ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

PERFORMANCE ASSESSMENTS OF PUBLIC BUILDING CONSTRUCTION PROJECTS: THE CASE OF ARADA AND LIDETA SUB-CITIES

BY:

MANALEBSH TILAHUN
(SGS/0404/2010A)

JUNE 2019

ADDIS ABABA, ETHIOPIA

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THESIS SUBMITED TO ST. MARY'S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTERS OF ARTS (MA) IN PROJECT MANAGEMETN.

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DEPARTMENT OF PROJECT MANAGEMENT

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DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Dr. Dereje Teklemariam. All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

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Name	**Signature**
St. Mary's University, Addis Ababa	**July 2, 2019**

ENDORSEMENT

This thesis, titled "Performance Assessments of Public Building Construction Projects: The Case of Arada and Lideta Sub-Cities" has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

________________________	________________
Advisor	Signature
St. Mary's University, Addis Ababa	July 2, 2019

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List of Abbreviations

CPI- Cost Performance Indicators

CV- Cost Variation

EEA-Ethiopian Economic Association

EVM- Earned Value Management

PMI- Project Management Institute

RII- Relative Importance Index

SPI-Schedule Performance Indicator

SV-Schedule Variation

TRADE-Training Resource and Data Exchange

USCINRC- U.S Construction Industry National Research Council

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ABSTRACT

Construction industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants, stakeholders, shareholders, regulatory bodies and others. This research tries to investigate performance of public building construction projects in Addis Ababa, Arada & Lideta sub-cities. A questionnaire survey and secondary data were conducted. A total of 105 questionnaires were distributed to contractors, consultants and clients, 78 questioners were returned 15(19%) from clients, 25 (32%) from contractors and 38(492%) from consultants. The outcome of these analyses showed that all the respondents agreed that construction projects were influenced by the time and cost factors indicated on the questionnaire. Based on these findings, the study recommended that the sub cities should develop a well-defined work scope for each project, proper project planning is required, professional competency of the contractor should be given prior attention and deployment of effective sight management by contractor is mandatory for improvement of cost and time performance of construction projects.

Key words: *Project Performance, Constriction Projects, Factors, performance problem.*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

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 infrastructures, such as buildings, roads and bridges (Takim & Akintoye, 2002). Especially a developing country, like Ethiopia, where consecutive economic growth has been registered, demands high rate of investment and consequently the need for construction of adequate public facilities to serve the development of the country.

The contribution of the sector to the overall economic development of a country is significant (EEA, 2007). It is among the major economic activities for the development of social, political, and economical welfare of the society. Construction projects are also dynamic and challenging, which attracts capital, new technologies and brilliant brains. Building projects particularly represent one of the largest sectors of the construction industry in the most developing economies of the world (Garbharran & Govender, 2012). It involves substantial financial and human resources, plays a vital role in the national economy, and has a wide range of application to different sectors.

According to U.S. Construction Industry National Research Council (USCINRC, 2009), the industry is segmented by analysts and practitioners into at least four distinct sectors—residential, commercial, industrial, and heavy construction. These sectors differ from each other in terms of the characteristics of project owners, their sophistication, and their involvement in the construction process, complexity of project, the source and magnitude of financial capital, required labor skills, the use of specialty equipment and materials, design and engineering processes.

The quality of life of human beings relies in part on the products of construction industry—houses, office buildings, factories, shopping centers, hospitals, airports, universities, refineries, roads, bridges, power plants, water and sewer lines, and other infrastructure. Construction product such as buildings and infrastructures provide shelter, water, power, and support commerce, education, recreation, mobility and connectivity (USCINRC, 2009).

Building projects are unique in their nature and construction process varies widely because variations in factors such as the physical and the economic environments, the construction team and/or location and time, due to the uniqueness of projects, there is no one way or method of organizing the resources for all projects. Every construction project is unique and has its own operating environment and sets of technical requirements. As a result, the execution of a construction project is subjected to numerous constraints that limit the commencement or progression of field operation, which have significant impact on project performance (Xiao and Proverb, 2003).

In Ethiopia, the sector has registered a remarkable growth. In the last two decades, the construction industry has been one of huge investment areas in which both public and private sectors have been committing a substantial amount of financial and other resources. It has great deal of contribution to different sectors, such as manufacturing, agriculture, transportation, education, health etc.(Minster of Urban Development and Construction, July 2012).Therefore, evaluating the performance of construction projects is a current issue that should be considered as to how it has been done and look for some areas, which need improvement to achieve project objectives.

1.2 Statement of the Problem

Construction can be considered as a dynamic industry, which is constantly facing uncertainties. Besides these uncertainties, involvement of many stakeholders make the management of cost and time difficult which consequently causes time and cost deviation. Therefore, cost and time overruns are considered one of the most critical issues during the execution of construction projects (Arcila, 2012).

The findings of the study conducted by Memon et al. (2014) revealed that 92% of construction projects, for instance, in Malaysia were facing time overrun and only 8% of project could achieve completion within contract duration and 89% of respondents agreed that their projects were facing the problem of cost overrun with average overrun at 5-10% of contract price. Construction projects in Nigeria are also facing the same problem concerning cost and time. According to Akinsiku (2014) 42.3% of construction projects' time and cost performance is between 5-10% of the time scheduled and budgeted cost.

In Ethiopia public and private clients allocate huge amount of budget for the construction of different building and infrastructure projects to achieve their objectives. The objectives of the owners could be financial, social, and political and in whichever the case controlling and monitoring the efficiency and effectiveness of the project is crucial. Therefore, measuring performance is very important to connect industry and project goals and objectives for improvement of process and method of doing things and administering projects. There could be many different ways of doing things and administering projects. In addition to identification of performance success factors, investigation of performance of projects should have to be done in project and industry level along with their respective process and method.

Performance measures are enablers of innovation and of corrective actions throughout a project's life cycle. They can help policy and decision makers, and different concerned stakeholders to understand how processes or practices led to success or failure, improvements or inefficiencies, and how to use that knowledge to improve methods, processes, and the outcomes of active projects.

Management in construction industry is considered as one of the most important factors affecting performance of works. Ugwu and Haupt (2007) stated that documenting and archiving performance data could be useful for future reference, such as for settling disputes on claims, and in maintenance and repair works. Kuprenas (2003) remarked that quantification of the impacts of the project management processes are identified through three steps of analysis: comparison of summary statistics of design performance, proof of statistical significance of any differences and calculation of least squares regression line of a plot of design performance measurement versus amount/application of project management as a means to quantify management influence to design phase cost performance.

According to Ethiopian Economic Association report on 2006/7, in Ethiopia the performance of the construction industry is constrained by problems and challenges the industry has been facing, namely; the difficulties in accessing land, sub-standard quality of construction raw materials and hence construction output, limited access to finance, widespread corruption, huge cost and time overrun, lack of periodically amended rules and regulations of the industry, absence of Construction Industry Policy and lack of effective rules and regulatory mechanisms that help ensure compliance of various actors in the construction

Project-level measures are needed to contribute to the understanding of how an individual project compares with other similar projects in terms of cost, schedule, cost changes, labor hours, and other factors. Such current measures are of greatest value to owners of multiple projects and to large contractors who are seeking to reduce the costs and delivery time of projects, to improve worker safety, or to initiate some other changes in construction-related processes and practices. When we come to the case of performance of construction projects in Addis Ababa, However, a report by Federal Democratic Republic of Ethiopian, Ministry of Urban Development, Housing and Construction (2014) on project performance status evaluation stated that among 14 public building projects under construction 8 projects, i.e. 57%, have failed to meet the planned percentage, which is the concern of this study.

1.3 Research Questions

The study is guided by the following research questions:

I. What are the most performance problems that occurs frequently in the public building construction projects in Arada and Lideta sub cities,

II. What are the critical factors that affect performance of public building construction projects in *terms of cost and time* in the study area? And

III. What is the status of performance of public building construction projects in the selected sub-cities?

1.4 Objectives of the Study

1.4.1 General Objectives

The overall aim of the study is to investigate performance of public building construction projects in Addis Ababa, Arada & Lideta sub-cities.

1.4.2 Specific Objectives

Specifically, the study tries to address the following key research objectives:

I. To identify the most performance problems that occur frequently in public building construction projects in Addis Ababa, Arada & Lideta sub-cities
II. To identify critical factors that affect performance of public building construction projects in terms of cost and time in Addis Ababa, Arada & Lideta sub-cities, and
III. To assess the status of performance of public building construction projects in Addis Ababa, Arada & Lideta sub-cites

1.5 Significance of the Study

This study helps to identify crucial factors that are affecting the efficacy of construction management of public buildings and comes up with the level of performance of construction project in Addis Ababa, Arada & Lideta Sub-cities. The study helps professional, decision makers, policy designers and practitioners to look for the best policies, methods and process of doing and managing projects to get best out of it and to use and coordinate human, material and other resources efficiently and effectively.

In addition, it helps in improving the existing policies, regulations, and proclamations and leads to reformation of the construction industry by identifying the responsibility and accountability of each players of the construction industry and help to play their role for the successful achievement of projects and effective utilization of resources.

1.6 Scope and Limitations of the Study

There are various sectors in construction industry such as road, water works, housing and other public buildings that are managed by different government offices. Hence, this research scope is Public-building projects in Addis Ababa, Arada & Lideta sub-cities.

Many parameters used to measure performance of construction projects. The nature, complexity and objectives of the project determine which indicator is much more suitable to assess the performance of a particular project. Time, cost and quality are, however, the three predominant performance evaluation dimensions. Due to time and budget constraints, this research focuses on time and cost parameters to measure performance of public building construction projects in Addis Ababa and only in Arada and Lideta sub-cities.

The limitation of this study was gathering comprehensive registered history of each public project, time & budget performances of required public project and offices. In addition to these, getting voluntary participants to give genuine information about the history and performance of the project was challenging.

1.7 Ethical Consideration

The researcher assures the ethical undertaking of the research by adhering to the following ethical standards of doing research. Informed consent, voluntary participation, confidentiality and anonymity of respondents. Prior to data collection, letter was taken from concerned administrative bodies of St. Mary's University. The public clients and Contractors under the study were also informed about the study and a formal letter was obtained. During data collection, each respondent were informed about the purpose, scope and expected outcome of the research, and appropriate informed written consents was taken from the respondents. Anyone who was not willing to participate was excluded from the study.

1.8 Organization of the Study

The study report is organized in to five chapters. The first chapter comprises the background of the study, problem statement, research objectives, and research questions, significance of the research, Scope and limitations of the study, the second chapter present the related literature reviews exploration of the electronic and hard copy media in answering the research objectives. It incorporates comprehensively all areas under the research topic to understand the existing knowledge about the subject matter, the third chapter discussed the tools and methods used for data collection, the fourth chapter constituted the analysis of data gathered with the research instruments. It analyzed data from the questionnaire, Interview and Literature Review and the final chapter, chapter five contain conclusions and recommendations that drawn based on the analysis of data, relating them to the problem statement and objectives of the study

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Theoretical Review

Performance is a broader concept that covers both the economic and operational aspects of an industry. Performance refers to fineness and includes profitability and productivity among other non-cost factors, such as quality, speed and delivery. "If you don't know how well you are doing, how do you know you are doing well?" (TRADE, 1995:p.7).Performance means carrying out a task, the progress of which can be measured and compared using a set of stated requirements. Therefore, performance factor is a fact or situation, which influences a progress of work, which can be measured and compared using a set of stated requirements.

2.1.1 Definition of Success in Construction Project

The term "Success" implies different meaning for each person. There does not exist an exclusive definition of project success due to the fact that the meaning is different for each person, project team and company. Project success should be assessed based on different criteria, which usually change depending on the eye of the beholder. The most appropriate criteria to measure project success are the project objectives (Arcila, 2012).

These Objectives are also different depending on the person or the company that is assessing them Success is a result much better than expected or normally observed in terms of cost, schedule, quality, safety and participant satisfaction (salleh, 2009). Project success can be also defined as meeting the required expectation of the stakeholders and achieving its intended purpose. Project success requires creating a well-planned project schedule as well as understanding of the key success factors. Project managers would have a clear understanding of which aspects of projects might be critical for their successful completions.

Salleh (2009) cited the work of Sanvido et.at (1992) and defined the success of construction projects as the degree to which project goals and expectations are met. These goals and expectations may include technical, financial, social, and professional aspects. The study covered all the project phase, including design, construction and maintenance.

For a project to be successful, it is essential to understand the project requirements right from the start and go for project planning which provides the right direction to project managers and their teams and execute the project accordingly. For the purpose of this research, successful project is defined as building construction project that is delivered on time and managed within the budget, Time, cost and quality have been recognized as “triple constraint” or important elements of project success (Babu and Sudhakar 2015).

2.1.2 Project Performance

Performance has been described as the degree of execution of certain task (TRADE, 1995). It is related to the prescribed objectives which form the project considerations. From project management perspective, it is all about meeting stakeholders’ needs and expectations from a project. It invariably involves placing consideration on three major project elements i.e. time, cost and quality (PMI, 2004). It has been pointed out that, in today’s highly competitive and uncertain business environment, the client who is the major stakeholder, wants speedier delivery of their project with early start of construction work, certainty of performance in term of cost, quality and time, value for money for their investment, minimal exposure to risk and early confirmation of design and price or cost. Although many tend to focus on the elements of cost, quality and time, all others are also important parameters of project performance.

Various literature and researchers have revealed that performance should not be considered only as the achievement of project schedule, time and quality. It is has a broader concept that can be assessed taking different parameter relating to the objective of different stakeholders for a particular project. Customer satisfaction, meeting specifications, health and safety, environmental responsiveness are some of the concerns when evaluating successful achievement of project objectives.

2.1.3 Performance Measurement

Performance Measurement (PM) is a vital tool that can enhance the capturing of knowledge and hence provide improved construction performance, at both corporate and project levels. Measurement is a core activity for sector that is focused on delivering results. Performance is measured primarily allow maximizing the results that are meaningful to organizations by adjusting product or service, using the capabilities and funding available. It enhances the development of a learning organization by capturing and analyzing what is happening in the firms or industry environment, especially through its customers, employees, suppliers, partners and new technologies (Mbugua et al., 1999).

Measurement enables projects and businesses to be compared with each other on the basis of hard information, allowing effective (best) practices to be identified and applied more widely. PM improves management practice. It provides essential information by enabling activities to be monitored, on a regular basis, at several levels within the organization. Performance measurement provides information for strategic evaluation. It also provides a broad / comprehensive/ picture of a business and a strategic focus on critical business issues and on continuous improvement (Mbugua et al., 1999).

Neely et al. (1995:p.55) refer to the performance measurement system as *"… a set of metrics used to quantify both efficiency and effectiveness of actions."* Performance measurement has two main aims: to connect company goals and objectives to improvements and to set targets for improvement activity (Grunberg, 2004). Measurement enables increased visibility of the quality and progress of a certain task and helps to justify, manage and evaluate quality and productivity improvement programs at the operations level. The point has been made that proper measurement goals are those that focus as much on communication as on evaluation and targets (Pekuri et al., 2011).

2.1.4 Benefits of Performance Measurements

US department of Energy in its book titled "How to measure performance (1995)" listed seven important benefits of measurements.

1. Identify whether customer requirements have been met.?
2. Helps to understand processes. To confirm what is known or reveal what is not known. Aids to identify where the problems are?
3. Ensures decisions are based on fact, not on emotion. Are decisions based upon well documented facts and figures or on intuition and gut feelings?
4. To show where improvements need to be made. Where can we do better? How can we improve?
5. To show if improvements actually happened. Do we have a clear picture?
6. To reveal problems that bias, emotion, and longevity cover up. If we have been doing our job for a long time without measurements, we might assume incorrectly that things are going well. (They may or may not be, but without measurements there is no way to tell.)
7. To identify whether suppliers are meeting requirements. Do suppliers know if our requirements are being met?

2.1.5 Performance Measurement Process

US department of defense (1995), on its book how to measure performance stipulated the process of measuring performance as the following

1. Identify the process flow. This is the first and perhaps most important step. If your employees cannot agree on their processes, how can they effectively measure them or utilize the output of what they have measured?
2. Identify the critical activity to be measured. The critical activity is that culminating activity where it makes the most sense to locate a sensor and define an individual performance measure within a process.
3. Establish performance goal(s) or standards. All performance measures should be tied to a predefined goal or standard, even if the goal is at first somewhat subjective.
4. Establish performance measurement(s). In this step, you continue to build the performance measurement system by identifying individual measures. Identify responsible party(s). A specific entity (as in a team or an individual) needs to be assigned the responsibilities for each of the steps in the performance measurement process.

5. Collect data. In addition to writing down the numbers, the data need to be pre-analyzed in a timely fashion to observe any early trends and confirm the adequacy of your data collection system.
6. Analyze/report actual performance. In this step, the raw data are formally converted into performance measures, displayed in an understandable form, and disseminated in the form of a report.
7. Compare actual performance to goal(s). In this step, compare performance, as presented in the report, to predetermined goals or standards and determine the variation (if any).
8. Are corrective actions necessary? Depending on the magnitude of the variation between measurements and goals, some form of corrective action may be required. Make changes to bring back in line with goal. This step only occurs if corrective action is expected to be necessary. The actual determination of the corrective action is part of the quality improvement process, not the performance measurement process. This step is primarily concerned with improvement of your management system.
9. Are new goals needed? Even in successful systems, changes may need to be revised in order to establish ones that challenge an organization's resources, but do not overtax them. Goals and standards need periodic evaluation to keep up with the latest organizational processes.

2.1.6 Success Factors

Many literature indicate that without identifying the evaluation criteria, it is not possible to adequately assess the performance of a project (salleh, 2009). Many researches have been conducted to investigate the success factors of construction projects with the aim of providing contract parties with valuable insight into how to consistently achieve superior results for their projects. Although construction projects, by their nature, are repetitive activities, each one has its own characteristics and circumstances. According to its nature and complexity, the factors that affect one project differs from the other. A factor that could affect the success of one project might not affect the other.

Therefore, Identification of the success factors is considered as the key to achieving success in projects. Critical success factors are those inputs to the project management system that directly increase the likelihood of achieving project success.

According to Abraham (2002), the main determinants of project success are budget performance, schedule performance and quality performance.

2.1.7 Critical factors affecting cost and time performance

Salleh (2009) cited the work of Chan and Kumarswamy (1997) and presented the result of a survey undertaken to determine and evaluate the relative importance of the significant factors causing time and cost overrun in Hong Kong construction projects. The factors were grouped into eight major factor categories: project related, client related, design related, contractor related, material, labor, equipment and external factors. The following is a brief description of these categories. Project related factors include, Project characteristics, Necessary variation Communication among various parties, Speed of decision making involving all project teams, and Ground conditions. Client-related factors include those concerned with Client characteristics, Project financing, Client Variations and requirement, Interim payment to contractors. Design-team related factors consist of Design team experience, Project design complexity, and Mistakes and delay in producing design document. Contractor-related factors comprise those related to; Contractor experience in planning and controlling the project, Site management and supervision, Degree of subcontracting, and Contractor's cash-flow. Material factors include: Shortage, Material changes, Procurement programing, and Proportion of off-site prefabrication. Human factors encompass, Labor shortage, Low skill levels Weak motivation, and Low productivity. Equipment factors include: Shortages, Low efficiency, Breakdown, and Wrong selection, External factors comprise those such as, Waiting time for approval of drawings and test samples of materials, and Environmental concerns and restrictions.

2.1.8 Project cost and schedule performance

Earned Value Management (EVM) methodology is commonly defined as a management technique that relates resource planning and usage to schedules and to technical performance requirement. More specifically, EVM can be said to bring cost and schedule variance analysis together to provide accurate status of a project (Eun Hong et al. 2003).

Schedule variation is determined by (SV) and is the difference between planned and actual duration. A negative SV means the project is late while a positive SV means the project has been completed before scheduled time. Similarly cost variation (CV) is measured as the difference between planned cost and actual cost. A negative CV means over budget or overspent project and a positive CV means an under budget project. Performance can be also determined using SPI (schedule performance index) and CPI (Cost performance index) (Ahsan, 2009).

When the three key parameters are properly recorded along the project life, PMs are able to calculate two types of performance measures. The first type of performance measures are variances which represent the difference between the current status of the project and its baseline. A negative (positive) value points out that more (less) has been spent for the executed activities than what was originally planned. The **Schedule Variance (SV)** is an indicator that provides PMs with a value that represents whether the project is on schedule or not. A negative (positive) value means that the project is behind (ahead of) schedule.

Another type of performance measures are indices, also calculated from the three key parameters of EVM. The indices are again used to display how well the project is performing, now relatively in comparison with the baseline. Again two types of indices can be distinguished. The first type of index is the **Cost Performance Index (CPI)**, which expresses the cost efficiency of the executed work. A CPI of less or more than one means that the project is currently running over or under budget. The second index is the **Schedule Performance Index (SPI)**. The SPI shows whether the project is performing on schedule or not. A SPI of more or less than one means that the project is ahead of or behind.

It is clear that the variances and indices are interrelated. Still it is useful to calculate both performance measures. The variances can give a snapshot of where the project is today (expressed in monetary value) while the indices are rather used to represent the evolution in performance of the project. This is of significant importance to make forecasts about the future of the project.

2.1.8.1 Project Cost Performance

Navon (2005) defined performance measurement as a comparison between the planned and the actual performances. For example, when a deviation is detected, the construction management analyzes the reasons for it. The reasons for deviation can be schematically divided into two groups: (a) unrealistic target setting (i.e., planning) or (b) causes originating from the actual construction process. In many cases the causes for deviation originate from both sources. Navon (2005) stated that performance measurement is needed not only to control current projects but also to update the historic database. Such updates enable better planning of future projects in terms of costs, schedules, labor allocation, etc.

Pheng and Chuan (2006) stated that the measurement of project performance can no longer be restricted to the traditional criteria, which consist of time, cost and quality. There are other measurement criteria such as project management, stakeholder satisfaction, health and safety, defects, etc.

Cost Performance (CV) can be computed as (Kuprenas, 2003)

$$CV = \frac{BCWP - ACWP}{BCWP} \times 100 \quad \text{…………… (Equation 2.1)}$$

$$CPI = \frac{BCWP}{ACWP} \quad \text{……………………………. (Equation 2.2)}$$

Where:

- BCWP= Budgeted cost of Work Perfomed
- ACWP= Acctual Cost of work Performed
- CPI= cost performance index

- CV= Cost Variance

2.1.8.2 *Project Time Performance*

Project time performance is measured by comparing actual with the planned project period. This performance metric provides an indication of deviation of schedule between planned Project Time (Duration) over the actual completion duration of the Project.

$$PV= \frac{STWP-ATWP}{STWP} x100 \text{ …………… (Equation 2.3)}$$

$$TPI= \frac{STWP}{ATWP} \text{ …………………………… (Equation 2.2)}$$

Where:

- STWP= Scaduled time of Work Perfomed
- ACWP= Acctual time of work Performed
- TPI= Time performance index
- CV= Schedul Variance

2.1.9 Quality Measure

Managing quality in projects must be addressed from two different perspectives: the quality of the product of the project, and the project quality management process. Issues associated with product quality, such as quality metrics and required tools and techniques, are very specific to the nature of the product. For example, the quality issues to be addressed and approaches to be used in building a convention center will be significantly different from those of manufacturing a jet engine. On the other hand, the project quality management process is applicable to a whole spectrum of projects, with wide variation in the nature of the product from project to project. It includes all necessary activities undertaken by the project organization to ensure that the needs of the project and the purpose for which it was initiated are fully met, such as determining quality policies, objectives, and responsibilities. The project quality management process facilitates the implementation of a quality management system through policies, procedures, and the sub processes of quality planning, quality assurance, and quality.

2.2 Empirical Review

Different findings were given by Atkinson, et al., (1997), Successful construction project performance is achieved, when stakeholders meet their requirements, individually and collectively. However, in order to meet their requirements and continual participation, it is important for the stakeholders to address and distinguish the three orientation criteria that exist in the life cycle of a project: the procurement', the 'process' and the 'result' orientation (Takim, R. and Akintoye, A., 2002).

Biyadglign (2017), on his thesis report recommended that to develop performance measurement framework and modeling system in order to measure performance of construction organizations and projects.

2.2.1 Problem of Performance in Construction Industry

The failure of any construction project is mainly related to the problems and failure in performance. Moreover, there are many reasons and factors which attribute to such problem. Shaban S.A. (2008) stated that the construction industry performance problems in developing economies can be classified in three layers: problems of shortages or inadequacies in industry infrastructure (mainly supply of resources), problems caused by clients and consultants and problems caused by contractor incompetence/inadequacies.

The subject of performance measurement or assessment has become a matter of concern to several countries at different levels of socio-economic development which have realized the need to improve the performance of their construction industry (Kingsley A. N. 2010). Navon (2005) identified in various forms as low productivity, delays, cost overrun, poor, and quality and so on.

Neely et al (2007) remarked that architectural, engineering and construction (AEC) firms may face difficulties managing construction projects performance in China because they are unfamiliar with this new operating environment. International construction projects performance is affected by more complex and dynamic factors than domestic projects; frequently being exposed to serious external uncertainties such as political, economic, social, and cultural risks, as well as internal risks from within the project

2.2.2 Performance Indicators

Performance measures quantitatively tell something important about products, services, and the processes that produce them. They are tools to help us understand, manage, and improve what organizations do. They provide with the information necessary to make intelligent decisions about what to do (TRADE, 1995).

- How well an organization is doing?
- Whether Goals have been met.
- If customers are satisfied.
- If processes are in statistical control.
- If and where improvements are necessary.

A performance indicator is composed of a number and unit of measure. The number gives us a magnitude (how much) and the unit gives the number a meaning (what). Performance measures are always tied to a goal or an objective (the target). Performance measures can be represented by single dimensional units like hours, meters, nanoseconds, dollars, number of reports, number of errors, etc. They can show the variation in a process or deviation from design specifications. Single-dimensional units of measure usually represent very basic and fundamental measures of some process or product (TRADE, 1995).

More often, multidimensional units of measure are used. These are performance measures expressed as ratios of two or more fundamental units. These may be units like Kilometer per Liter (a performance measure of fuel economy), number of accidents per million hours worked (a performance measure of the companies safety program), or number of on-time vendor deliveries per total number of vendor deliveries. Performance measures expressed this way almost always convey more information than the single-dimensional or single-unit performance measures.

According to TRADE (1995); most performance measures can be grouped into one of the following five general categories. However, certain organizations may develop their own categories as appropriate depending on the organization's mission:

- Quality
- Cost
- Timeliness.
- Productivity
- Safety

2.2.3 Key Performance Indicators in Construction Projects

The purpose of the Key Performance Indicators (KPIs) is to enable measurement of project and Organizational performance throughout the construction industry (UK working group, 2000). Performance of construction projects depends upon on many different factors that are available all the way through consecutive and progressive phases that starts from inception to operation and commissioning stages. The common assessment of the success of construction projects is that they are delivered on time, to budget, to technical specification and meet client satisfaction (Baker *et al.*, 1983). However, the criteria for success are in fact much wider, incorporating the performance of the stakeholders, evaluating their contributions and understanding their expectations (Atkinson et *al.*, 1997).

Traditionally, three indicators have been used to evaluate the success of construction projects: cost, time and quality. Kagioglou et al. (2001) contend that these measures are insufficient, and that many other factors exist that can influence customer satisfaction and the client's willingness to pursue a given procurement route in the future. It has been proposed, for example, that project success should also take into account the project's psychosocial outcomes, which refer to satisfaction of interpersonal relations with project members.

Cost, time and quality are the three common parameters of project performance. It has been stressed that in today's highly competitive and uncertain business environment, clients are demanding for better value from their investment. They want their project to be completed on time, within the estimated cost and with the right quality (Padang; 2006).

The traditional measures known as the "iron triangle" provide an indication of the success or failure of a project, but they do not provide a balanced view of the project's performance. Usually they are apparent only at the end of the project and should therefore be classified as lagging indicators of performance (Kagioglou et al., 2001). The general revolution on performance measurement that has taken place over the past several years has focused on a more comprehensive approach to assess project success. Performance measurement frameworks have been proposed where project success is divided into dimensions, and where project success is considered during the different stages of a project as well as from various perspectives (Chan et al., 2004).

Since most of the current performance indicators have been product and outcome focused, there is a skeptical attitude towards key performance indicators. However, in recent years, performance indicators related to processes have started to emerge. These indicators include: planned percent complete (PPC), waste, safety and quality process improvement, Habanova and Al-Jibouri (2009) have further identified key performance indicators for the pre-project, design and construction phase of a project. These indicators are likely to improve practices by enabling managers to focus on controlling the main sub-processes and thus increasing the chance of project success measured by the following end-project goals: meeting financial, scheduling and functional requirements, ensuring client satisfaction, health and safety and building quality.

UK Working Group Report on Key Performance Indicator (2000) have identified seven parameters for benchmarking projects, in order to achieve a good performance. These are Time, Cost, Quality, Client Satisfaction, Client Changes, Business Performance, Health and Safety.

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

2.3 Conceptual Framework

The indicators are identified as applicable at project and/or company levels. In some cases the company indicator is the average value of that company's project indicators. The indicators are identified as appropriate to the various members of the supply chain to which they could be applied (UKWGR, 2000). Various conceptual frameworks are developed by different scholars to show the interdependence of variables and their causal relationship.

Table 2. 1 Key Performance Indicator

Indicator Group	Indicator	Level
Time	1. Time for Construction	Headline
	2. Time Predictability-Deign	Headline
	3. Time Predictability-Construction	Headline
	4. Time Predictability-Design & Construction	Operational
	5. Time Predictability- Construction (Client Change Order)	Diagnosis
	6. Time Predictability- Construction (Project Leader Change Order)	Diagnosis
	7. Time to Rectify Defects	Operational
Cost	1. Cost for Construction	Headline
	2. Cost Predictability – Design	Headline
	3. Cost Predictability – Construction	Headline
	4. Cost Predictability – Design & Construction	Operational
	5. Cost Predictability – Construction (Client Change Orders)	Diagnosis
	6. Cost Predictability – Construction (Project Leader Change Orders	Operational
	7. Cost to Rectify Defects	
Quality	1. Defects	Headline

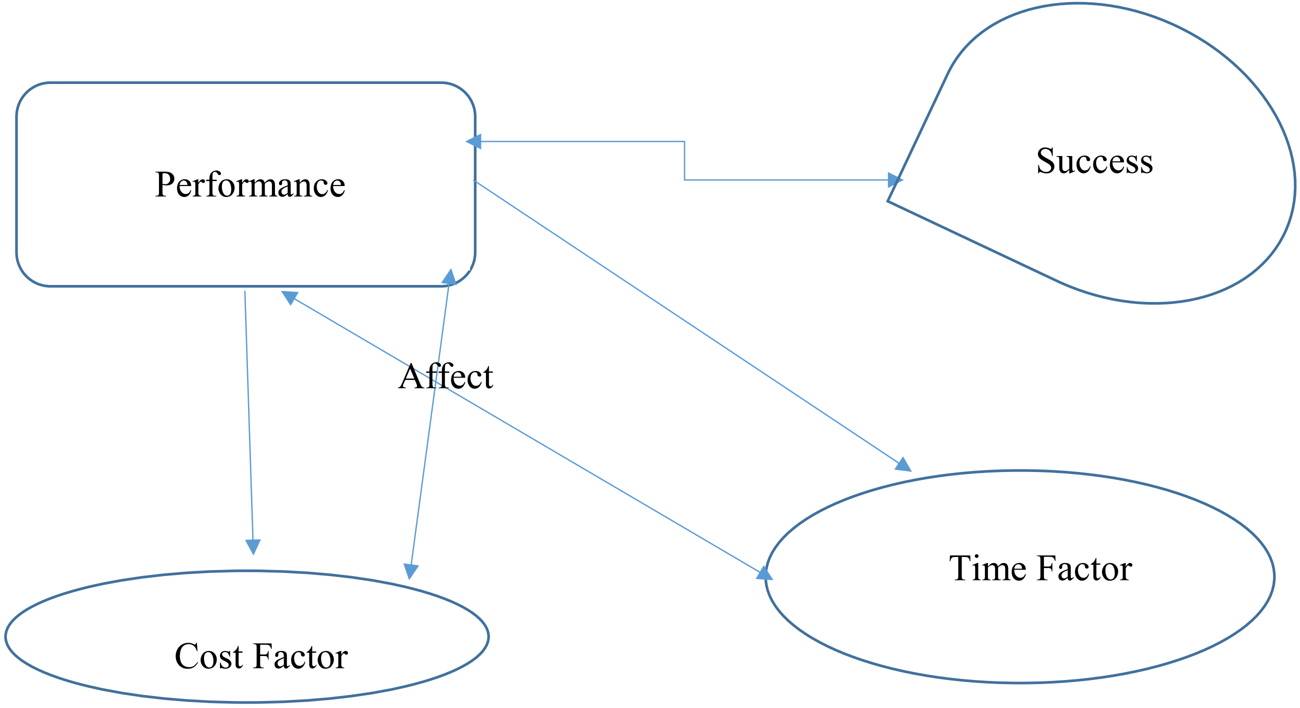
	2. Quality Issues at Available for Use 3. Quality Issues at End of Defect Rectification Period	Operational Operational
Client satisfaction	1. Client Satisfaction Product – Standard Criteria 2. Client Satisfaction Service – Standard Criteria 3. Client Satisfaction – Client-Specified Criteria	Headline Headline Operational

Source: - UK Working Group Report on Key Performance Indicator (2000)

Headline Indicators provide a measure of the overall, rude state of health of a firm. Operational Indicators bear on specific aspects of a firm's activities and should enable management to identify and focus on specific areas for improvement. Diagnostic Indicators provide information on why certain changes may have occurred in the headline or operational indicators and are useful in analyzing areas for improvement in more detail. The indicators are identified as applicable at project and/or company levels. In some cases the company indicator is the average value of that company's project indicators.

The tool used to achieve the relationship between the critical success factor and project performance in this study is by developing a conceptual framework. Critical success factor is a variable that can have a significant impact that delivers measurable improvements to the project success. The study employed the following conceptual framework to address research objectives.

Research conducted by Atkinson, et al., (1997) reveals that KPIs are schedule and budget compliance, number of scope changes, number of issues and defects, and stakeholder satisfaction. Performance measurement during a project is to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage expectations. A secondary benefit is information that can be used to improve the planning and performance of future projects.



- Variation Order
- Escalation of Material Price
- Design Change
- Project Characteristics (size, type etc)
- Ground conditions
- Design team experience
- Delay in producing design document
- Material Change
- Project Complexity
- Initial budget estimate
- Contract and specification interpretation
- Natural environment
- Location of project

- Low productivity of Labor
- Equipment breakdown
- Working equipment selection
- Wrong selection equipment
- Waiting time for approval of drawing and test
- Low efficiency equipment
- Relation b/n client and contractor
- Conflict between project parties
- Initial planning
- Contractors structure
- Project tam turn over

Figure 2.1: Conceptual Framework of the Study

Adapted from Takim and Akintoye (2000)

Cost, time and quality are the three common parameters of project performance. It has been stressed that in today's highly competitive and uncertain business environment, clients are demanding for better value from their investment. They want their project to be completed on time, within the estimated cost and with the right quality (Padang; 2006).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology should reflect the understanding of the researcher in order to extract valuable results of the study using various methods available, in single or combination form. Methodology is a plan of action that shows how the problems are investigated, what information are collected using which methods, and how this information is analyzed in order to arrive at conclusions and develop recommendations. Research follows some steps and procedures when conducted. Once the problem statement has been formulated, it should clearly portray the kind of data that is required, and the type of analysis that is most appropriate to analyze the data.

3.2 Description of the study Area

This chapter describes research approaches with a view of selecting the most appropriate methodology for the research project, including the research strategy and justification of the methodology: the procedure that is used and sampling techniques to achieve the objectives of the research. The objectives of the research is investigating the existing performance of public building construction projects in Addis Ababa, Arada and Lideta cubcities and identifying critical factors that affect performances in terms of time and cost of projects.

3.3 Research Approach and Design

3.3.1 Research Design

There are numerous types of research design that are appropriate for the different types of research projects; such as experiments, surveys, action research, grounded theory and case studies, and all of them have advantages and disadvantages. Therefore, there are three different conditions that indicate the type of strategy that should be used in a research. These conditions are the type of research question, the control that the investigator has in the actual behavioral events and the focus on contemporary events (Saunders et al., 2009).

Therefore, following the three conditions presented in the conceptual framework of the study; i.e. Figure 2.1, to answer the research questions, the researcher prefers to use descriptive research design, which helps to use both qualitative and quantitative data analysis.

3.3.2 Research Approach

To undertake this research, qualitative and quantitative approaches were adopted. The objectives of the research is investigating the existing performance of public building construction projects in Addis Ababa, Arada and Lideta sub cities and identifying critical factors that affect performance of projects in terms of cost and time in Arada and Lideta Sub-cities. Descriptive research studies are those studies, which are concerned with describing the characteristics of a particular individual or of a group. The major purpose of descriptive research is description of the state of affairs, as it exists at present.

3.4 Data Type and Source

3.4.1 Data type

The objectives of the research is investigating the existing performance of public building construction projects in Addis Ababa in Arada and Lideta sub cities and identifying critical factors that affect time and cost performance of projects. Thus, using a combination of qualitative and quantitative data can improve an evaluation by ensuring that the limitations of one type of data are balanced by the strengths of another. Thus, mixture of both qualitative and quantitative data is used to present a more complete and synergistic research analysis. The qualitative data is used to assess the performance of public building construction projects in terms of cost and time efficiency. And the quantitative analysis is used to evaluate the factors of project performance in the study area.

3.4.2 Data Source

There are two sources of data namely, primary and secondary source. In this research, both primary and secondary sources of data were used through Questionnaires and literature review.

3.4.2.1 Primary Data Source

Questionnaire: Close-ended questionnaire in 5-point Likert scales were used to collect data from the sample respondents. The questionnaire has five rating scales ranging from 1- very low to 5- very high. Data gathered through questionnaires is simple and clear to analyses and it allows for tabulation of responses and quantitatively analyzes certain factors. Furthermore, to this it is time efficient for both the respondents and researcher. The questionnaire was structured in such a way that it includes all relevant parts of and information to clearly acquaint the respondents. In addition to the questionnaire survey the study employs key informant interviews with senior staffs and managerial level employees of project participants.

3.4.2.2 Secondary Data Sources

To strengthen the reliability of research data information was collected from other related researches, Journals, archival document from the selected sub cities.

3.5 Target population and Sample

3.5.1 Target population

The study needs two types of populations to answer the objectives. The first population was the number of public building projects that have been constructed in Arada and Lideta Sub-Cities between the years 2012/13 to 2017/18 and the second population was the number of professionals who have been directly participated on the projects. These populations used to assess the performance problem of public building constructions, to identify critical factors that affect time and cost performance of the projects in Arada and Lideta sub-cities and to assess the current performance of the projects in the selected sub-cities. Within the study period, 36 public buildings projects were in operation in the Arada and Lideta Sub-cities. Each project has an average of four professionals working in the project. So the average number of professional in a project are four and the total target population of professionals were 144 individuals.

3.5.2 Sample size determination

This refers to the number of items to be selected from the universe to constitute a sample. It is a major issue before a researcher headed to collection of data. The size of sample should neither be excessively large, nor too small. It should be optimum. An optimum sample is one, which fulfills the requirements of efficiency, representativeness, reliability and flexibility. While deciding the size of sample, researcher must determine the desired precision as also an acceptable confidence level for the estimate and hence 95% confidence level is used to calculate the sample size.

The sample size was determined by using formula Yamane, (1967, 886) formula.

$$\boldsymbol{n = \frac{N}{1 + N(e)^2}}$$

Where:

n = Desired sample size

N =Total population size

e = error margin and a 95% confidence level were taken and e=0.05

Therefore, based on the formula stated above, the sample size of the study at hand was as follows

$$\mathbf{n = \frac{144}{1 + 144(0.05)^2}}$$

n = 105

3.5.3 Sampling Selection Procedure

Broadly, there are two sample design methods: Probability and non -probability sampling. Each categories has subdivisions. This research was used random sampling to have an equal chance of being selected.

3.6 Data Collection Methods and Tools

Data was collected using questionnaire and archives; valuable information was obtained from literature review. Based on the acquired facts questionnaire was designed. Also to collect secondary data a comprehensive format was developed which help to get necessary data to assess time and cost performance of public building projects in Addis Ababa, Arada and Lideta sub-cities.

The questionnaire has two parts. The first part is general background information about the respondent. This includes the demographic questions about the respondents, years of experience academic qualification, organization and job classification. This information help the researcher to validate the outcome of the survey, as the research requires involvement of professionals who participated in public building projects.

In the second part professionals who had been working for client, contractor and consultant were asked to rank time and cost factors in general. The evaluation scale is a five-point Likert scale.

3.7 Data Analysis and Presentation

The term analysis refers to the computation of certain measures along with searching for patterns of relationship that exist among data-groups. Thus, “in the process of analysis, relationships or differences supporting or conflicting with original or new hypotheses should be subjected to statistical tests of significance to determine with what validity data can be said to indicate any conclusions (Kothari, 2004).

The data collected by questionnaire survey was analyzed by using SPSS percentage, Mean, and correlation. Questionnaire survey was designed for engineering professional engaged in Design project contract administration and construction work. The relative importance index method (RII) was used herein to determine owners', consultants' professionals and contractors' perceptions of the relative importance of the identified performance factors. The RII was computed as (Cheung et al. 2004).

$$RII = \frac{\Sigma W}{A x N} \text{ (w1+w2+w3+...w5)} \quad \text{.............. (Equation 3.1)}$$

Where

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

A – The highest weight = 5;

N – The total number of respondents the relative importance rate is 0-1 (tam and le, 2006)

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, the researcher presents data analysis, discussion and interpretation of finding on the collected data. The main objective of this study is to investigate the performance of public building construction projects in Addis Ababa, specifically construction projects in Arada and Lideta Sub-Cities. In order to achieve the research objectives, the study used both primary and secondary data. The primary data was collected via a structured questionnaire from sampled professionals who are working for project clients, contractors and consultants. The secondary data was collected from Arada and Lideta sub-cities archives regarding the actual and scheduled cost and time performance of construction projects. The study also utilized data collected through Key Informant Interview with senior staffs and managerial level employees working in construction projects at the selected sub-cities.

A total of 105 questionnaires were distributed to professionals who are working for project clients, contractors and consultants, which is 50 for Contractor, 30 for consultant and 25 for clients. Out of the total 105 questionnaires distributed, 78 useable questionnaires were obtained with 74.2% successful response rate. In order to assess the performance of public building construction projects, close-ended questions in 5-point Likert scales are used which has five rating scales ranging from 1- Strongly disagree to 5- Strongly agree. The data analysis was conducted by evaluating participants' Relative Importance Index (RII) and rank of project performance problems, critical factors that affecting cost and time performance of projects and performance state of public building constructions In addition to the questionnaire survey the researcher conducted five key informant interviews with senior staffs and managerial level employees of project participants.

4.1.1 Respondents' Profile

The descriptive analysis of the data on the sampled respondent characteristics of the professionals who are working for project clients, contractors and consultants is presented in Table 4.1. Out of the total 78 survey participants 59 (76%) were male and 19 (24%) were female employees working in the construction of projects. The majority of the respondents were in the age group of 20-30 years making 46% (36) of the respondents, followed by 31-40 years and 41-50 years making 33% (26) and 12% (9) of respondents respectively. While 7 respondents (9%) were above 50 years old and none of the sampled employees were aged below 20 years.

Table 4. 1 Demographic Profile of Respondents

Demographic Variable	Option	Frequency	Percentage
Gender	Male	59	76%
	Female	19	24%
	Total	78	100%
Age	Less than 20	0	0%
	20-30	36	46%
	31-40	26	33%
	41-50	9	12%
	Above 50	7	9%
	Total	78	100%
Position	Construction Engineer	14	18%
	Office Engineer	21	27%
	Design Engineer	4	5%
	Project Manager	16	21%
	Site Engineer	23	29%
	Total	78	100%
Education	PHD	0	0%

	Master’s Degree	6	8%
	BA Degree	62	79%
	Diploma	10	13%
	Total	78	100%
Experience	Less than 5 Years	44	56%
	5-10 Years	20	26%
	More than 10 Years	14	18%
	Total	78	100%
Type of Organization	Client	15	19%
	Contractor	25	32%
	Consultant	38	49%
	Total	78	100%

Source: Own survey, 2019

Educational status can influence ones understanding and proper implementation of the required task with regard to organizational objectives. As shown in the Table 4.1 above, the educational qualification of the surveyed professionals is sufficiently high. 8% (6 participants) of respondents have MA degrees while 79% (62) of the respondents are BA degree holders. And the remaining 13% of respondents have diploma level educational qualification.

The above demographic table also reveals that 44 respondents, representing 56% of the sample have less than 5 years of experience, while 20 respondents, representing 26% of the sampled staff have work experience that lies between 5-10 years and 14 respondents, representing 18% of the sampled professionals have more than 10 years of experience.

Furthermore, Table 4.1 also shows the type of organization for which the sampled professionals are working for. 15 respondents (19%) were professionals working for the client of the building, 25 respondents (32%) were employees working for the contractor of the projects and 38 respondents (49%) were employees of the consultants.

4.1.2 Data Reliability Test

The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. The reliability of an instrument is the degree of consistency which measures the attribute it is supposed to be measure (Saunders, 2009). The lesser the variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool.

Cronbach's alpha coefficient was employed to measure the reliability of the data. As suggested by Fields and Bisschoff (2013) a reliability coefficient of 0.70 was set. The reliability of the factors used for project performance analysis is presented in table below.

Table 4. 2 Chronbach's Alpha Test of Reliability

S.N	Factors	No. of Variables	Cronbach's Alpha
1	Cost	14	0.79308
2	Time	13	0.76157
3	Other Factors	9	0.74722

Source: Own survey, 2019

As displayed in Table 4.2, the values of Chronbach's Alpha for cost factors, time factors and other factors assessed in the questionnaire. For the fields, values of Chronbach's Alpha were in the range from 0.79, 0.76 and 0.74 for the three project performance factors evaluated. The Chronbach's Alpha tests of the factors have satisfactory reliability coefficients since all the test results are in excess of the required 0.70. Therefore, the value of Chronbach's alpha in this study indicates that the scales used in the instrument are adequate and suitable.

4.2 Results

4.2.1 Frequent Project Performance Problems of Public Building Construction Projects

The results of this part of study provides an indication of the participants' and combined relative importance index (RII) and rank of performance related problems in the public building construction projects in Addis Ababa, Arada and Lideta Sub-Cities. .

Table 4. 3 RII and Rank of Project Performance Problems

No	Performance Problem	Client		Contractor		Consultant	
		RII	Rank	RII	Rank	RII	Rank
1	Cost	0.840	1	0.904	1	0.853	1
2	Time	0.827	2	0.752	2	0.811	2
3	Quality	0.747	3	0.664	4	0.595	5
4	Customer Satisfaction	0.427	5	0.712	3	0.605	4
5	Safety	0.733	4	0.552	5	0.700	3

Source: Own survey, 2019

The above table present summary of the participants' combined RII of performance problems and ranks of the performance problem from the collected data of professionals who participated in the project.

The major causes of the cost and time performance factors, which are the two most important performance related problems according to the collected data from professionals participating in the project.

Quality problem was perceived as the 3rd most important performance problem by clients while customer satisfaction problem and safety issues were ranked as relatively less important issues by contractor and consultant professionals.

Combined RII of Project Performance Problems

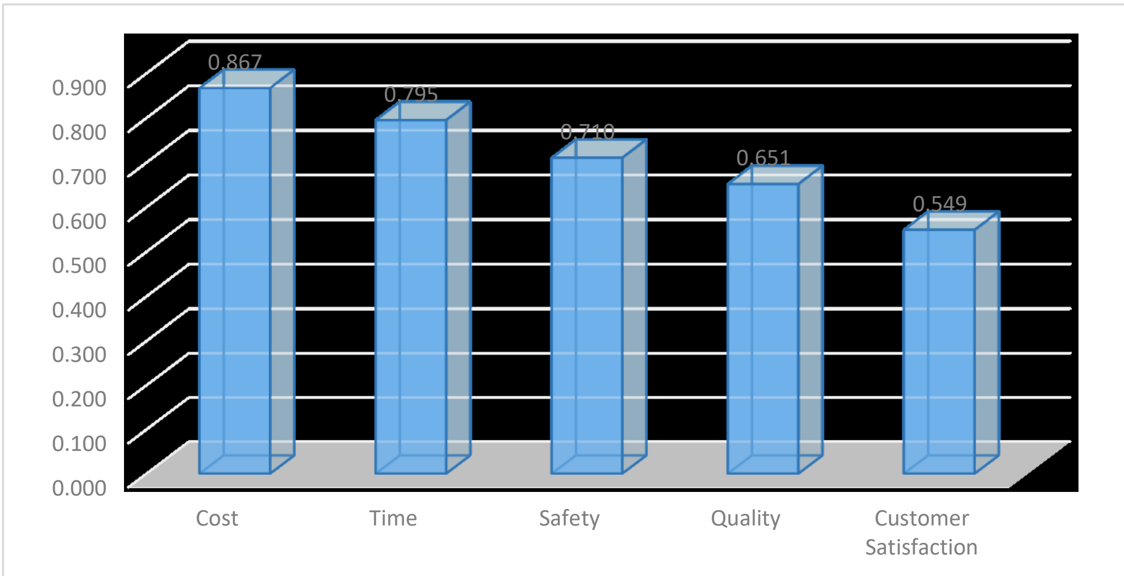


Figure 4.1**:** Combined RII of Project Performance Problems:

Source: Own survey, 2019

From the combined Relative Importance Index (RII) result shown on Figure 4.1, the major performance problems which have been occurring on the construction projects in the selected sub-cities are cost and time, following to cost and time factors; safety, quality and customer satisfaction are the second major performance problems according to the collected data from professionals participating in the projects.

Among the various reasons given by key informants for low cost and time performance of construction projects, inflation of construction material price, inaccurate project estimates and poor project management was considered to be important factors. The cost of construction materials have been consistently increasing in the past few years and this price change was perceived as the major factor affecting cost performance of projects. Construction material price increment can be attributed to limited construction material suppliers, factories, devaluation of Ethiopian currency, shortage of raw materials and transportation cost from foreign countries.

4.2.2 Critical Factors that affect Performance of Public Building Construction Projects in terms *of cost and time.*

4.2.2.1 Project Cost Performance Factor

Table 4.4 presents the responses of client, contractor and consultant on major causes of poor cost performance on the implemented construction projects in Arada and Lideta Sub-Cities.

Table 4. 4 Cost Factor RII & Rank

Cost Factors	**Client**		**Contractor**		**Consultant**	
	RII	**Rank**	**RII**	**Rank**	**RII**	**Rank**
Variation Order	0.600	8	0.792	2	0.747	3
Escalation of Material Price	0.840	1	0.880	1	0.847	1
Design Change	0.760	3	0.784	3	0.763	2
Project Characteristics	0.547	11	0.776	4	0.695	4
Ground Condition	0.693	6	0.648	10	0.684	5
Design Team Experience	0.600	9	0.672	9	0.595	12
Delay in Producing Design Documents	0.560	10	0.704	8	0.621	9
Material Change	0.787	2	0.768	5	0.674	6
Project Complexity	0.680	7	0.712	7	0.632	7
Initial Budget Estimate	0.720	5	0.624	11	0.626	8
Specification Interpretation	0.533	12	0.576	12	0.616	11
Natural Environment	0.747	4	0.768	6	0.616	10
Location of Project	0.427	13	0.552	13	0.595	13

Source: Own survey, 2019

The above table showed us escalation of material price is the most important factors contributing to cost performance problem for three professional categories, i.e. client, contractor and consultant with RII of 0.840, 0.880 and 0.847 respectively. Material price escalation is considered as the critical cost factor since it directly affects the liquidity of projects and cost performance of projects. The cost of construction materials have been consistently increasing in the past few years.

Variation order was ranked the second critical cost factor by contractor respondents and the third critical cost factor by consultant respondents.

Design change was ranked as the second most critical factor by consultants and the third critical factor by client and contractor respondents in affecting the cost performance of projects in the sub-cities. Design changes and scope modification can significantly impact early received quotes related to major equipment and engineered materials. Late engineering/design, procurement, and scope modifications will give rise to additional manpower requirements, inflated construction re-work, out of sequence activities and additional field in-direct costs.

- **Aggregate Cost Factors**

Figure 4.2 below shows cost factors ranked by their combined value of relative importance index (RII). The first five most important cost factors agreed by all stakeholders are escalation of material price, design change, construction material change, variation order and natural environment of the project with the value of RII 0.86, 0.77, 0.74, 0.71 and 0.71 respectively. Escalation of material price is the most critical factor for all parties involved in the project.

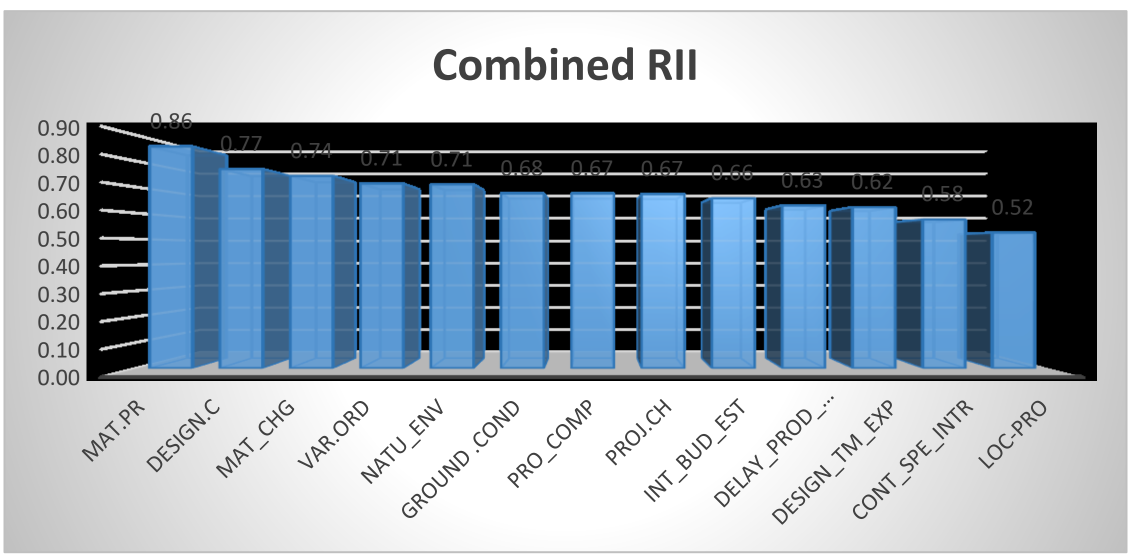


Figure 4.2: Combined RII of Cost Factors
Source: Own survey, 2019

- **Correlation of Cost Factors**

On Table 4.5, the spearman correlation coefficient indicates that the response of client has a moderate relation with both the contractor and consultant responses. While the RII of the contractor has a relatively strong relation with the responses of consultant.

Table 4. 5 Spearman's Correlation Coefficient of Cost Factors

	RII Client	**RII Contractor**	**RII Consultant**
RII Client	1	0.554	0.537
RII Contractor	0.554	1	0.788
RII consultant	0.537	0.788	1

Source: Own survey, 2019

The reason for strong relations between consultant and contractor is that both have similar understanding regarding the cost factors and give analogous attention for the project cost. While the moderate relations between the client with contractor and consultant on the cost implies that the role and finally outcome of controlling the project cost mainly resides on the client of the project and they have somewhat a different perception regarding the major cause of cost performance problems.

4.2.2.2 Project Time Performance Factors

The responses of client, contractor and consultant on major causes of poor time performance on the implemented construction projects in Arada and Lideta Sub-Cities is presented in Table 4.6 below.

Table 4. 6: Time Factor RII & Rank

Time Factors	Client		Contractor		Consultant	
	RII	Rank	RII	Rank	RII	Rank
Low Productivity of Labor	0.7067	10	0.824	2	0.726	3
Additional Work Order	0.8533	1	0.864	1	0.779	2
Equipment Breakdown	0.7067	9	0.744	6	0.674	8
Working equipment selection	0.4800	14	0.520	14	0.474	14
Waiting Time for Approval of Sample Materials	0.5867	13	0.648	12	0.500	13
Project Complexity	0.7733	4	0.808	5	0.826	1
Low Efficiency Equipment	0.7600	5	0.728	7	0.689	6
Relationship Between the Client and Contractors	0.7200	7	0.696	10	0.700	4
Conflict between project parties	0.7200	8	0.704	9	0.605	10
Conflict of Interest	0.7067	11	0.640	13	0.537	12
Contract and Specification Interpretation	0.8000	2	0.712	8	0.695	5
Initial Planning	0.7067	12	0.816	4	0.647	9
Contractor's Organizational Structure	0.7467	6	0.816	3	0.684	7
Project Team Turn Over	0.7867	3	0.672	11	0.595	11

Source: Own survey, 2019

The calculated RII of additional work order is 0.85 for clients, 0.86 for contractors and 0.77 for consultants.

Project complexity was ranked the most important factor contributing to the delay of projects and affecting the time performance of projects by consultants and the fourth and fifth important factor by clients and contractors respectively

From Table 4.6, it can also be seen that productivity of labor is among the main factors affecting time performance of projects in the selected sub-cities. Labor productivity was the second and third most critical factor by contractor and consultant respondent categories with RII of 0.82 and 0.72 respectively. Productivity of labor in construction is often broadly defined as output per labor hour. Since labor constitutes a large part of the construction work and the quantity of labor hours in performing a task in construction is more susceptible to the influence of management than are materials or capital, this productivity measure is often referred to as labor productivity. However, it is important to note that labor productivity is a measure of the overall effectiveness of an operating system in utilizing labor, equipment and capital to convert labor efforts into useful output, and is not a measure of the capabilities of labor alone. Thus, low labor productivity can result in project implementation delay as well as cost overrun in construction projects.

- **Aggregate Time Factors**

Figure 4.3 below shows time factors ranked by their combined value of relative importance index (RII) by the client, contractor and consultant respondents. The first five most important time factors agreed by all stakeholders are additional work order, project complexity, low productivity of labor, contractor's organizational structure and contract & specification interpretation by project participants with the RII value of 0.83, 0.80, 0.75, 0.75 and 0.74 respectively.

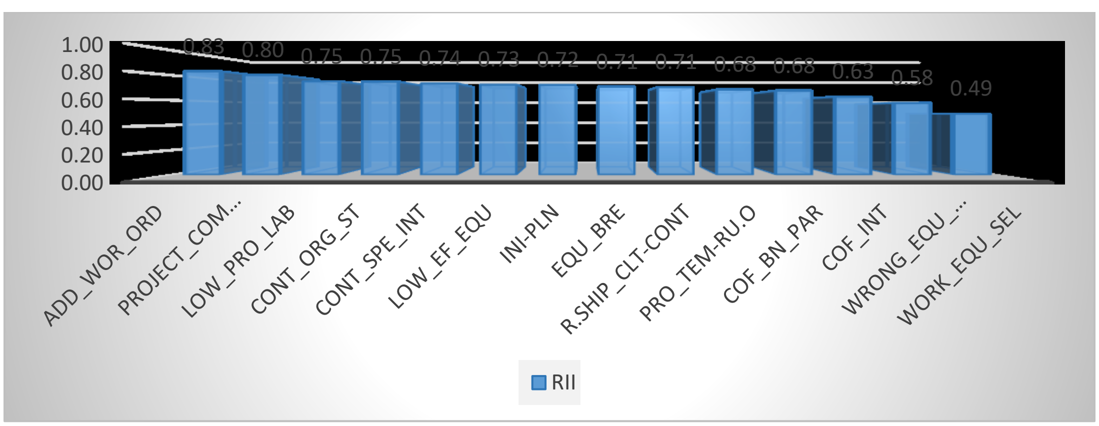


Figure 4.3. Combined RII of Time Factors
Source: Own survey, 2019

- **Correlation of Time Factors**

Based on the spearman's correlation coefficient on Table 4.7, there is strong relation between the responses of contractor-consultant, moderate relation between client-consultant and weak relation between client-contractor.

Table 4. 7: Spearman's Correlation Coefficient of Time factors

	RII Client	RII Contractor	RII Consultant
RII Client	1	0.402	0.621
RII Contractor	0.402	1	0.75
RII Consultant	0.621	0.75	1

Source: Own survey, 2019

The reason for the occurrence of strong relation between contractor and consultant is that the rank of responses to additional work order, poor project management assistance, project complexity, financial constraints and unavailability of resources were the same. In addition, the combined RII of time factors indicate that additional work order or scope change was the main cause of low time performance and delay of projects. In addition, the contractor and consultants are the ones, which are responsible for handling the additional work order. Thus, strong correlation among the response of contractor and consultant is expected. Whereas for the moderate relation between the responses of client and consultant is that they have the same rank on productivity of resources and near the same rank on equipment breakdown, conflict of interest between parties and time needed to implement variation orders.

And for the weak relation between client and contractor respondents is because of the different view of each parties on delay in projects occur, particularly in factors like waiting time for approval of test sample material, initial planning of project and company structure of the construction company.

According to the information collected from key informants, inaccurate initial project estimates was also perceived to be a key factor in contributing to the cost overrun of projects in the sub-cities. Due to the competitive nature of the bidding process, estimates may suffer from wrongful expectations of the scope of work included in the project specification. Many times the estimate is compiled utilizing the most optimistic escalation rates. Major projects that take longer time form completion are particularly susceptible to increased costs related to labor, construction materials and in-direct costs. The majority of front end cost estimates of projects in the sub-cities tend to be over-optimistic, that unfortunately can lead to an underfunded cost estimate. In addition, initial cost studies, and conceptual designs are mostly completed by individuals or teams that have a particular interest in the future of the project and are eager for the project to moving forward. This predisposition can impact the initial estimated cost and result in cost and time overrun.

Furthermore, poor project management and inexperienced project managers are considered to be the other key factor contributing to poor cost and time performance for construction projects in the sub-cities.

4.2.3 Performance States of Public Building Construction Projects in Arada and Lideta sub cities.

This section of the study addresses performance of public building construction projects in the two sub-cities. Performance measurement is defined as the process of evaluating performance relative to a defined goal. The measurement can guide steady advancement toward established goals and identify shortfalls or stagnation. It is widely accepted view that, at a minimum, performance measures of a project are based on time and cost parameters. To assess time performance of project for this study, scheduled or planed duration of projects and actual duration of projects were used. For evaluating cost performance of the projects budgeted cost and actual cost of project were employed.

Project performance can be measured by variance of actual and scheduled performance factors. Cost and time variance shows the magnitude of variation between the budgeted and actual cost and duration of project in terms of Birr and days. Therefore, in this research time and cost variance was used to analyze the performance of public building construction projects in the selected sub-cities.

Secondary data on time and cost performance of 36 construction projects were collected form Arada and Lideta Sub-Cities. The data was collected from contract documents, schedule time tables, performance related documents and annual reports. Analysis of numerical data was done in the form of descriptive statistics using tables.

4.2.3.1 Cost Performance

Table 4.8 below presents the summary statistics of cost variation for the 36 projects evaluated in the study. From cost variation descriptive statistics it can be seen that the mean variation of the projects is 27%. This means that on average each project required additional 27% cost from the initial budget scheduled by the sub-cities. In terms of monetary value, there was additional 653,757 Birr cost per each project.

Table 4. 8: Descriptive Statistics of Cost Variation

Variation	Number of Projects	Minimum Variation	Maximum Variation	Mean Variation
Cost (Birr)	36	-354,760	6,060,071	653,757
Percentage	36	-54.02%	92.29%	27.07%

Source: Arada and Lideta Sub-City

Figure 4.4 indicates the general cost performance of evaluated public building projects in the two sub-cities. Out of the total 36 projects, only 1 project was completed under budget, 3 projects were completed within the scheduled budget and the remaining 31 projects were completed with more than planned budget. The cost variation range lies between -54.02% for the construction project of Woreda 10 Youth Center and 92.29% for the construction of Woreda 8 Finance Office & Store.

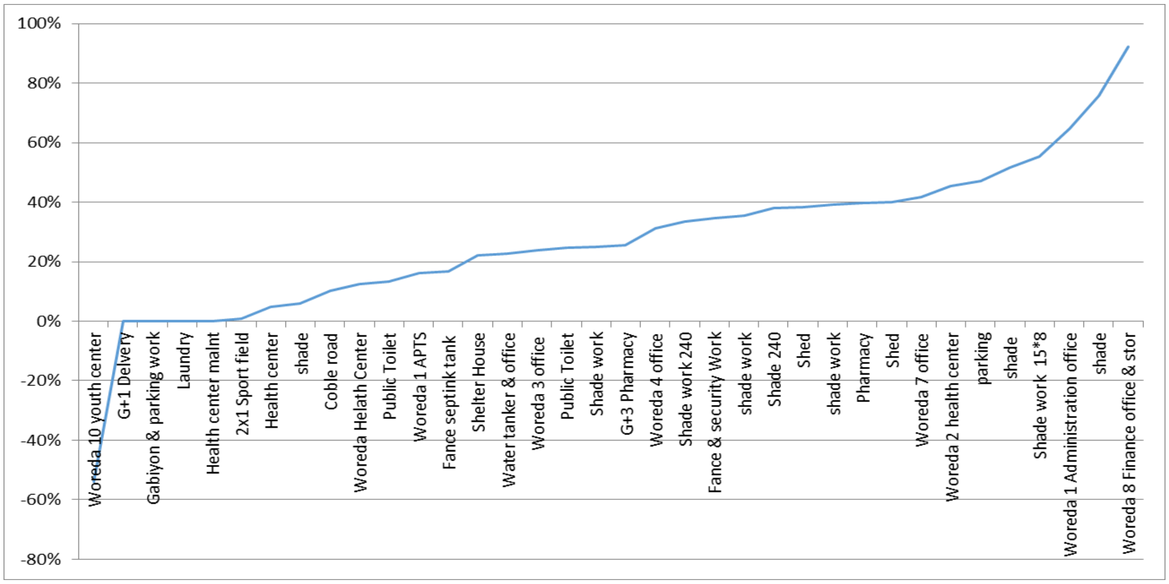


Figure 4.4: Cost Variation

Source: Arada and Lideta Sub-City

4.2.3.2 Time Performance

It is very important for construction projects to be completed on time, as the clients, users, stakeholders and the general public usually looks at project success from the macro view where their first criterion for project success appeared to be the completion time.

Table 4. 9: Descriptive Statistics of Time Variation

Variation	Number of Projects	Minimum Variation	Maximum Variation	Mean Variation
Time (Days)	36	-15	1,645	219
Percentage	36	-25.00%	913.89%	261.97%

Source: Arada and Lideta Sub-City

Figure 4.5 below indicates the overall time performance of evaluated public building projects in the two sub-cities. Out of the total 36 projects, only onr project was completed with the scheduled time frame and the remaining 35 projects experienced time overrun from scheduled time. The cost variation range lies between -25% for the construction project of Woreda 8 Sport Field and 913% for the construction of Coble road in Arada Sub-city.

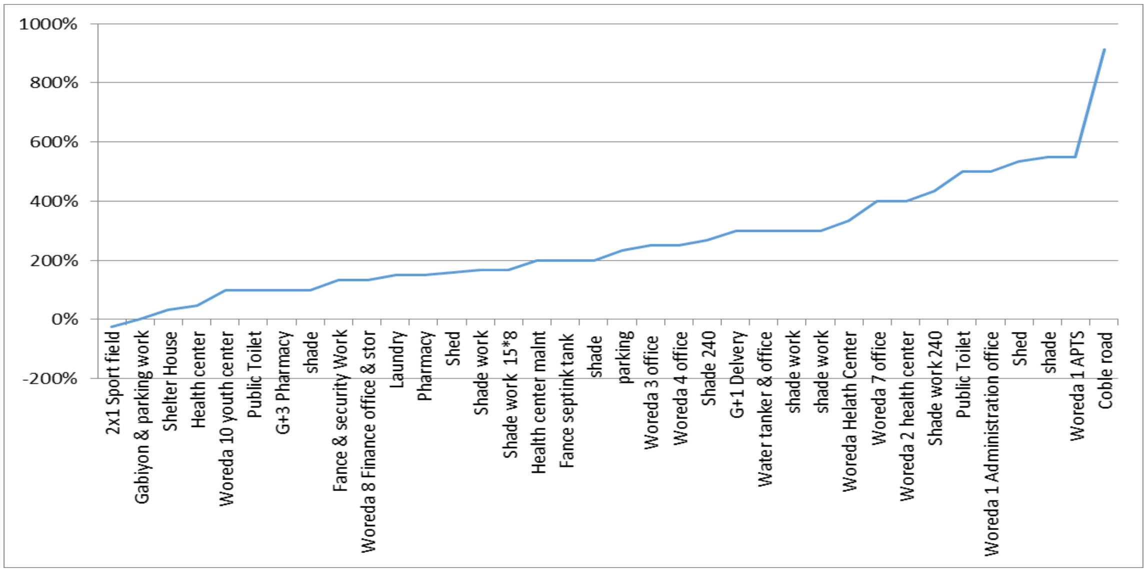


Figure 4.5: Time Variation

Source: Arada and Lideta Sub-City

From the cost and time variance analysis of the evaluated 36 construction projects, there is considerably large gap between the actual and scheduled project cost and time. Thus, it can be stated the construction projects in Arada and Lideta Sub-Cities are facing significant cost and time performance problems. In particular, the time performance of the projects is quite low.

The result of in-depth interview with 5 Key Informant with managerial level employees and key staffs of project participants. The interview focused on evaluating the current performance of construction projects in Arada and Lideta Sub-cities in terms of cost and time parameters and main factors contributing to the performance.

Cost of the project, its duration and the value achieved from the project is an important issue, particularly for public funded projects, like the construction projects performed under the sub-cities. As these types of projects are sponsored by tax payers, hence it becomes necessary to provide better value for their money in terms of services or facilities. Increased duration means the tax payers and the overall economy of the country have to wait for facilities such as infrastructure and services. According to the information collected from key informants, an unacceptable trend has been noticed whereby the majority of projects in the sub-cities do not get completed within initially set targets of time and cost. This .problem is not only rampant in the selected sub-cities but is country wide issue.

4.3 Discussion

According to the collected data from professionals participating in the project, the major performance problems, which have been occurring on the construction projects in the selected sub-cities, were cost and time with a RII of 0.86 and 0.79 respectively. These is due to escalation of material price, design change, variation orders from owner, shortage of construction materials on the market, low productivity of labor and equipment breakdown. Safety (0.710), quality (0.652) and customer satisfaction (0.689) are the second major performance. Quality problem was perceived as the 3rd most important performance problem by clients while customer satisfaction problem and safety issues were ranked as relatively less important issues by contractor and consultant professionals

There are performance problems in construction projects that were identified from the literature reviews. Shaba S.A. (2008) stated that the construction industry performance problems in developing economies classified in three layers: problems of shortages cost, schedule (time) problem upon the planning stage of the project and quality.

Thirteen factors were identified from the literature reviews that affect the performance of cost in building construction of projects, according to the collected data, escalation of material price is the most critical important factors contributing to cost performance problem for three professional categories, i.e. client, contractor and consultant with RII of 0.840, 0.880 and 0.847 respectively. Material price escalation is considered as the critical cost factor since it directly affects the liquidity of projects and cost performance of projects. The cost of construction materials have been consistently increasing in the past few years and this price change was perceived as the major factor affecting cost performance of projects.

According to the collected data, escalation of material price is the most important factors contributing to cost performance problem for three professional categories, i.e. client, contractor and consultant with RII of 0.840, 0.880 and 0.847 respectively. Material price escalation is considered as the critical cost factor since it directly affects the liquidity of projects and cost performance of projects. The cost of construction materials have been consistently increasing in the past few years and this price change was perceived as the major factor affecting cost performance of projects.

Variation order was ranked the second critical cost factor by contractor respondents and the third critical cost factor by consultant respondents. Variation order or change in the scope of the project is considered an important factor for the contractors and consultants because a change request from the owners or regulatory body has to be designed by the consultants and implemented by the contractors; generating additional cost and negatively affecting the liquidity of both parties.

Design change was ranked as the second most critical factor by consultants and the third critical factor by client and contractor respondents in affecting the cost performance of projects in the sub-cities. Design changes and scope modification can significantly impact early received quotes related to major equipment and engineered materials. Late engineering/design, procurement, and scope modifications will give rise to additional manpower requirements, inflated construction re-work, out of sequence activities and additional field in-direct costs.

Fourteen factors were identified from the literature reviews that affect the performance of time in building construction of projects. Based on the combined Relative Importance Index (RII) and rank the critical time performance factors on selected building construction projects.

According to the collected data, additional work order is the most important factors contributing to low time performance problem for the client and contractor and the second critical time factor for consultant respondents.

Additional work order particularly occurs when there is a change in project scope. Scope is the term that defines the entire deliverables that is expected at the end of a project. Therefore, it can be said that all project plans, estimation, schedule, quality and base lines are usually designed base in the initial project scope. Thus, any change in the project scope during execution will mean that the entire initial project plan will have to be reviewed such that a reviewed budget, schedule and quality will have to be developed. This means more time and resources will be needed as against the initial baseline.

Project complexity was ranked the most important factor contributing to the delay of projects and affecting the time performance of projects by consultants and the fourth and fifth important factor by clients and contractors respectively. Complexity could be define in terms of the size of the project, most large projects tend to have relatively long implementation period when compared to small project. This could be affected by change in material price, design such that the initial timeline and budget may need to be supplemented for the project to be completed. The result could be cost overrun and long chains of negotiation which will lead to delay. Similarly, projects with high degree of complexity usually result in complex plans, schedules and estimations. Such that if care is not taken the tendency of omitting certain aspect of the project plans and estimation could be prominent, thereby leading to change orders and implementation delay.

Secondary data on time and cost performance of 36 construction projects were collected from Arada and Lideta Sub-Cities. The data was collected from contract documents, schedule time tables, performance related documents and annual reports.

Cost performance is the most important indicator of project success. It presents not only the firm's profitability but also the productivity of organizations at any point during the construction processes. It can be seen in the project account and is always used to measure project performance. Generally, construction industry has been facing poor cost performance which describes inability to complete project within budget (Olawale and Sun, 2010).

From the selected 36 projects the descriptive statistics assessment of time variation, it can be seen that the mean time variation of the projects is 261%. This means that from the initial time schedule each project required additional 261% time period for the completion of the projects. In terms of time period, on average an additional 219 days were required for the completion of each project.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

This chapter presents the general summery of the study, the conclusion and the recommendation parts of the thesis. The main objective of this study was to investigate the performance of public building construction projects in Arada and Lideta Sub-Cities. In order to achieve this objective, the study used both primary and secondary data. The primary data was collected via a structured questionnaire from 78 professionals who are working for project clients, contractors and consultants. The secondary data was collected from Arada and Lideta sub-cities regarding the actual and scheduled cost and time performance of 36 construction projects. The study also utilized data collected through Key Informant Interview with 5 senior staffs and managerial level employees working in construction projects.

5.1 Conclusion

The primary data analysis of surveyed professional indicates that the major performance problems which have been occurring on the construction projects are cost and time with an RII of 0.86 and 0.79 respectively. Following to cost and time factors; safety (0.710), quality (0.652) and customer satisfaction (0.689) were the second major performance problems according to the collected data from professionals participating in the projects.

According to the analysis of collected survey data, escalation of material price is the most important factors contributing to cost performance problem for three professional categories, i.e. client, contractor and consultant with RII of 0.840, 0.880 and 0.847 respectively. Material price escalation is considered as the critical cost factor since it directly affects the liquidity and cost performance of projects. In addition design change, construction material change, variation order and natural environment of the project were perceived as critical cost factors with RII value of 0.77, 0.74, 0.71 and 0.71 respectively.

With regard to critical factors affecting time performance, the top five most important time factors agreed by all stakeholders influencing time performance of project were additional work order, project complexity, low productivity of labor, contractor's organizational structure and contract & specification interpretation by project participants with the RII value of 0.83, 0.80, 0.75, 0.75 and 0.74 respectively.

Inaccurate initial project estimates was also perceived to be a key factor in contributing to the cost overrun of projects in the sub-cities. Due to the competitive nature of the bidding process, estimates may suffer from wrongful expectations of the scope of work included in the project specification. Many times the estimate is compiled utilizing the most optimistic escalation rates. Furthermore, poor project management and inexperienced project managers are considered to be the other key factor contributing to poor cost and time performance.

The result of the Key Informant Interview indicate that an unacceptable trend has been noticed whereby the majority of projects in the sub-cities do not get completed within initially set targets of time and cost. Among the various reasons given by key informants for low cost and time performance of construction projects, inflation of construction material price, inaccurate project estimates and poor project management was considered to be important factors. The cost of construction materials have been consistently increasing in the past few years and this price change can be attributed to limited construction material suppliers, factories, devaluation of Ethiopian currency, shortage of raw materials and transportation cost from foreign countries.

5.2 Recommendations

It's important for participants in the construction industry to identify the factors contributing to weakness of performance in order to solve and overcome. Based on the findings of the research, the following major recommendations are suggested.

- The study finding suggest that scope change and variation order are among the critical factor affecting time and cost performances of construction projects in Arada and Lideta Sub-cities. Before the design work is commenced to the contractor, the sub-cities should develop a well-defined scope of the project. Proper scope definition reduces the amount of variation that will occur during construction stage. Good scope definition is vital for completion of projects with in the schedule time and budget enabling the client to allocate sufficient budget and to determine project duration.

- All stakeholders should be on board during the planning process and always know in which direction the project is going to go. They should ensure that proper planning is done to accommodate for unforeseen events that may prolong the construction period, increase cost and cause damage to property. Especially professionals from the sub-cities should ensure that proper planning and costing of the works are made during the pre-contract period so as to avoid intermittent stoppage of works as a result of funding constraints. A solid planning phase before groundbreaking ensures that the project will have a better process of documentation, less confusion between administrators, and a solid project schedule, all helping to reduce future expenses and time overrun.

- Professional competency and understanding of project requirements are required at the early stages of contract announcement, bidding and awarding. When these variables are taken seriously, competent contractors with the requisite experience and capacity will be selected for contracts. This implies that subjects of competency and poor understanding of contract requirements will be outdated.

- The contractor should ensure effective site management and supervision of the works so as to keep watch on critical activities and endeavor to complete projects within the specified time while meeting quality and cost requirements. Administrative employees should be assigned to make necessary measures to complete projects within the specified time while meeting quality and cost requirements.

- This study utilized data collected from 78 professionals working at the construction projects at Lideta and Arada Sub-Cities. Future researches can be done by incorporating a larger sample taken from additional Sub-cities in Addis Ababa or regional states to get a full understanding of construction project performance in the country. In addition, this study did not focus on construction project performance factors like quality of project, productivity of resource, safety issues and customer satisfaction. Other studies can be conducted by focusing on these significant performance factors.

REFERENCES

Abreham Aschalew, (2002): Factors Affecting the success of Constriction project.

Ahsan Skully, (2009): Project Control Factors at Front End: Indian Persipective.

Akinsiku Olusegun, (2014). Cost & Time Perfornace of Constraction Projects: comparative study of Southern peninsular Malaysia & Lagos, Nigeria.

Arcila (2012). Avoiding Cost Overrun in Construction projects in the United Kingdom.

Atkinson, R., Fakher, A., & Shenhar, A. (1997). Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria.

Biadglgn Tagess, (2017): Assessment of Construction Performance Challenges in Selected University Building Constriction Projects.

Chan, D. W., & Kumaraswamy, M. M. (1997). A comparative study of causes of time overruns in Hong Kong construction projects.

Cheung Sai On, Suen Henry C.H. and Cheung Kevin K.W., (2004), PPMS: a Web based construction Project Performance Monitoring System, Automation in Construction. Department of building and construction, city university of Hong Kong, Hong Kong

Ethiopian Economic Association, Report on Current Economy; the Current State of the Construction Industry, Vol. 2006/07.

Garbharran, H., & Govender, J (2012): Critical Success Factors influencing project Success in the Constraction Industry.

Grunberg Aki (2004). Prodactivity and Performance Management-Managerial practice in the constraction industry.

Kagioglou, M., Cooper, R. and Aouad, G. (2001) Performance Management in Construction: A Conceptual Framework. Construction Management and Economics.

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

Kothari, C. (2004); Research Methodology: Methods and Techniques (2nd Ed). New Delhi: New Age International (P) Ltd, Publishers.

Kuprenas John A., (2003), Project management actions to improve design phase cost performance, Journal of Management in Engineering

Mbugua, L. M., Harris, P. T., Holt, G.D., and Olomolaiye, P. O. (1999) A framework for determining critical success factors influencing construction business performance).

Memon, A., Nadzirah, R., & Noor, Y. (2014). Improving Time Performance in Constraction Projects: Perspective of Constractor.

Minister of Urban Debelopment & Constraction. (2012). National Report on Housing & Sustanable Urban Development.

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

Neely, A., Gregory, M. and Platts, K. "Performance measurement system design: a literature review and research agenda," International Journal of Operations & Production Management.

Pheng O, and Chuan E,. (2006). Factors Affecting the performance of Pavement Road Constraction Projects in Uganda.

Pekuri, A., Harri, H and Maila, H. (2011): Prodactivity and Performance Management-Managerial practice in the constraction industry.

Project Managemetn Institiution (2004). Cost and Time performance of construction projects.

Salleh R. (2009) Critical success factors of project management for Brunei Construction Projects: improving project performance. A thesis submitted in partial fulfilment of the requirement for the degree of Doctor of philosophy.

Saunders M. et al. (2009). Research Methods for Business Students (5th):.Harlow: Pearson Education Limited.

Sanvido, V., Francois, G., & Kevin, P. (1992). Critical Success Factors For Constraction Project.

Shaban, S. (2008). Factors Affecting the Performance of Construction Projects in the Gaza Strip. The Islamic University of Gaza, Palestine

Takim, R and Akintoye, A (2002) Performance indicators for successful construction project performance. In: Greenwood, D (Ed.), 18th Annual ARCOM Conference, 2-4 September 2002, and University of North Umbria. Association of Researchers in Construction Management..

Training Resources and Data Exchange (TRADE, 1995), How to Measure Performance A Handbook of Techniques and Tools.

Ugwu O.O. and Haupt T.C., (2007), Key performance indicators and assessment methods for infrastructure sustainability - a South African construction industry perspective, Building and Environment

U.S. Construction Industry, National Research Council (2009): Advancing the Competitiveness and Efficiency of the U.S. Construction Industry

U.S. Construction Industry, National Research Council (1995): Advancing the Competitiveness and Efficiency of the U.S. Construction Industry

Xiao,H., & Proverb, D (2003): The Performance of Constraction in Japan, the UK and the USA: An evaluation constraction quality.

Yamane, Taro. (1967). Statistics: An Introductory Analysis, 2nd Edition, New York: Harper and Row.

Appendices

Appendix I: Questionnaire

ST. MARY UNIVERSITY

Department of Project Management

Introduction

I am Student of Masters of Project Management at St. Mary University. As partial fulfillment of the program, I am undertaking a research on the topic of **Performance Assessment** ***of Public building construction projects in Addis Ababa**: **The case of Arada & Lideta Sub-cities***. The research result could be used as an input for decision makers, professionals, academician and other interested groups to play their respective role for the achievement of project objectives.

It is believed that your participation in this research will contribute in achieving the objectives of the research. Thus, the quality of your response towards the question items determines the quality of the research results. Therefore, please answer the questions as thoroughly, objectively and honestly as possible according to the instructions contained in the body of the questionnaire. Finally, I want to assure you that all information provided in this survey will be treated with strict confidentiality and allowed to serve only for the purpose of the research under consideration.

Interested participant of this study will be given feedback on the overall research results after the completion of the research work.

Thank You in Advance for your cooperation!!

Part 1: Demographic Profile of respondents

Please encircle only one that represents you most appropriately.

1. What is your title/position?

A) Construction Engineer B) Office Engineer C) Design Engineer

D) Project Manager F) Site Engineer

2. What is your highest Educational Level?

A) PhD degree B) Master's degree

C) First degree D) Diploma

3. How many years of Experience do you have?

A) Less than 5 years B) 5-10 years C) More than 10 years

4. Type of organization you are working for?

A) Client B) Contractor C) Consultant D) Regulatory

5. Which of the following performance related criteria problems are in use for the evaluation of public construction projects in your organization? Select all that is applicable.

☐Cost

☐ Time

☐ Quality

☐ Satisfaction

☐ Safety

If other please specify ____

6. In your opinion, how do you understand cost/time as performance criteria? Circle your choices. (Numbers in the bracket indicates points given to each choices)

1) Strongly Disagree 2) Disagree 3) Neutral

4) Agree 5) Strongly Agree

Part Two: Critical Factors Affecting time and cost Performance of Construction Projects

Below are list of factors affecting performance of construction projects? From your experience, please express your opinion on the importance of the following factors that affect public building construction projects in Addis Ababa. In your sub-city. (Please put a tick mark in the appropriate column according to their degree of rank).

Factors	Degree of Rank				
	5	4	3	2	1
1. Cost Factors					
Variation Order					
Escalation of Material price					
Design Change					
Project Characteristics (size, type etc)					
Ground Conditions					
Design team experience					
Delay in producing design documents					
Material Change					
Project complexity					
Initial budget estimate					
Contract and Specification interpretation					
Natural environment (climate condition)					
Location of project					

2. Time Factor					
Additional Work order					
Low productivity of Labor					
Equipment breakdown					
Working equipment selection					
Project Complexity					
Waiting time for approval of drawing and test samples of Materials					
Low Efficiency equipment					
Relationship between the client and contractors					
Conflict between project parties					
Conflict of Interest					
Contract and specification interpretation					
Initial planning					
Contractor’s organizational structure					
Project team turn over					
Waiting time for approval of test sample material					
3. Other Factors					
Project management practices					
Site management					
Labor deployment of contractor					
Contractors’ commitment					
Top management support					
Speed of decision making					
Client's unwillingness to help contractor					
Contractor’s financial capacity (cash flow)					
Project team motivation					

Thank You!

Appendix II: Key Informant Questions

ST. MARY UNIVERSITY

Department of Project Management

Introduction

I am Student of Masters of Project Management at St. Mary University. As partial fulfillment of the program, I am undertaking a research on the topic of **Performance Assessment *of Public building construction projects in Addis Ababa*: *The case of Arada & Lideta Sub-cities*.** The research result could be used as an input for decision makers, professionals, academician and other interested groups to play their respective role for the achievement of project objectives.

It is believed that your participation in this research will contribute in achieving the objectives of the research. Thus, the quality of your response towards the question items determines the quality of the research results. Therefore, please answer the questions as thoroughly, objectively and honestly as possible according to the instructions contained in the body of the questionnaire. Finally, I want to assure you that all information provided in this survey will be treated with strict confidentiality and allowed to serve only for the purpose of the research under consideration.

Interested participant of this study will be given feedback on the overall research results after the completion of the research work.

Thank You in Advance for your cooperation!!

Part 1: Demographic Profile of respondents

Please encircle only one that represents you most appropriately.

1. What is your title/position?

A) Construction Engineer B) Office Engineer C) Design Engineer

D) Project Manager E) Project manager F) Site Engineer

2. What is your highest Educational Level?

A) PhD degree B) Master's degree

C) First degree D) Diploma E) Other

3. How many years of Experience do you have?

A) Less than 5 years B) 5-10 years C) More than 10 years

4. Type of organization you are working for?

A) Client B) Contractor C) Consultant D) Regulatory

5. In your opinion, to what extent has performance of public building construction projects been achieved in terms of cost in your sub-city?

____
____
____
____
____

6. In your opinion, to what extent has performance of public building construction projects been achieved in terms of time in your sub-city?

____
____
____

____

____

7. Which of the following performance related criteria are in use for the evaluation of public construction projects in your organization? Select all that is applicable.

□Cost

□ Time

□ Quality

□ Satisfaction

□ Safety

If other please specify ____

8. What are critical factors that affect cost and time performance of public building construction projects in your sub-cities

____

____

____

____

____

9. What do you think should be done to improve the efficiency of public building construction projects in your sub-city?

____

____

____

____

____

Thank You!

Appendix III- Project Time and Cost Performance

S.N	Project Name	Sub-City	Duration of Project (Days)		Project Cost (Birr)	
			Contract	Actual	Contract	Actual
1	School Café for Wereda 6	Lideta	45	240	143,397	215,261
2	Shade work 240	Lideta	90	240	925,046	2,071,268
3	Shade work 15*8	Lideta	90	240	1,211,545	1,615,508
4	Shade work	Lideta	60	240	769,631	1,193,915
5	shade work	Lideta	60	240	768,131	1,259,646
6	shade work	Lideta	60	221	726,652	1,174,459
7	Shade 240	Lideta	90	270	955,655	1,977,089
8	shade	Lideta	90	180	281,194	1,160,955
9	shade	Lideta	60	390	1,486,726	1,582,453
10	shade	Lideta	60	390	1,328,819	1,582,453
11	Woreda 1 APTS	Lideta	60	300	1,441,356	2,641,799
12	Woreda 2 health center	Lideta	90	390	1,418,087	1,618,613
13	Woreda 3 APTS work helath Center	Lideta	90	360	1,011,466	1,310,770
14	Woreda 10 Water tanker and office	Lideta	60	120	1,011,466	656,706
15	Woreda 10 youth center	Lideta	60	360	1,364,001	3,868,444
16	Woreda 1 Administration office	Lideta	60	210	573,461	752,723
17	Woreda 3 office	Lideta	60	210	490,148	712,639
18	Woreda 4 office	Lideta	60	300	715,789	1,227,247
19	Woreda 7 office	Lideta	90	210	267,816	3,472,611
20	Woreda 8 Finance office and store	Lideta	90	210	948,675	1,448,972
21	Fence and security home work	Lideta	60	180	1,078,307	1,296,998
22	Woreda 3 Fence septink tank and guard house	Lideta	90	300	699,366	1,325,479
23	parking	Lideta	30	30	1,823,908	1,823,908
24	Gabiyon and parking work	Lideta	120	300	1,103,726	1,832,822
25	Pharmacy	Arada	90	120	853,900	1,097,596
26	Shelter House	Arada	150	390	9,817,485	15,877,556
27	Shed	Arada	60	150	1,326,726	1,326,726
28	Laundry	Arada	17	25	310,000	325,960
29	Health center	Arada	180	1825	8,735,001	9,738,915

30	Coble road	Arada	30	90	791,915	791,915
31	Health center malnt	Arada	60	45	1,029,822	1,038,600
32	2x1 Sport field	Arada	90	570	495,205	826,587
33	Shed	Arada	60	120	916,621	1,232,281
34	G+3 Pharmacy	Arada	180	720	5,028,239	5,028,238
35	G+1 Delivery	Arada	60	360	1,409,957	1,624,449
36	Public Toilet	Arada	45	90	193,178	256,099