questioners distributed to consultants, contractors out of this 42 questioner distributed to consultants, and 71 questioners distributed to contractors. From distributed questioner total of 78 valid questioner returned out of this as shown in **Table- 4-2** number of questioner returned from consultant was 31 which is 73.81 % and 47 (60.26%) valid questioner was returned from contractors .

Table 4-2 Type of Organization

Type of organization	Distributed Questioner	Returned valid Questioner	Returned in %	Percentage from total returned Questioner
Consultant	42	31	73.81%	39.74%
Contractor	71	47	69.19%	60.26%
Total		78		100%

4.3.1.2. Job Title of the Respondents

As shown in, **Table-4.3 presented below**. From a total of 31 consultants respondents 19.35% (6) is site engineer.38.71 % (12) is office engineer, resident engineer cover16.13 % (5), contract administration and other position cover 12.90% (4) each. In case of contractors from total of 47 respondents,25.53% (12) where project manager, site engineer take the highest number with 34.04%(16),office engineer take 29.79%(14),and contractors administration where 6.38%(3) ,and resident engineer cover 2.13%(1) and reaming 2.13%(1) other.

Table 4-3 Job Title of the Respondent

Job title of the respondent	Consultant		Contractor	
	Frequency	Percentage %	Frequency	Percentage %
Project manger	0	0	12	25.53%
Site engineer	6	19.35%	16	34.04%
Office engineer	12	38.71%	14	29.79%
Resident engineer	5	16.13%	1	2.13%
Contract administration	4	12.90%	3	6.38%
Other	4	12.90%	1	2.13%
Total	31	100%	47%	100%

4.3.1.3 Year of Experience

From a total of 31 consultant's respondent, there level of experience in construction industry are ,45% of respondent are between 1-5 have year of experience,36% of respondent have between 5-10 year of experience and the remaining 16 % are above 10 year of experience. In case of contractors respondent, 34% of respondent have experience of a year between 1-5, 40% of respondent have year of experience between 5-10 and the remaining 26% above 10 years of experiences in construction projects.

4.3.2. Factors Affecting Cost Performance

This part consists of results and discussion of factors that influence cost performance of public construction projects in Addis Ababa using relative importance index and ranking of factors affecting the performance.

The following table shows the summary of RII value of factors affecting cost performance according to each type of target group.

Table 4-4 RII of Factors Affecting Cost Performance from Consultant's and Contractor's View

Factors Affecting Cost Performance	Consultant	Contractor	Overall Weight
	RII	RII	RII
Inflation of construction material	0.8065	0.8042	0.8051
Lack of cost planning/monitoring during pre-and post-contract stage	0.7096	0.8042	0.7666
Lack of cost report during construction stage	0.6709	0.7489	0.7179
Improvement to standard drawing during construction stage	0.6645	0.7787	0.7333
Inaccurate quantity estimation (excess quantity during construction)	0.7419	0.8212	0.7898
Design problem (Frequent design change)	0.7354	0.8382	0.7973
Cash flow and financial difficulty faced by contractor	0.7032	0.8	0.7615
Contractor poor site management and supervision	0.6645	0.7489	0.7153
Change in the scope of the project	0.6451	0.6936	0.6743
Unclear specification or change in specification	0.6709	0.7276	0.705
Material wastage on site	0.6193	0.6765	0.6537
Contract award cost of project	0.6064	0.6893	0.6563
Poor scheduling of labor	0.6709	0.7276	0.705
Risk and uncertainty associated with project	0.6516	0.6893	0.6743
Discrepancies in contract document	0.6387	0.6936	0.6717
Unpredictable weather conditions	0.5483	0.5574	0.5537

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Lack of appropriate planning and scheduling of work	0.7032	0.7957	0.7589
Rework of bad quality performance	0.6451	0.7404	0.7025
Poor productivity of labor	0.7096	0.7276	0.7204
Accessibility of construction material	0.6129	0.6978	0.664
Poor productivity of equipment	0.6387	0.7106	0.682
Cost under estimation	0.7870	0.7446	0.7614
Absences of construction cost data	0.6064	0.6978	0.6614
Additional cost due to variation work	0.7741	0.7234	0.7435
Increase in cost of labor	0.6516	0.6936	0.6769
Poor performance of sub-contractor	0.6903	0.7702	0.7384

Consultants' view:

According to consultant view, the value of RII and rank of factors affecting cost performance presented in the following Table: 4-5

Table 4-5 Summary of RII and Rank of Factors Affecting Cost Performance Consultants' Views

Factors	RII	Rank
Inflation of construction material	0.8065	1
Cost under estimation	0.787	2
Additional cost due to variation work	0.7741	3
Inaccurate quantity estimation (excess quantity during construction)	0.7419	4
Design problem (Frequent design change)	0.7354	5
Lack of cost planning/monitoring during pre-and post-contract stage	0.7096	6
Poor productivity of labor	0.7096	7
Cash flow and financial difficulty faced by contractor	0.7032	8
Lack of appropriate planning and scheduling of work	0.7032	9
Poor performance of sub-contractor	0.6903	10
Lack of cost report during construction stage	0.6709	11
Unclear specification or change in specification	0.6709	12

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Poor scheduling of labor	0.6709	13
Improvement to standard drawing during construction stage	0.6645	14
Contractor poor site management and supervision	0.6645	15
Risk and uncertainty associated with project	0.6516	16
Increase in cost of labor	0.6516	17
Change in the scope of the project	0.6451	18
Rework of bad quality performance	0.6451	19
Discrepancies in contract document	0.6387	20
Poor productivity of equipment	0.6387	21
Material wastage on site	0.6193	22
Accessibility of construction material	0.6129	23
Contract award cost of project	0.6064	24
Absences of construction cost data	0.6064	25
Unpredictable weather conditions	0.5483	26

From Table:4-5 according to consultant the extremely significant factors affecting cost performance ranked in first position from total of 26 factors was, inflation of construction material with (RII =0.806).

Cost under estimation was the second significant factors affecting cost performance with (RII= 0.7870).In the third position additional cost due to variation work with (RII=0.7741). In fourth position Inaccurate quantity estimation (excess quantity during construction) with (RII=0.7419). Moreover, in fifth position according to consultant view Design problem (Frequent design change) with RII=0.7354, was the significant factors affecting cost performance. And Lack of cost planning/monitoring during pre-and post-contract stage ,Poor productivity of labor ,Cash flow and financial difficulty faced by contractor ,Lack of appropriate planning and scheduling of work, and Poor performance of sub-contractor are ranked from six to ten respectively.

In general, in consultant view the top ten significant factors affecting cost performance presented in Table: 4-6.

Table 4-6 Summary of Top Ten Factors Affecting Cost Performance Consultants' Views

Factors	RII	Rank
Inflation of construction material	0.806	1
Cost under estimation	0.7870	2
Additional cost due to variation work	0.7741	3
Inaccurate quantity estimation (excess quantity during construction)	0.7419	4
Design problem (Frequent design change)	0.7354	5
Lack of cost planning/monitoring during pre-and post-contract stage	0.7096	6
Poor productivity of labor	0.7096	7
Cash flow and financial difficulty faced by contractor	0.7032	8
Lack of appropriate planning and scheduling of work	0.7032	9
Poor performance of sub-contractor	0.6903	10

Contractors' views:

The summary of factors affecting cost performance, with RII and Ranking of factors presented in the Table: 4-7.

Table 4-7 summary of RII and rank of factors affecting cost performance contractors' views

Factors	RII	Rank
Design problem (Frequent design change)	0.8382	1
Inaccurate quantity estimation (excess quantity during construction)	0.8212	2
Inflation of construction material	0.8042	3
Lack of cost planning/monitoring during pre-and post-contract stage	0.8042	4
Cash flow and financial difficulty faced by contractor	0.8	5
Lack of appropriate planning and scheduling of work	0.7957	6
Improvement to standard drawing during construction stage	0.7787	7
Poor performance of sub-contractor	0.7702	8
Lack of cost report during construction stage	0.7489	9

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Contractor poor site management and supervision	0.7489	10
Cost under estimation	0.7446	11
Rework of bad quality performance	0.7404	12
Unclear specification or change in specification	0.7276	13
Poor scheduling of labor	0.7276	14
Poor productivity of labor	0.7276	15
Additional cost due to variation work	0.7234	16
Poor productivity of equipment	0.7106	17
Accessibility of construction material	0.6978	18
Absences of construction cost data	0.6978	19
Change in the scope of the project	0.6936	20
Discrepancies in contract document	0.6936	21
Increase in cost of labor	0.6936	22
Contract award cost of project	0.6893	23
Risk and uncertainty associated with project	0.6893	24
Material wastage on site	0.6765	25
Unpredictable weather conditions	0.5574	26

According to contractors views design problems (frequent design change) is the most significant factors affecting cost performance and ranked in the first position with RII equal to 0.8382.

Inaccurate quantity estimation (excess quantity during construction) has been considered as the second factor affecting cost performance with RII=0.8212

Inflation of construction material, has been considered as the third most important factors affecting cost performance) RII= 0.8042

Lack of cost planning/monitoring during pre-and post-contract stage ranked as the fourth factors affecting cost performance with RII=0.8042

Cash flow and financial difficulty faced by contractor ranked in the fifth position affecting cost performance with RII=0.8

Lack of appropriate planning and scheduling of work, Improvement to standard drawing during construction stage, Poor performance of sub-contractor,

Lack of cost report during construction stage, Contractor poor site management and supervision In general, in contractors' view the top ten significant factors affecting cost performance was presented in Table: 4-8.

Table 4-8 Summary of Top Ten Factors Affecting Cost Performance Contractors' Views

Factors Affecting Cost Performance	RII	Rank
Design problem (Frequent design change)	0.8382	1
Inaccurate quantity estimation (excess quantity during construction)	0.8212	2
Inflation of construction material	0.8042	3
Lack of cost planning/monitoring during pre-and post-contract stage	0.8042	4
Cash flow and financial difficulty faced by contractor	0.8	5
Lack of appropriate planning and scheduling of work	0.7957	6
Improvement to standard drawing during construction stage	0.7787	7
Poor performance of sub-contractor	0.7702	8
Lack of cost report during construction stage	0.7489	9
Contractor poor site management and supervision	0.7489	10

Overall Response of Factors Affecting Cost Performance

The general summery and discussion of the first top ten actors affecting cost performance. Based on the overall RII value, the factors presented in Table: 4-9 and depicted by bar chart on Figure-1.

Inflation of construction material: ranked in first position with (RII=0.8051) the most significant factors affecting cost performance. Inflation is increase in cost of construction material from original value of cost.

Design problem (frequent design change): this happen before or during construction stage due to omission of major part of design, design incompleteness and client requirement change

Inaccurate quantity estimation (excess quantity during construction): this factor direct effect on cost performance, which means for each increase in quantity of contract quantity, which result in increases initial estimated cost to complete the project.

Lack of cost planning/monitoring during pre-and post-contract stage: This problem happen because of in case of client and consultants during pre-contract stage lack of proper planning of project budget ,lack of checking the financial arrangement of client before contract the project. In case of contractor ,poor cost estimation of project for the purpose of binding ,during post contract stage lack of monitoring cost performance of the project is progress as planned through base line budget or not .

Cash flow and financial difficulty faced by contractor): if the contractor faced financial difficult during execution of project, would result in termination of the project .that means the client forced to hire new contractor.

Cost under estimation: result due to inappropriate usage of cost estimation method ,,result due to lack of cooperating all the necessary cost item, the current biding system employed in public construction project ,in this system those contractor offer the least price wine the tender , this would result in cost under estimation of project by contractor intentions of winging the tender.

Lack of appropriate planning and scheduling of work: Result due to improper usage of planning method, poor planning in crew establishment for activity, poor productivity calculation for labor and equipment, and scheduling problem, will affect cash flow program or financial arrangements for works, Lack of experience also main cause.

Additional cost due to variation work: Variation work is result due to client change in the scope of work. To execute variation work additional budget need by project owner, this means project imperiled to cost overrun.

Poor performance of sub-contractor: Ranked in ninth position Poor performance of work by sub-contractor result in late time completion of the project as planned, the project risked to inflation and this would result in price adjustment of direct cost component of project.

Improvement to standard drawing during construction stage: are factors affecting cost performance overall ranked in tenth position .if there is improvement to standard drawing during construction stage there will be change in scope of project /additional work, which result in additional cost.

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Table 4-9 Overall Response Summary of RII and Rank of Top Ten Factors Affecting Cost Performance

Factors Affecting Cost Performance	RII	Rank
Inflation of construction material	0.8051	1
Design problem (Frequent design change)	0.7973	2
Inaccurate quantity estimation (excess quantity during construction)	0.7898	3
Lack of cost planning/monitoring during pre-and post-contract stage	0.7666	4
Cash flow and financial difficulty faced by contractor	0.7615	5
Cost under estimation	0.7614	6
Lack of appropriate planning and scheduling of work	0.7589	7
Additional cost due to variation work	0.7435	8
Poor performance of sub-contractor	0.7384	9
Improvement to standard drawing during construction stage	0.7333	10

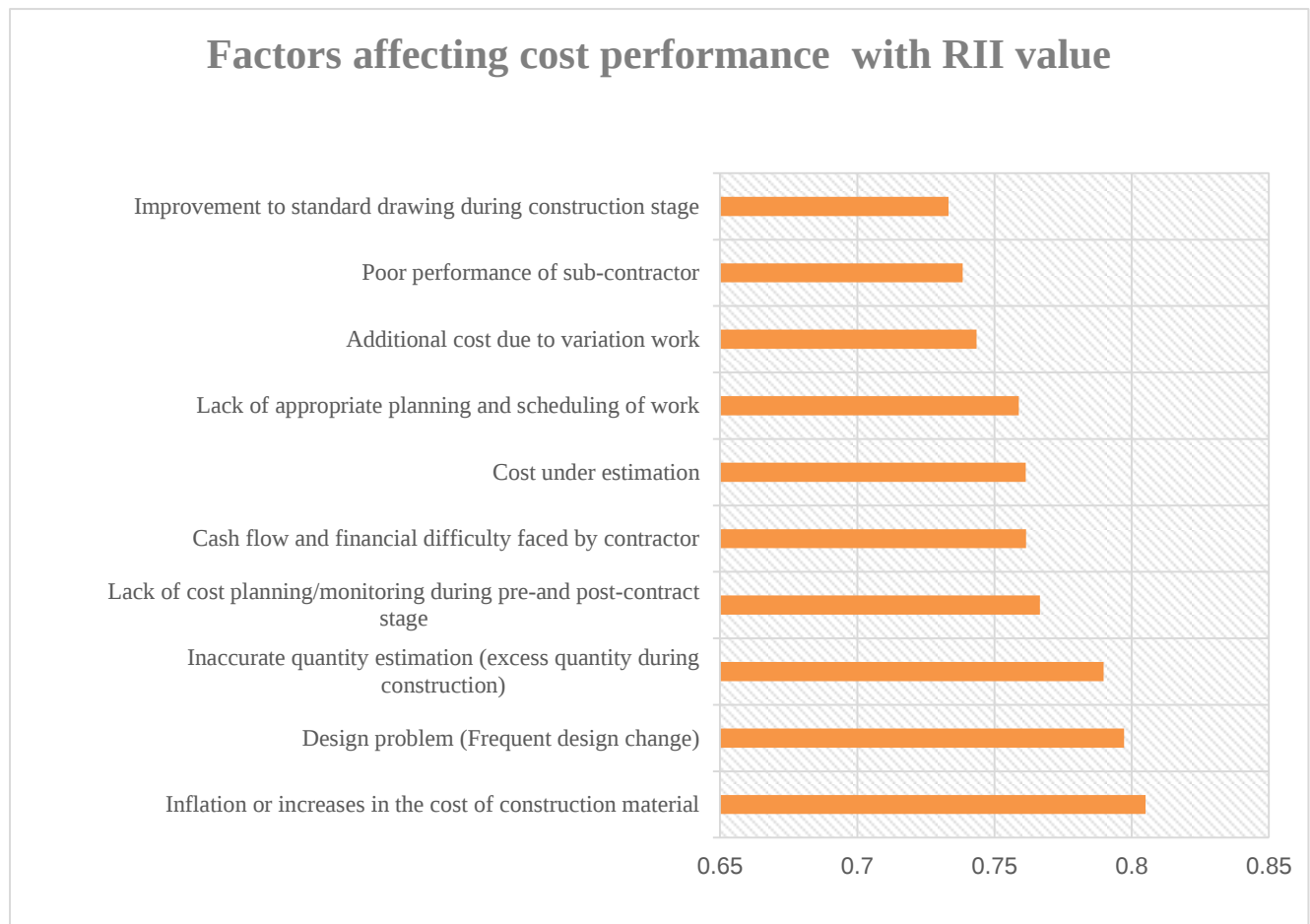


Figure 1 Top Ten Factors Affecting Cost Performance Overall Response

Relationship Measurement on Cost Performance

Spearman correlation coefficient was determined to determine association/correlation exist between consultants' and contractors' respondents on ranking of factors affecting cost Performance, the result of correlation coefficient is attached in **Appendices 2**. the coefficient of correlation between consultants' and contractors' was ($\rho=0.755$) Which shows there is strong correlation, implies both have the same opinion on ranking of the factors.

4.3.3 Factors Affecting Time Performance

Result analysis of factors affecting time performance using relative importance index and ranking of top ten factors affecting time performance according to respondent view; consultants', contractors'' and overall response.

The summary of 37 factor presented in Table: 4-10 below with calculated RII value according to consultants and contractors' 'rating scale and overall response RII value.

Table 4-10 RII of Factors Affecting Time Performance from Consultant's and Contractor's Views

Factors	Consultant	Contractor	over all
	RII	RII	RII
Delay in progress/ interim payments by owner to contractor	0.6968	0.7957	0.7563
Delay to furnish and deliver the site to the contractor by owner	0.6199	0.6894	0.6617
Change order by owner during construction	0.6323	0.7489	0.7025
Financial inability /financial arrangement for the project	0.7225	0.834	0.7896
Rework due to errors during construction	0.6065	0.7277	0.6795
Delay in site mobilization	0.6516	0.7447	0.7076
Ineffective planning and scheduling of project by contractor	0.7613	0.8213	0.7974
Difficult in financing project by contractor	0.7548	0.7915	0.7769
Improper construction methods implemented by contractor	0.6968	0.7659	0.7384
Poor site management and supervision by contractor	0.7484	0.7957	0.7769
Delays in sub-contractors works	0.6903	0.7447	0.723
Delay in approving major change in the scope of work by consultant	0.6581	0.8213	0.7564
Late in reviewing and approving design documents by consultants	0.7097	0.8255	0.7794

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Poor contract management	0.6774	0.7872	0.7435
Waiting time for approval of tests and inspection	0.6645	0.7872	0.7384
Original contract duration is too short	0.7032	0.7745	0.7461
Inadequate definition of substantial completion	0.6645	0.7872	0.7051
Delay in producing design document	0.6968	0.7234	0.7128
Mistake and discrepancies in design documents	0.729	0.7872	0.764
Unclear and inadequate details in drawing	0.729	0.7787	0.7589
Major disputes and negotiations	0.6839	0.7702	0.7359
Change in material types and specifications during construction	0.6581	0.7489	0.7128
Shortage of construction material on site	0.7419	0.7829	0.7666
Delay in material delivery to the site	0.7226	0.7447	0.7359
Low quality of material	0.7098	0.7362	0.7257
Poor procurement system of material	0.6323	0.7319	0.6923
Poor material handling on site	0.6774	0.7234	0.7051
Shortage of equipment during construction	0.7226	0.7532	0.741
Equipment failure	0.6709	0.7362	0.7102
Low productivity and efficiency of equipment	0.6839	0.7532	0.7256
Low productivity level of labor	0.6903	0.7659	0.7358
Shortage of Skilled labors	0.7355	0.7362	0.7359
Weather condition	0.6194	0.5872	0.5999
Accident during construction	0.5355	0.5957	0.5717
Unforeseen site condition	0.6258	0.6043	0.6128
Unavailability of utilities in site :such as water, electricity ...etc.	0.6709	0.7106	0.6948

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The following Table: 4-11 is adopted from Table: 4-10 present List of top ten factors affecting time performance.

Table 4-11 Summary of List of Top Ten Factors Affecting Time Performance

Rank	Top Ten Factors Consultants' View	Top ten factors contractors 'views	Overall top ten factor
1	Ineffective planning and scheduling of project by contractor	Financial inability /financial arrangement for the project	Ineffective planning and scheduling of project by contractor
2	Difficult in financing project by contractor	Late in reviewing and approving design documents by consultants	Financial inability /financial arrangement for the project
3	Poor site management and supervision by contractor	Ineffective planning and scheduling of project by contractor	Late in reviewing and approving design documents by consultants
4	Shortage of construction material on site	Delay in approving major change in the scope of work by consultant	Difficult in financing project by contractor
5	Shortage of Skilled labors	Delay in progress/ interim payments by owner to contractor	Poor site management and supervision by contractor
6	Mistake and discrepancies in design documents	Poor site management and supervision by contractor	Shortage of construction material on site
7	Unclear and inadequate details in drawing	Difficult in financing project by contractor	Mistake and discrepancies in design documents
8	Delay in material delivery to the site	Poor contract management	Unclear and inadequate details in drawing
9	Shortage of equipment during construction	Waiting time for approval of tests and inspection	Delay in approving major change in the scope of work by consultant
10	Financial inability /financial arrangement for the project	Inadequate definition of substantial completion	Delay in progress/ interim payments by owner to contractor

Consultants' Views:

Based on the research finding the first top ten factors affecting time performance of public building construction project in Addis Ababa, according to consultants' respondents view was, Ineffective planning and scheduling of project by contractor, Difficult in financing project by contractor, Poor site management and supervision by contractor, Shortage of construction material on site, Shortage of Skilled labors. In addition, Mistake and Discrepancies in design documents, Unclear and inadequate details in drawing, Delay in material delivery to the site, Shortage of equipment during construction and financial inability /financial arrangement for the project. The summery of the factors are, shown in Figure-2 below

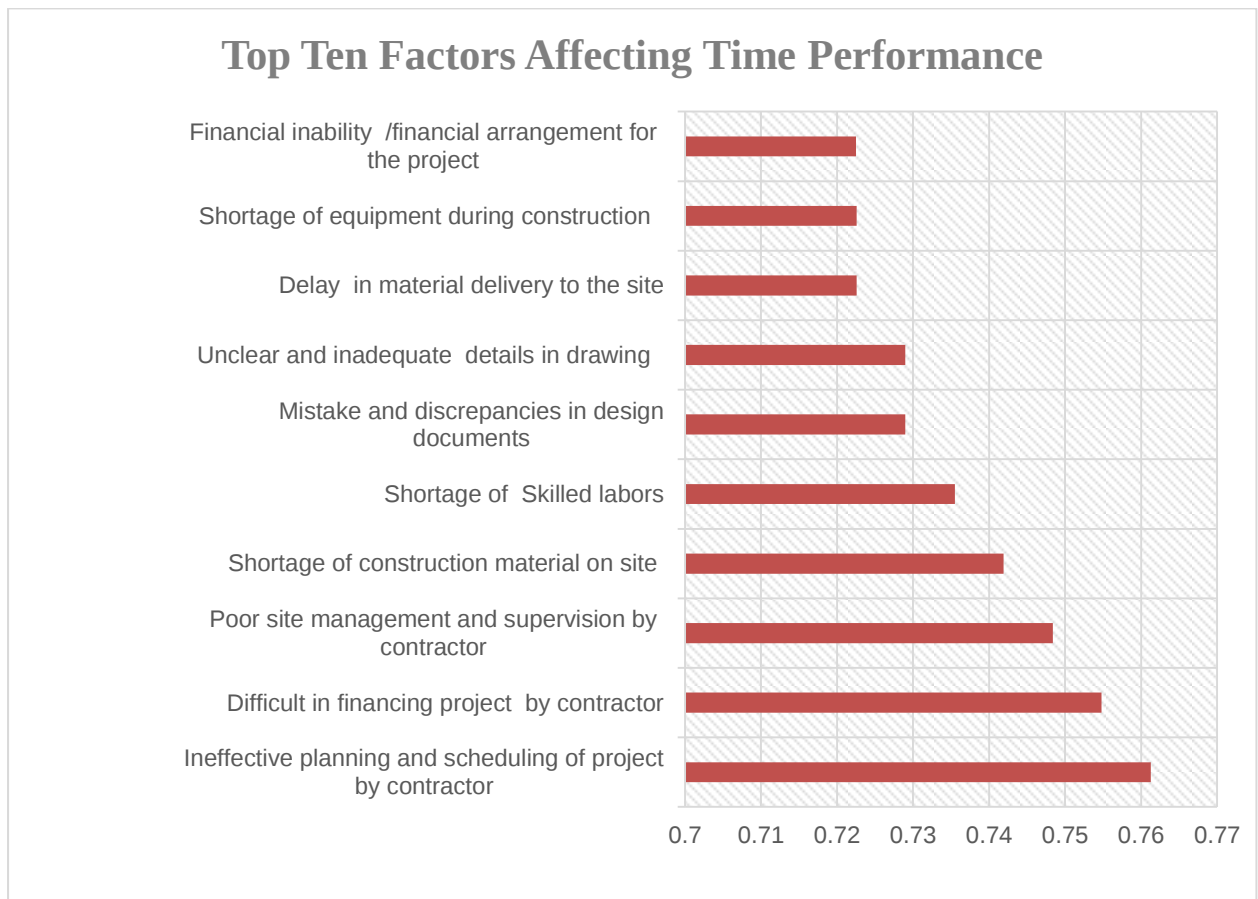


Figure 1 Top Ten Factors Affecting Time Performance According to Consultants' Views

Contractors' views

Based on the research finding the first top ten factors affecting time performance of public building construction project in Addis Ababa, according to contractors' respondent view was, Financial inability /financial arrangement for the project by client, Late in reviewing and approving design documents by consultants, Ineffective planning and scheduling of project by contractor. Moreover, Delay in approving major change in the scope of work by consultant,

Delay in progress/ interim payments by owner to contractor, Poor site management and supervision by contractor, Difficult in financing project by contractor, Poor contract management, Waiting time for approval of tests and inspection, and Inadequate definition of substantial completion. The summary of the factors are, shown in Figure-3 below

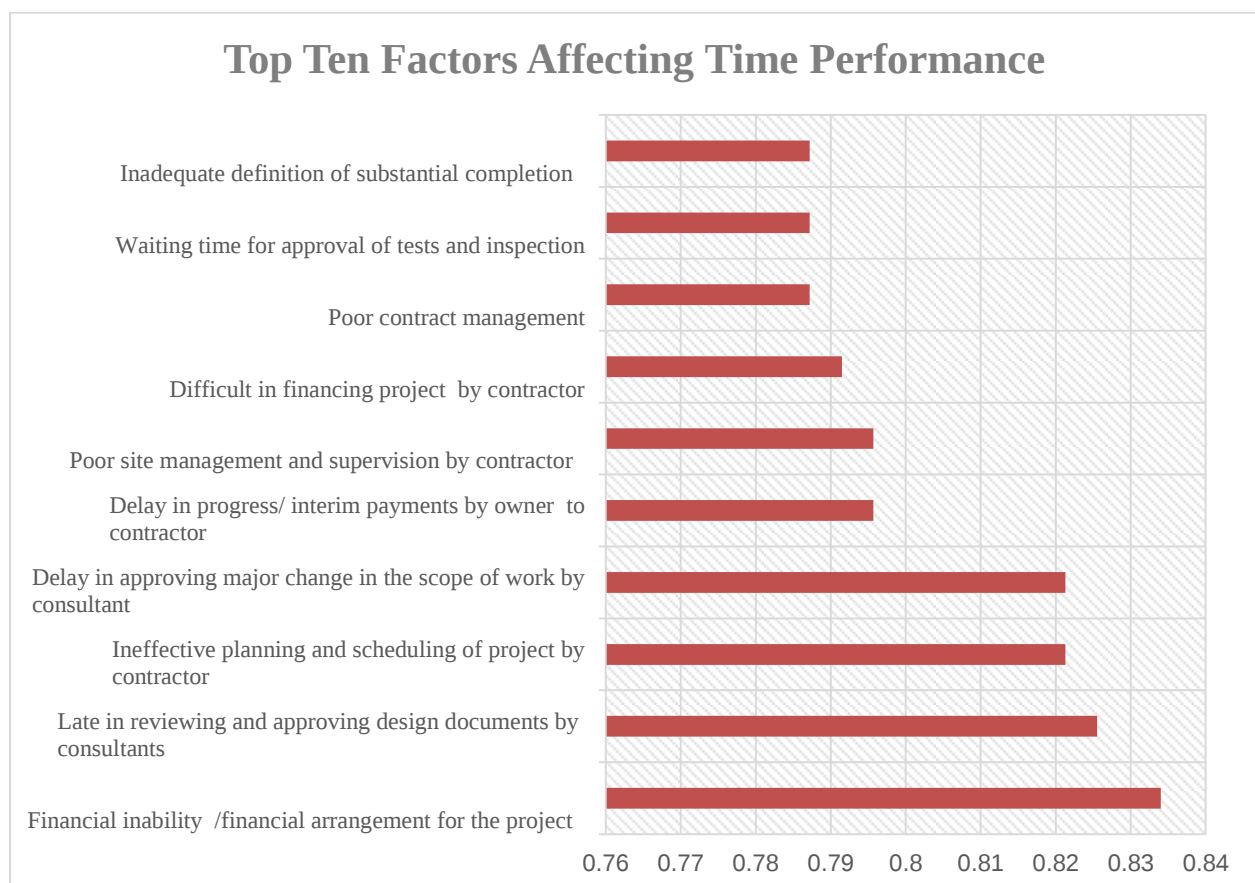


Figure 2 Top Ten Factors Affecting Time Performance According To Contractors Views

Overall Top Ten Factors Affecting Time Performance

Based on the overall RII value the first top ten factors affecting time performance are, ineffective planning and scheduling of project by contractor, Financial inability /financial arrangement for the project, Late in reviewing and approving design documents by consultants. And Difficult in financing project by contractor, Poor site management and supervision by contractor, Shortage of construction material on site, Mistake and Discrepancies in design documents, Unclear and inadequate details in drawing, Delay in approving major change in the scope of work by consultant ,Delay in progress/ interim payments by owner to contractor in order of descending.

4.3.3.2 Result Analysis of Factors Affecting Time Performance by Group

This part consists of results and discussion of factors that influence time performance of public construction projects in Addis Ababa using relative importance index and ranking of factors affecting the time performance. The following section present separately of factors ranking according to each type of target group.

4.3.3.2.1 Client Related Factors:

The relative importance index (RII) and rank of time factor are summarized in Table: 4-12

Table 4-12 RII and Rank of Client Related Factors Affecting Time Performance

Factors	Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank
1.Client Related Factor						
Delay in progress/ interim payments by owner to contractor	0.6968	2	0.7957	2	0.7563	2
Delay to furnish and deliver the site to the contractor by owner	0.6199	4	0.6894	4	0.6617	4
Change order by owner during construction	0.6323	3	0.7489	3	0.7025	3
Financial inability /financial arrangement for the project	0.7225	1	0.8340	1	0.7896	1

Consultants and contractors' views:

From Table: 4-12, financial inability /financial arrangement for the project by owner is the most significant factor affecting time performance which is ranked in the first position both by consultants' and contractors' respondents. But the RII value for both is different value consultants' RII value with 0.7225 were as contractors' respondents with higher value of RII equal to 0.8340.

Delay in progress /interim payments by owner to contractor has been ranked in second position, factor affecting time performance, both consultants' and contractors' respondents the significant. With the difference in RII value .in case of contractors the factor; give higher value with RII equal to 0.7957 and consultants RII value equal to 0.6968.

Change order by owner during construction has been ranked in the third position both by consultants' and contractors' respondent's. With consultant RII, value equal to 0.6323.and contractor RII value equal to 0.7489

Delay to furnish and deliver the site to the contractor by owner has been, ranked in the fourth position both by consultants and contractors respondents. The RII value of contractor's respondent is higher over consultant's respondent equal to 0.6894 and 0.6199 respectively.

Over all response; financial inability /financial arrangement for the project, Delay in progress/ interim payments by owner to contractor, Change order by owner during construction and Delay to furnish and deliver the site to the contractor by owner, are factors affecting time performance in order of deciding from this group of factors.

4.3.3.2 Contractor Related Factors:

The relative importance index (RII) and rank of time factor are summarized in Table: 4-13

Table 4-13 RII and Rank of Contractor Related Factors Affecting Time Performance

Factors	Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank
2.Constructor Related Factor						
Rework due to errors during construction	0.6065	7	0.7277	6	0.6795	6
Delay in site mobilization	0.6516	6	0.7447	5	0.7076	5
Ineffective planning and scheduling of project by contractor	0.7613	1	0.8213	1	0.7974	1
Difficult in financing project by contractor	0.7548	2	0.7915	3	0.7769	2
Improper construction methods implemented by contractor	0.6968	4	0.7659	4	0.7384	3
Poor site management and supervision by contractor	0.7484	3	0.7957	2	0.7769	2
Delays in sub-contractors works	0.6903	5	0.7447	5	0.7230	4

Consultants and contractors' views:

According to consultants respondents the major Factors affecting time performance, which related to contractor cause, as shown in the above Table 4.3. Ineffective planning and scheduling of project by contractor has been, ranked in first position as major significant factor with RII of 0.7613. Also according to contractor's respondents, the factor has been, ranked in the first position with RII of 0.8213. The RII the contractor's respondent give higher value than consultants do.

In second position according to consultant respondents difficult in financing project by contractor has been ranked in second position with RII value equal to 0.7548 .but according to contractors respondents poor site management and supervision by contractor is has been ranked in the second significant factor with RII value equal to 0.7957.

Poor site management and supervision by contractor, has been, ranked in third position with RII value equal to 0.7484 according to consultant respondent .in accordance to contractor

respondents difficult in financing project by contractor considered as ranked in third position significant factor with RII value equal to 0.7915.

Both consultant and contractors respondents have the same place on improper construction methods implemented by contractor has been ranked in fourth position, but the value of RII is different with 0.6968 of consultant and 0.7659 contractor.

Overall response: Ineffective planning and scheduling of project by contractor, Difficult in financing project by contractor, improper construction methods implemented by contractor, Delays in sub-contractors works, Delay in site mobilization and Rework due to errors during construction, are factors affecting time performance in order of deciding from this group of factors.

4.3.3.2.3 Consultant Related Factors:

The relative importance index (RII) and rank of time factor are summarized in Table: 4-14

Table 4-14 RII and Rank of Consultant Related Factors Affecting Time Performance

Factors	Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank
3.Consulatant Related Factor						
Delay in approving major change in the scope of work by consultant	0.6581	4	0.8213	2	0.7564	2
Late in reviewing and approving design documents by consultants	0.7097	1	0.8255	1	0.7794	1
Poor contract management	0.6774	2	0.7872	3	0.7435	3
Waiting time for approval of tests and inspection	0.6645	3	0.7872	3	0.7384	4

Consultants and contractors' views:

From consultant related Cause, late in reviewing and approving design document by consultant is ranked in the first significant factor cause for poor performance of time, according to consultants respondent with RII=0.7097.this factor is also ranked in first position according to contractors respondent with higher value of RII =0.8255which cause poor performance.

Poor contract management, ranked in second cause significant factor for poor performance according to consultants view with RII=0.6774.acording to contractors respondent this factor is ranked in third position cause factor affecting time performance with RII=0.7872

Waiting time for approval of tests and inspection by consultant has been ranked in third position with $RII=0.6645$ according to consultants respondents. according to contractors respondents this factor has been ranked in fourth position.

Delay in approving major change in the scope of work by consultant has been ranked in fourth position with $RII=0.6581$. this factor is considered as the second significant factors affecting time performance with $RII=0.8213$.

Overall response: Late in reviewing and approving design documents by consultants, Delay in approving major change in the scope of work by consultant, Poor contract management and Waiting time for approval of tests and inspection, are factors affecting time performance in order of deciding from this group of factors.

4.3.3.2.4. Project and Design Related Factors:

The relative importance index (RII) and rank of time factor are summarized in Table: 4-15

Table 4-15 RII and Rank of Project and Design Related Factors Affecting Time Performance

Factors	Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank
4. Project and Design Related Factor						
Original contract duration is too short	0.7032	1	0.7745	3	0.7461	3
Inadequate definition of substantial completion	0.6452	5	0.7447	5	0.7051	6
Delay in producing design document	0.6968	3	0.7234	6	0.7128	5
Mistake and discrepancies in design documents	0.7290	2	0.7872	1	0.7640	1
Unclear and inadequate details in drawing	0.7290	2	0.7787	2	0.7589	2
Major disputes and negotiations	0.6839	4	0.7702	4	0.7359	4

Consultants and contractors' views:

From project and design related factor, original contract duration too short, is ranked in the first position, the most significant factor affecting time performance according to consultant view with RII equal to 0.7032. this factors has been ranked in the third position according to contractors views with $RII=0.7745$

Mistake and discrepancy in design document and unclear and inadequate details in drawing, is considered as the second significant factors affecting time performance with $RII=0.7290$. and according to contractors' respondents Mistakes and discrepancies in design document are

considered as the most significant factors affecting time performance from this group and ranked in the first position with RII=0.7872 followed by unclear and inadequate details in drawing ranked in the second position with RII=0.7787

Delay in producing design document ranked in the third position according to consultants with RII=0.6968 and ranked in six position according to contractors' respondents with RII=0.7234

Both consultants' and contractors' views, Major disputes and negotiation during construction stage ranked in fourth position, which affect time performance. Followed by, inadequate definition of substantial completion ranked in fifth position.

Overall response: Mistake and discrepancies in design documents, Unclear and inadequate details in drawing, Original contract duration is too short, major disputes and negotiations, Delay in producing design document, and inadequate definition of substantial completion, are factors affecting time performance in order of deciding from this group of factors?

4.3.3.2.5. Material Related Factors:

The relative importance index (RII) and rank of time factor are summarized in Table: 4-16

Table 4-16 RII and Rank of Material Related Factors Affecting Time Performance

Factors	Consultant		Contractor		Over all	
	RII	Rank	RII	Rank	RII	Rank
5. Material Related Factor						
Change in material types and specifications during construction	0.6581	5	0.7489	2	0.7128	4
Shortage of construction material on site	0.7419	1	0.7829	1	0.7666	1
Delay in material delivery to the site	0.7226	2	0.7447	3	0.7359	2
Low quality of material	0.7098	3	0.7362	4	0.7257	3
Poor procurement system of material	0.6323	6	0.7319	5	0.6923	6
Poor material handling on site	0.6774	4	0.7234	6	0.7051	5

Consultants and contractors' views:

From material related factor, Shortage in construction material on site is, considered as the most significant factors affecting time performance ranked in the first position both by consultants and contractors respondents with different RII value .the RII value of the contractors higher than consultant's value. The RII values are, 0.7829 and 0.7419 respectively.

Delay in material delivery to the site is considered as the second significant factors cause time performance with $RII=0.7226$.in addition this factor as considered as the third significant factors according to contractor respondents factor cause with $RII=0.7447$.

Low quality of material has been ranked in third position with $RII=0.7098$ cause factors according to consultant respondents .this factor has been ranked in fourth position according to contractors respondents with $RII=0.7362$.

Poor material handling on site has been ranked in fourth position with $RII= 0.6774$ according to consultants views .whereas this factor are considered as the list significant factors cause from material related factor ranked in last position with $RII=0.7234$ according to contractors view.

Change in material types and specifications during construction ranked in fifth position according to consultants respondent.in case of contractors respondents this factors has been ranked in the second position which has significant impact on time performance from material associated Cause with $RII=0.7489$.

Poor procurement system of material considered as less significant impact on time performance according to consultants views, and has been ranked in six position with $RII=0.6323$.according to contractors views this factor has been ranked in fifth position with $RII= 0.7319$.

Overall response: Shortage of construction material on site, Delay in material delivery to the site, Low quality of material, Change in material types and specifications during construction, Poor material handling on site, and Poor procurement system of material, are factors affecting time performance in order of deciding from this group of factors.

4.3.3.2.6 Equipment and Labor Related Factors:

The relative importance index (RII) and rank of time factor are summarized in Table: 4-17

Table 4-17 RII And Rank of Equipment and Labor Related Factors Affecting Time Performance

Factors	Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank
6.Equipement and Labor Related Factor						
Shortage of equipment during construction	0.7226	2	0.7532	2	0.7410	1
Equipment failure	0.6709	5	0.7362	3	0.7102	5
Low productivity and efficiency of equipment	0.6839	4	0.7532	2	0.7256	4
Low productivity level of labor	0.6903	3	0.7659	1	0.7358	3
Shortage of Skilled labors	0.7355	1	0.7362	3	0.7359	2

Consultants and contractors views:

From equipment related factors, shortage of skilled labor has been considered as the extremely significant factors affecting time performance ranked in the first position with RII=0.7355 according to consultants respondents. Followed by shortage equipment during construction ranked in the second position with RII=0.7226.and third position low productivity level of labor with RII= 0.6903 and low productivity and efficiency of equipment ranked in the fourth position with RII=0.6839 .and lest significant factors affecting time performance according to consultants is equipment failure.

From the above table: according to contractors respondent low productivity level of labor is considered as the most significant factor affecting time performance from this group and ranked in the first position with RII=0.7659

In the second position contractors respondents give the same weight for both low productivity and efficiency of equipment and shortage of equipment during construction factors with RII=0.7532.

Equipment failure and shortage of skilled labor both factors are ranked in the third position significant affecting time performance from this group according to constructors respondents with RII=0.7362.

Overall response: Shortage of equipment during construction, Shortage of Skilled labors Low productivity level of labor, Low productivity and efficiency of equipment and Equipment failure, are factors affecting time performance in order of deciding from this group of factors.

4.3.3.2.7 External Related Factors:

The relative importance index (RII) and rank of time factor are summarized in Table: 4-18

Table 4-18 RII and Rank of External Related Factors Affecting Time Performance

Factors	Consultant		Contractor		Over all	
	RII	Rank	RII	Rank	RII	Rank
7.External Related Factor						
Weather condition	0.6194	3	0.5872	4	0.5999	3
Accident during construction	0.5355	4	0.5957	3	0.5717	4
Unforeseen site condition	0.6258	2	0.6043	2	0.6128	2
Unavailability of utilities in site (such as water, electricity ...etc.)	0.6709	1	0.7106	1	0.6948	1

Consultants and contractors' views:

Both consultant and contractors respondents agree on from external related factor, Unavailability of utilities in site (such as water, electricity) has been, ranked in the first position. In addition, considered as the significant factors affecting time performance from this group.

Unforeseen site condition also considered as significant impact on time performance both by consultants and contractors respondents and has been ranked in the second position with RII=0.6258 & RII=0.6043 respectively both for consultant and contractors respondents.

Accident during construction has been considered as the least impact on time performance and has been ranked in fourth position according to consultants views with RII=0.5355. according to contractors views this factors are considered has been ranked in the third position with RII=0.5957

Unforeseen site condition has been considered as least significant factors affecting time performance according to consultants and ranked in fourth position with

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RII=0.5355. according to contractors this factor are ranked in the third position with RII=0.5957.

Overall response: Unavailability of utilities in site (such as water, electricity ...etc.), Unforeseen site condition Weather condition, and Accident during construction, are factors affecting time performance in order of deciding from this group of factors.

Summary of Factors Affecting Time Performance by Group

Overall summary of the factors affecting time performance by category of each group, Using mean RII value for each group and Rank based on consultants and contractor's respondent rating weight presented in Table: 4-19

Table 4-0-19 Summary of RII and Rank of Factors Affecting Time Performance by Group

Group Of Factor	Consultant		Contractor		Overall	
	RII	Rank	RII	Rank	RII	Rank
Client Related Factor	0.6678	6	0.767	3	0.7276	4
Contractor Related Factor	0.7013	1	0.7702	2	0.7428	2
Consultant Related Factor	0.6774	5	0.8053	1	0.7544	1
Project and Design Related Factor	0.6978	3	0.7631	4	0.7371	3
Material Related Factor	0.6903	4	0.7446	6	0.723	5
Equipment and labor Related Factor	0.7006	2	0.7489	5	0.7297	6
External Related Factor	0.6129	7	0.6244	7	0.6198	7

From Table:4-19,above Client related factor is considered as the least factor affecting time performance according to consultants, but according to contractor respondents client related factor has been ranked in third position .this group of factor considered over all in fourth position.

Contractor related factor, according to consultant respondent view this group considered as the most significant factor affecting time performance .according to contractor view ranked in the second .overall this factor ranked in the second position.

Consultant related factor ,has least significant factor according to consultants view, contractors respondent belief the major factor affecting time performance ,was on the first line factors associated with consultant related cause .overall rank this group also the most significant factor affecting time performance ranked in the first position.

Project and design related factor, according to consultant respondent this group of factor ranked in third position, contractors respondents ranked in fourth position. Overall ranked in, third position.

Material related factor, ranked in the fourth position according to consultant respondents, but according to contractor respondents this factor considered as least factors affecting time performance .over all this group of factor been ranked in fifth position.

Equipment and labor related factor, considered as the second group factor affecting time performance according to consultants respondent, on the view of contractor respondent this group related factor has been least impact on time performance and ranked in fifth position .overall this group of factor ranked in six positions.

External related factor: the factor listed in this group considered as the very least significant factors affecting time performance, and ranks seven positions according to consultant and contractor respondents.

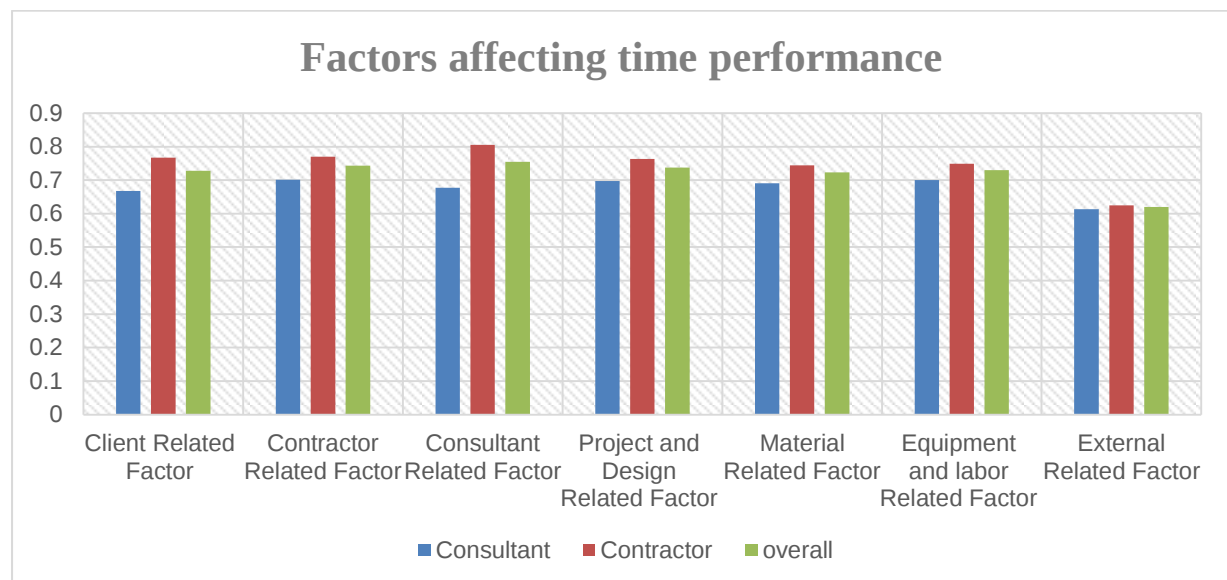


Figure 3 Consultants' Contractors' and Overall Response, Factors Affecting Time Performance by Group

4.3.3.3. Relationship Measurement

The following part of analysis result shows the relationship between consultants and contractors' respondents' agreement on the factor affecting time performance between each group of factors. As mentioned in chapter three to measure the relationship exist between consultants' and contractors' Spearman (rho) correlation coefficient was determined to measure the agreement exist between each group factor based on the consultants' and contractors' respondents rating scale on significant level rating for each factor. Result interpretation (1)-perfectly positively correlated, [1, 0.3]-positively correlated, [-0.3, 0.3] no correlation, [-1,-0.3] negatively correlated, (-1) - perfectly negatively correlated The result of Spearman correlation coefficient and sig value for each group is attached on the **Appendices-B**. the summer of the result was presented in Table:4-20

Table 4-20 Spearman Correlation Coefficient between Consultants and Contractors' On Group of Factors

Group of factor	Spearman correlation coefficient	Result interpretation
Client Related Factor	1.000	Perfectly positively correlation
Contractor Related Factor	0.955	Positively correlated
Consultant Related Factor	0.316	Positively correlated
Project And Design Related Factor	0.812	Positively correlated
Material Related Factor	0.543	Positively correlated
Equipment Related Factor	0.000	No correlation
External Related Factor	0.800	Positively correlated

From Table: 20 above, both consultants' and contractors' respondents have the same perception on ranking of client related factors, with perfectly positive correlation. There is positive agreement or correlation exist between consultants' and contractors' respondents on ranking of the following group of factors affecting time performance, consultant related factors, contractor related factors, Material related, project and design related factors and external related factors.

In case of equipment related factors there is no agreement or correlation exist on the ranking between both consultants' and contractors'' respondents.

4.3.4. Respondent Opinion on Factors Affecting both Cost and Time Performance

In the last part (section D) of Questioner, the respondents enquired to transcribe their own opinion on the most important factors affecting both cost and time performance. Based on the data collected, not all but some respondents mention their opinion on the factors affecting both cost and time performance. From their opinion, some of the factor mentioned by respondent was those factors as mention in **Section -B** and **Section -C** parts of questioner part. and there are few factors which are mentioned by respondent frequently .based on this the factors are presented in three parts, the first part is those factors mentioned by consultants, followed by contractors' and in last those factor mention by both consultant and contractor respondents in common.

According to some consultant's respondent's opinion, factors affecting both cost and time performance are:

- ✓ Change in the scope of work
- ✓ Shortage of equipment manpower and material due inflation of cost
- ✓ Cost under estimation before construction
- ✓ Client financial status
- ✓ Consultant controlling system
- ✓ Less productivity of manpower
- ✓ Unexpected whether condition
- ✓ Bidding system in the public construction projects (least bidder) is the most affecting factors for both cost and time performance.
- ✓ Contractors are not committed to work /execute there project according to schedule of time ,material and labor
- ✓ Under quality construction material
- ✓ Weather condition
- ✓ Unforeseen site condition
- ✓ Design change
- ✓ Delay in both site delivery and payment arrangement between contractor and client
- ✓ Unforeseen obstacles in the construction site such as high tension electric power lines, water source

- ✓ Poor feasibility study , poor design and preparation of drawings and contract document
- ✓ Late material delivery to the site and poor utilization of materials as per the contract document
- ✓ Equipment failure in construction site

According to some contractor's respondent's opinion, factors affecting both cost and time performance are:

- ✓ Material related factor
- ✓ Poor management on site
- ✓ Poor scheduling and management of site by contractor
- ✓ False time schedule
- ✓ Lack of attentive following of the supervision by consultants
- ✓ Poor financial management
- ✓ Design related issues, failure to give response by the designer (consultants)
- ✓ Improper planning and scheduling of the project compilation date
- ✓ Review problem of the contract document before handover the project
- ✓ Lack of appropriate planning and scheduling of work
- ✓ Poor scheduling of labor
- ✓ Ineffective planning and scheduling of project
- ✓ Construction industry in the country, highly influenced by unprofessional group(people, ethnic group in project place, politician those who don't have knowledge of engineering
- ✓ Equipment failure
- ✓ Delay in material delivery to the site
- ✓ Change in material type and specification during construction
- ✓ Poor work man- ship
- ✓ Delay in approval of variation work
- ✓ Risk and uncertainty associated with project
- ✓ Waiting time of approval of test and specification
- ✓ Scope change
- ✓ Less estimation of quantity on pre- contract stage

The following list of factors, are those factors mentioned both by consultant and contractor respondents have common opinion on the factors affecting both cost and time performance .

- ✓ Payment delay from the employee
- ✓ Delay in interim payment by client
- ✓ Lack of contractor planning for work, manpower, material and equipment and should work based on the plan
- ✓ Lack of supervision from employer and consultants
- ✓ Poor planning and scheduling
- ✓ Delay of subcontractors work
- ✓ Inflation of construction material
- ✓ Poor material system of material on site
- ✓ Capacity of contractor
- ✓ Poor coordination among stakeholders
- ✓ Variation of work during construction stage, shortage of material in the market due to inflation, lack of communication skill with other external body and corruption of different body those who are involved (participated) in public construction project
- ✓ Delay in approving design and contract document
- ✓ Poor management in the all of construction activities
- ✓ Extreme increase in the cost of construction material

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 Introduction

The development of construction industry now a day show remarkable growth compared to other sector in Ethiopia. Moreover, its GTP contribution to economy is increase from year to year. However the major chronic problem facing the construction industry was, difficult to finish the project with planned budget and time schedule. The major objective of this research was identifying factors affecting cost and time performance of construction projects in Ethiopia (case of: Public building projects in Addis Ababa) to achieve this objective deferent research methodology was used as discussed in chapter three.

In chapter four, data obtained through desk study and questioner, analyzed and presented in detail. Conclusion of research finding, and recommendation, presented in this chapter. In addition, suggestion of research area for future study also encompassed.

5.2 Conclusion

The following conclusion are drawn from research finding

- ❖ The specific objective of this research was assessment of cost and time performance of public building construction project ,to identify wither there exist the problem of poor performance in cost and time perspective using disk study, the result of finding shows there is problem of poor performance.
- ❖ The other specific objective of the research was identifying factors affecting cost performance, to achieve this 26 factors are, identified through literature review and structured questioner was, prepared with five-scale liker scale rating and distributed to local consultants and contractors'' respondents. Finally, top ten factors affecting cost performance was identified by this study, Design problem (Frequent design change),Inaccurate quantity estimation (excess quantity during construction),Inflation of construction material ,Lack of cost planning/monitoring during pre-and post-contract stage, Cash flow and financial difficulty faced by contractor. And Lack of appropriate planning and scheduling of work, Improvement to standard drawing during construction stage, Poor performance of sub-contractor, Lack of cost report during construction stage and Contractor poor site management and supervision.
- ❖ The other specific objective of the research was identifying factors affecting time performance public building construction projects in Addis Ababa , to achieve this total of 37 factors are identified through literature review and grouped under seven major part and structured questioner was prepared with five scale Liker scale rating

and distributed to local consultants' and contractors' respondents. Top ten factors affecting time performance identified by this study, Ineffective planning and scheduling of project by contractor, financial inability /financial arrangement for the project, late in reviewing and approving design documents by consultants, Difficult in financing project by contractor. And Poor site management and supervision by contractor, Shortage of construction material on site ,Mistake and discrepancies in design documents, Unclear and inadequate details in drawing ,Delay in approving major change in the scope of work by consultant and Delay in progress/ interim payments by owner to contractor.

- ❖ The other finding of the research was, the relationship or correlation exist between consultants and contractors' respondent agreement on ranking of factors affecting cost and time performance. Based on the measurement result (spearman's correlation coefficient), there is strong association/correlation on the ranking of factors affecting cost performance exist between consultants' and contractors' respondents'. in case of ranking on factors affecting time performance ,there is strong/positive correlation exist between consultants' and contractors' respondents' on the seven groups of factors, except on Equipment related factors (there is no correlation between them)

5.3 Recommendation

The major objective of this research was to identify and ranking the factors affecting cost and time performance in public building construction project in Addis Ababa. Based on the objective the factors and ranking was, achieved as discussed in chapter four part of the research. In addition, the specific objective of this research was recommendation of the ways to improve cost and time performance based on the finding obtained from the research, the following recommendation is given.

Recommendation on ways to improve cost performance:

- ❖ From the result obtained design problem, which associated with frequent design problem is the major problem, which affect cost performance. to alleviate this problem, before starting any construction project every part involved in design process should consider or check that all the necessary consideration is included in design. Due care should be done in selection of design team professional, in respect of their experience and educational level.

- ❖ There should be expertise or independent organization either in private or government level that is responsible for checking every construction project, design related issues, based on the standard code and give approval.
- ❖ The other problem was excess quantity during construction, to alleviate this problem proper care should be, taken during preparation of bill of quantity in side of owners before tendering. Establishment of qualified, experienced and quantity professional team
- ❖ The other problem is inflation of construction material, to alleviate this problem, there should be in government level strong agencies that provide information, about update price cost data of construction material. This will enable cost estimator, forecast the cost of construction material price in future and make contingency for unexpected inflation based on previous data. Since inflation associated with time, finishing construction project with short time will make project not subjected to inflation.
- ❖ Minimizing massive usage of imported construction material and replacing with local construction material.
- ❖ There should be appropriate planning and follow-up of construction cost during pre-and post-contract stage by, preparing cash flow program (budget plan) based on the planning work schedule during pre-contract stage and during construction stage. In addition establishing appropriate cost control mechanism in every construction like Earned Value Analysis, which will truck the project weather on budget or over budget during post contract stage.
- ❖ Cash flow and financial difficult of facing contractor, is the other major problem which affect cost performance. To alleviate this problem proper care and higher attention, should be taken during procurement or selection of contractor, through deep investigation and evaluation of contractor financial status using contractor, current or previous year financial statement (like Balance sheet statement and Income statement etc.) and finical analysis ratio.
- ❖ Appropriate planning and scheduling of work, should be done .this will make easier to monitor and control construction project and also the major input for development of cash flow program to truck cost performance.
- ❖ Minimizing error during preparation of standard drawing before construction start

- ❖ Selection of competitive sub-contractor based on technically capability, financial status. Past performance assessment related to projects
- ❖ Proper site management, supervision, and better communication between all parts involved in construction project.

Recommendation on ways to improve time performance

- ❖ The major problem affecting time performance was financial inability for project by owner, to alleviate this before starting any construction project owner should fix financial arrangement for the project.
- ❖ The owner should pay interim payment to contractor as per contract agreement. to achieve this in government side, the system of payment system should be free from any hindrances, and further training will be given to for those professionals involved in fiancé department about construction project.
- ❖ Contractor should be responsible for planning and scheduling the project in right and proper way,
- ❖ Contractor should, Select and use most time saving, economical and effective construction method.
- ❖ Contractor should minimize defect (error) during construction project. This saves project time need to rectify the defect. Through proper site supervision and management of labor
- ❖ Proper cares should be taken in side of consultants, in reviewing and approving design document. Consultants should give accurate, quickly review, and decision in case of design change.
- ❖ In case of scope change, the consultant should be responsible. By managing the scope change by identification of cause of change, measuring the magnitude of change and its impacts. In addition, provide proper solution for the scope change, finally giving immediate response in approving change order.
- ❖ There should be good and strong contract administration system in all construction projects.
- ❖ In case of breach of contract by contractor or client, there should be proper system to solve the problem.
- ❖ The contract document should be prepared in manner of free from, contradiction and discrepancy and should be prepared on consideration of

government condition of contract with experience professional. This will minimize conflict and dispute rise during construction stage.

- ❖ The time need to complete the project should, be scheduled as much as possible client should set in the feasible project completion duration during contract stage.
- ❖ Should be proper construction material management implied in side of contractor. In addition, for client provide construction material, especially on the following point on time delivery of material, procurement and usage of quality material as per specification of contract document, proper material handling of material on site, establishing proper and time saving procurement system.
- ❖ Proper scheduling of equipment before construction stage, to alleviate the problem of shortages, prepare scheduled maintenance program of equipment, in site to overcome productivity problem.
- ❖ Increase labor productivity during construction period, through motivation, wage increment, providing training and providing suitable working environment for laborer.

5.4 Recommendation for Future Studies

This research was concentrated on identifying the factors affecting cost and time performance public construction project in Addis Ababa. For the future study,

- ✓ Impact of poor cost and time performance on public building construction project
- ✓ Mitigating method to improve cost and time performance

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Appendices 1: Questionnaire

QUESTIONNAIRE

Thank you for taking time to fill this Questionnaire. The aim of this questionnaire is to study the **“Factors Affecting Cost and Time Performance of Construction Project in Ethiopia (Case of: Public Building Projects in Addis Ababa)”**. The questionnaire are required to be filled with exact relevant fact as much as possible .All data included in this questionnaire will be used only for academic research and will be strictly confidential.

Detail of the researcher:

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Thanks in advance for your co-operation and help

Sincerely,

Dagim Gidissa

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SECTION -A: General Respondent Information

1. Type of organization

- Client
- Consultant
- Contractor

2. Job title of the respondent

- Project manger
- Site Engineer
- Office Engineer
- Resident Engineer
- Contract administration
- other

3. Year of experience in construction industry (.....)

4. Number of public building projects participated in the last five year
(.....)

SECTION -B

Below are numbers of hypothesized factors affecting the cost performance of construction projects? from your experience ,please express your opinion on the importance of the following factors as affecting the cost performance of public building project in Addis Ababa.(please tick the appropriate box √) with the following ordinal scale 1-5

- **Extremely significant = 5**
- **Very significant = 4**
- **Moderately significant= 3**
- **Slightly significant = 2**
- **Not significant = 1**

Hypothesized Factors Affecting Cost Performance	1	2	3	4	5
Inflation of Construction Material					
Lack of cost planning/monitoring during pre-and post-contract stage					
Lack of cost report during construction stage					
Improvement to standard drawing during construction stage					
Inaccurate quantity estimation (excess quantity during construction)					
Design problem (Frequent design change)					
Cash flow and financial difficulty faced by contractor					
Contractor poor site management and supervision					
Change in the scope of the project					
Unclear specification or change in specification					
Material wastage on site					
Contract award cost of project					
Poor scheduling of labor					
Risk and uncertainty associated with project					
Discrepancies in contract document					
Unpredictable weather conditions					
Lack of appropriate planning and scheduling of work					
Rework of bad quality performance					
Poor productivity of labor					
Accessibility of construction material					
Poor productivity of equipment					
Cost under estimation					
Absences of construction cost data					
Additional cost due to variation work					
Increase in cost of labor					
Poor performance of sub-contractor					

SECTION -C

Below are numbers of hypothesized factors, which is group in to seven major parts, affecting the time performance of construction projects? from your experience, please express your opinion on the importance of the following factors as affecting the time performance of public building project in Addis Ababa .(Please tick the appropriate box✓) with the following ordinal scale 1-5

- **Extremely significant = 5**
- **Very significant = 4**
- **Moderately significant= 3**
- **Slightly significant = 2**
- **Not significant = 1**

Hypothesized Factors affecting time performance		1	2	3	4	5
1. Client Related Factors						
	Delay in progress/ interim payments by owner to contractor					
	Delay to furnish and deliver the site to the contractor by owner					
	Change order by owner during construction					
	Financial inability /financial arrangement for the project					
2 Contractor Related Factors						
	Rework due to errors during construction					
	Delay in site mobilization					
	Ineffective planning and scheduling of project by contractor					
	Difficult in financing project by contractor					
	Improper construction methods implemented by contractor					
	Poor site management and supervision by contractor					
	Delays in sub-contractors works					
3 Consultant Related Factors						
	Delay in approving major change in the scope of work by consultant					
	Late in reviewing and approving design documents by consultants					
	Poor contract management					
	Waiting time for approval of tests and inspection					
4. Project and Design Related Factors						
	Original contract duration is too short					
	Inadequate definition of substantial completion					
	Delay in producing design document					
	Mistake and discrepancies in design documents					
	Unclear and inadequate details in drawing					
	Major disputes and negotiations					

Factors Affecting Cost and Time Performance of Construction Projects in Ethiopia
(Case of: Public Building Projects in Addis Ababa)

Continued		1	2	3	4	5
5. Material Related Factors						
	Change in material types and specifications during construction					
	Shortage of construction material on site					
	Delay in material delivery to the site					
	Low quality of material					
	Poor procurement system of material					
	Poor material handling on site					
6. Equipment & Labor Related Factors						
	Shortage of equipment during construction					
	Equipment failure					
	Low productivity and efficiency of equipment					
	Low productivity level of labor					
	Shortage of Skilled labors					
7. External Related Factors						
	Weather condition					
	Accident during construction					
	Unforeseen site condition					
	Unavailability of utilities in site (such as water, electricity ...etc.)					

SECTION -D

In your opinion, what are the most important factors affecting both cost and time performance

Thank you

Appendices 2: Spearman's rho correlation coefficient

Cost Performance

			Consultants' view	Contractors' View
Spearman's rho	Consultants' view	Correlation Coefficient	1.000	.775
		Sig. (1-tailed)	.	.000
		N	26	26
	Contractors' View	Correlation Coefficient	.775	1.000
		Sig. (1-tailed)	.000	.
		N	26	26

Time Performance Correlation on Client Related Factor

			Consultants' Views	Contractors' Views
Spearman's rho	Consultants' views	Correlation Coefficient	1.000	1.000**
		Sig. (1-tailed)	.	.
		N	4	4
	Contractors' Views	Correlation Coefficient	1.000**	1.000
		Sig. (1-tailed)	.	.
		N	4	4

**. Correlation is significant at the 0.01 level (1-tailed).

Factors Affecting Cost and Time Performance of Construction Projects in Ethiopia
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Correlation on Constructor Related Factor

		Consultants' views	Contractors' View
Spearman's rho	Correlation Coefficient	1.000	.955**
	Sig. (1-tailed)	.	.000
	N	7	7
	Correlation Coefficient	.955**	1.000
	Sig. (1-tailed)	.000	.
	N	7	7

** . Correlation is significant at the 0.01 level (1-tailed).

Correlation on consultant Related Factor

		Consultants' views	Contractors' Views
Spearman's rho	Correlation Coefficient	1.000	.316
	Sig. (1-tailed)	.	.342
	N	4	4
	Correlation Coefficient	.316	1.000
	Sig. (1-tailed)	.342	.
	N	4	4

Correlation on Project and Design Related factor

		Consultants' views	contractors' views
Spearman's rho	Correlation Coefficient	1.000	.812*
	Sig. (1-tailed)	.	.025
	N	6	6
	Correlation Coefficient	.812*	1.000
	Sig. (1-tailed)	.025	.
	N	6	6

*, Correlation is significant at the 0.05 level (1-tailed).

Correlation on Material related factor

		Consultants' views	Contractors' views
Spearman's rho	Correlation Coefficient	1.000	.543
	Sig. (1-tailed)	.	.133
	N	6	6
	Correlation Coefficient	.543	1.000
	Sig. (1-tailed)	.133	.
	N	6	6

Correlation on Equipment and Labor Related Factor

		Consultants' views	Contractors' views
Spearman's rho	Consultants' views		
	Correlation Coefficient	1.000	.000
	Sig. (1-tailed)	.	.500
	N	5	5
	contractors' views		
	Correlation Coefficient	.000	1.000
	Sig. (1-tailed)	.500	.
	N	5	5

Correlation on External Related factor

		Contractors' views	Consultants' views
Spearman's rho	Contractors' view		
	Correlation Coefficient	1.000	.800
	Sig. (1-tailed)	.	.100
	N	4	4
	Consultants' view		
	Correlation Coefficient	.800	1.000
	Sig. (1-tailed)	.100	.
	N	4	4