



ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE

Assessment of Practices and Challenges of Project Time and Cost Management: A case study of Bishoftu City Infrastructure Construction Projects.

Prepared by: Belay Demissie Bekele

A Project Work submitted to School of Graduate Studies, Addis Ababa University in partial fulfillment of the requirements for Master of Art Degree in Project Management.

June, 2023
Addis Ababa
Ethiopia

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By

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APPROVAL SHEET

We, the undersigned, members of the Board of Examiners of the final open defense by Belay Demissie have been read and evaluated his research project entitled "Assessment of the Practices and Challenges of Project Time and Cost Management; A case study of Bishoftu City Infrastructure Construction Projects" and examined the candidate. This is, therefore, to certify that the research project has been accepted as a partial fulfillment for the requirement of Masters of Art Degree in project Management.

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DECLARATION

I declare that this research project entitled "Assessment of Practices and Challenges of Project time and Cost Management; A case of Bishoftu City Infrastructure Construction Project" is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the thesis have been duly acknowledged.

Candidate:

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Date : July 14/2023

LETTER OF CETIFICATION

As Masters research project advisors, I hereby certify that I have read and evaluated this research project prepared under my guidance, by Belay Demissie entitled "Assessment of Practices and Challenges of Project time and Cost Management; A case of Bishoftu City Infrastructure Construction Project" I recommend that it can be submitted as fulfilling requirement of Masters of Art Degree in project Management.

Solomon Markos (PhD)
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Date

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ABSTRACT

Time and cost have its proven importance as the prime factor for infrastructure construction project success. This study assessed the practices and challenges of infrastructure construction projects time and cost management focusing on infrastructures construction projects of Bishoftu city. The objective of this study was to assess the practices and challenges of time and cost management of infrastructure projects forwarding proper remedial solutions. Descriptive types of research design with both quantitative and qualitative data type were used to assess the practices and bring out the challenges to the front for future recommendations. Data collected using questionnaires and interview for primary data source and document review for secondary data source were used to collect information and have been analyzed quantitatively and qualitatively. Interpretations have been done based on the common points and conceptualizing and explaining issues interrelated to one another in the themes. The analysis was mainly descriptive and the information collected from both primary and secondary sources were processed with the help of Microsoft excel and the analyzed data were presented using tables, chart, and percentage. The study strongly assessed the practices and challenges of time and cost management for infrastructure construction projects. There are poor practices of application of project management strategy and techniques for initiation, planning, execution controlling and closing for both project time and cost management in the city. Projects are delaying from 2 % - 137 % and cost overrun of these projects are from 17 % - 152 %. There was no sufficient communication among the stakeholders. Project scopes were not adequately defined. Contingency plans were not properly included in the project plans and the project plans were not detailed to the extent understandable by all the stakeholders. The study recommended that the city should use proper project management tools and techniques for planning, execution and control. Involvement of all concerned stakeholders during project planning and implementation will help the city to overcome the challenges.

Key Words: Cost Overrun, Infrastructure Construction Project, Time Delay.

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CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

The country's continued development depends on its infrastructure. While infrastructure provision can be costly, it has the potential to boost urban growth and the economy, impact settlement patterns and land use, and improve quality of life. Inappropriate land-use decisions, on the other hand, can have a negative impact on the efficient and effective functioning of infrastructure, reducing the advantages provided by infrastructure investment decisions (Afolayan et.al, 2017).

From a project management perspective, it has been argued that a successful project should meet the following criteria (Kerzner, 2009): (1) Complete within planned time and budget; (2) is carried out at a specified level of project performance; (3) provided in accordance with the needs and expectations of project stakeholders; (4) be completed within defined and agreed boundaries; Proper project planning and an established monitoring system are essential for this. However, time and cost overruns are a major problem for many infrastructure projects, and construction projects often fail to meet their goals within projected costs. Cost overruns are a common phenomenon affecting nearly every project in the construction industry. Achieving project completion is therefore not an achievement for the project owner. For a client or project owner, the success of a project depends on many factors. The most important factors are completing the project within budget and reaching the project completion date on time with quality work and no health and safety issues.

As the population grows, so does the demand for infrastructure, such as roads and urban storm water drainage systems. Ethiopia's growing urbanization, have higher demands of infrastructure and cities are highly investing lots of money on infrastructure construction. Construction project is a mission undertaken to create a unique facility, product or service within specified scope, quality, time and cost (Chitkara, 2004).

At both the national and international levels, the construction industry is a significant economic sector. Today, it contributes significantly to the growth and transformation of the country, provides a large number of jobs for its citizens, and has a significant impact on the economy. However, one of the main issues and hotly debated topics at the executive level is delays and cost overruns. Project execution delays are caused by time and cost overruns. Project overruns

are a serious problem in developing countries where project implementation is fraught with uncertainty. It wastes limited financial resources, delays facility delivery, hinders development, and increases construction costs (Turner, 1999). A scientific and systematic approach to project management is required to ensure project goals are met within the time and resource constraints imposed by globalization and technology-driven economic growth around the world (Chithkara 2006, Prabhakar 2008).

The main determinants of a project's success are time and budget. Changes in the owner's requirements, unforeseen site conditions, evolution of the design philosophies, and design or budget mistakes account for the majority of factors influencing project time and cost overruns (Harold, 2009). For the client or project owner, the completion of the project within the budgeted cost, reaching the project's completion date without delay, producing high-quality work, and posing no health and safety risks are the most crucial factors.

A major cause of project cost overruns and delays is the lack of an established and efficient system for tracking and controlling project time and costs. As a result, many construction projects in Ethiopia continue to suffer delays and cost overruns, often due to weak cost control systems. Even when the infrastructure is built by the city, the challenge of completing the project on time and on budget while maintaining appropriate quality standards remains. There are also challenges associated with planning projects with the right planning tools. Therefore, it is more pertinent to know and assess the practices and challenges faced by cities when planning and implementing infrastructure projects in order to increase the efficiency of project implementation.

1.2. Statement of the Problem

Projects are needed to be completed within the time frame, budgeted cost and required quality. However, many projects take longer time to complete, cost more than necessary and some projects are cancelled because of inefficient planning, execution, controlling and related challenges directly and/or indirectly related with it (Richard, 2012). Project schedule and budget management in construction involves complex challenges mainly due to the magnitude of stakeholders involved such as the owner, prime contractor, subcontractors, vendors, material suppliers, end users, regulatory agencies. Infrastructure construction projects in Ethiopia are increasing in size as well as challenges related to time and cost management is also increasing. In different studies, cost overrun was identified the major problem where 9 of 10 projects faced the overrun in the range of 50 to 100% (Werku & Koshe, 2016). Public building in Ethiopian constructions are suffering from delay, only 8.25% projects were finished on the original

planned completion date and the remaining 91.75% delayed up to 352% of its contractual time (Werku & Koshe, 2016).

The three variables time, cost, and quality are interrelated and a change in any single variable frequently has a significant impact on the others (Robert & Wallace, 2004). This means in trying to meet schedule and quality requirements, costs increase. Conversely, in trying to contain costs, quality of the work done erodes and schedules slip. If we try to deliver the project under the minimum time then we have to endure additional cost and maybe tradeoff the quality of the deliverables. This indicates that a project cannot be completed according to the initially planned budget and schedule without making any tradeoffs.

In recent times, it is extremely rare that a project is completed within its set budget. Proper planning is the key to a successful project, but there are few problems that are usually beyond the realm of planning. One of them is the budget overrun. It's true that we can avoid certain problems through planning and proper execution but it can never predict exactly what would happen once we start a project, as we execute the project proper adjustments and tradeoffs need to be made to the budget and schedule to deliver the project to the client. For the client the major key success factors are completing the project with the budgeted cost, with the stated time and with the quality defined, failing to meet the first two factors is what becoming a headache for almost every construction projects in our country (Ashebir, Wubishet, and Murad, 2017: Abubekir 2015: Zinabu and Getachew 2015: Fetene 2008). This problem in turn is causing difficulties in financing of upcoming projects, timely utilization of the facility by the public and the relationship among stakeholders (Client, Contractor, and Consultant) involved in the construction process. As every project is unique, there is no a single cause for construction project delay and cost overrun. But a challenging factor in one area will have a significant ripple effect over all other related areas, specially time and cost management have high interrelated scopes.

Delay and cost overrun are inherent part of most projects despite the much acquired knowledge in project management. It is therefore much appreciated to look at some reasons of delays and cost overrun in project and their mitigation process, so as to increase the perception of project success. In regard to Bishoftu City infrastructure construction activities, projects are delaying as well as costing over their planned budget. Time overrun and cost overrun are becoming the major challenges that the city is facing and challenging the life of the residents as well as infrastructure are not giving service within their planned time as budget. On the basis of data gathered from the desk study, the entire project evaluated in desk study registered time and cost

overrun. The rate of time overrun ranges from a minimum of 17 % to the maximum of 152 % of the contract time. Cost overrun, on the other hand, ranges from a minimum of 2 % to the maximum of 137 % of the contract amount for individual projects.

Bishoftu city has also not conducted assessment on practices and challenges of project time and cost management system and there are no studies conducted in the city to identify and tackle the challenge as there is a spill over effect on these areas. Those comprehensive views of all project time and cost management practice and challenge are necessary in order to effectively manage project implementation as there is construction time and cost management failure among stakeholders during construction contract execution remained the deep-rooted problem of the city. In line with, the study intended to fill this research gap to identify and evaluate major practice and challenge of project time and cost management system in Bishoftu City infrastructure construction projects.

1.3. Research Questions

The basic research questions are:

- What are the practices and challenges of the time management in infrastructure construction projects?
- What are the practices and challenges of the cost management in infrastructure construction projects?

1.4. Objective of the Study

1.4.1. General Objective

The main objective of the study is assessing the practices and challenges of the project time and cost management system as well as their interrelationships for infrastructure construction projects of Bishoftu city.

1.4.2. Specific Objectives

The specific objectives of the study are:

- To assess the practices and challenges of the project time management in infrastructure construction of Bishoftu city.
- To assess the practices and challenges of the project cost management in infrastructure construction of Bishoftu city.

1.5. Scope of the Study

The study is limited to Bishoftu city specifically to infrastructure department, even if there are general facts to be built to the general science. Detail planning software's which were used by the city were not analyzed except the outputs of the software were used for interpretations of the results.

The topic is limited to assessment of the practices and challenges of time and cost management only and all areas of time and cost managements are not considered. There is also time limit to assess all the details of the evidences as sample documents of the city are used for general interpretation of the paper.

1.6. Significance of the Study

The Study will help understand the practices the city is using now and enhance the project management system through identification of the practices and challenges related to infrastructure time and cost management. In addition during the planning, execution and closure of the infrastructure, the city will use this document as input to change its project planning, implementation as well as closure procedures.

Other researchers will also use this document as an input to study their researches in areas of project planning, scheduling and cost management.

1.7. Limitations of the Study

Though the study presented a comprehensive theme over the succeeding research results, it is not free from limitations. There are resource limit, time limit, limit to access information, when the researcher inquires respondents, they may be hesitating of the purpose of the study and show the sort of reluctant to offer the correct information because most of developing country public procurement construction projects are not free from corruption practices which are problems during management of time and cost in infrastructure projects, within our time frame the respondents are may be busy, and some of these bodies may not be willing to provide information that they think is confidential. It may be also difficult to gather sufficient information for the study due to the limited number of related prior research works regarding the assessment of the practices and challenges of infrastructure construction projects time and cost management. Here for limitation stated above the researcher has passed through by managing respondent's appointments in accordance of study's time schedule, by using wisely the allocated resources and by providing the required care and orientation for all respondents.

1.8. Organization of the Paper

This Thesis paper will be organized into five chapters: Chapter one contains the introduction part dealing with back ground of the study and study area, the research problem, research questions, objectives of the study, scope and limitation and significance of the study. The second chapter discusses the literature review about time and cost management. In chapter three research methodologies will be presented. In chapter four the analysis, presentations, and interpretation of the data collected, results and discussion of the study are presented and finally, in chapter five the major findings, conclusions and recommendations are presented.

CHAPTER TWO

LITERATURE REVIEWS

2.1. Overview of Project and Project Management

2.1.1. Project

A project is a temporary effort aimed at producing a unique product, service, or result. The time-limited nature of projects means that a project has a definite beginning and end. The end is reached when the objectives of the project are achieved or when the project is terminated because the objective could not be achieved or when the need for the project no longer exists. The International Project Management Association (IPMA) defines a project as a time- and cost-constrained process aimed at achieving a defined set of deliverables that meet quality standards and requirements. On the other hand, the Association of Project Managers (APM) defines a project as a one-time, temporary undertaking undertaken to achieve a desired result.

A project is a sequence of unique, complex, and interrelated activities that have a goal or purpose and must be completed within a specified time frame, within budget, and according to specifications (Wysocki, 2014).

2.1.2. Project Management

Project management is a set of tools, templates and processes designed to address the following six questions: What is the operational state of this project? What should the organization do? What do you think you're doing? How do you plan on doing that? How can you know you did it? And to what extent have you done it? (Wysocki, 2014).

Project management is the planning, organizing, directing, and controlling of organizational resources for a relatively short-term objective that has been established to achieve specific goals and objectives (Kerzner, 2009). Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements (PMI, 2013). This application of knowledge requires effective management of project management processes, which are interrelated actions and activities performed to create a predetermined product, service, or outcome. Each process is characterized by its inputs, the tools and techniques to be used, and the resulting outputs. Project management is achieved through the appropriate application and integration of logically grouped project management processes, which are

divided into five process groups. Namely, the process groups initiation, planning, execution, monitoring and control, and closure (PMI, 2013).

2.1.2.1. The Ten Knowledge areas of Project Management

A knowledge area represents a complete set of concepts, terms, and activities that make up a professional field, project management area, or area of specialization. These ten knowledge areas are used in most projects. Project teams should use these ten knowledge areas depending on the project. The knowledge areas are: Project integration management, project scope management, project time management, project cost management, project quality management, project personnel management, project communication management, project risk management, project procurement management, and project stakeholder management (PMI, 2013).

From the knowledge areas described above, the main focus of this paper is project time and cost management.

Project Time Management - Project time management includes the processes required to manage the timely completion of the project (PMI, 2013). It includes both a planning and a control component. The planning component provides time estimates for both the duration of a project task (that is, how long will it take to complete the task) and the actual effort or labor time required to complete the task. The duration is used to estimate the total time needed to complete the project. The labor time is used to estimate the total labor cost of the project. The control component is part of the Monitoring and Controlling Process Group and involves comparing estimated times to actual times as well as managing the schedule and cost variances (Wysocki, 2014).

Project Cost Management - A project cost management process is a method by which costs of labor, equipment, material and administration are formally identified, approved and paid (PMI, 2000). Project Cost Management includes both a planning and a control component. The planning component includes building the project budget and mapping those costs into the project schedule. This provides a means of controlling the consumption of budget across time. Variance reports and earned value reports are used in the Monitoring and Controlling Process Group (Wysocki, 2014).

2.1.2.2. Infrastructure Construction Project Management

Construction projects are series and collections of projects related to the construction sector that have a limited time span and resource allocation to realize an idea and a specific goal after the idea is feasible (Majib, 2006).

All construction projects begin with planning, design, and financing and continue until the structure is ready for use. During its lifetime, a construction project goes through a long and complex process. Infrastructure construction projects consist of many smaller project activities that follow one another and are interrelated. A series of activities consists of initiation, planning, design phase, procurement phase, execution phase, maintenance phase, and preparation for operation or use. The management of infrastructure construction projects is completely different from the management of other projects. The distinction lies largely in the nature and characteristics of construction projects (Ahmed et al., 2003). It is important to consider these differences when managing construction projects successfully.

Construction projects tend to be capital intensive, complex, and require extensive management skills and the involvement and coordination of a wide range of professionals from different fields. They are often labor intensive and require a large amount of materials and tools. The ultimate goal of a project is to complete the project within budget and on time and quality.

The choice of procurement system is the main factor for the poor performance of the construction industry (Dissanayaka and Kumaraswamy, 1999). The main performance criteria of construction projects are financial situation, work progress, quality level, health and safety, resource allocation, client and consultant relationships, management skills, disputes and claims, subcontractor relationships, credibility, and subcontract scope (Theodore, 2009). Construction schedule and budget are becoming increasingly important as they are often used as criteria for measuring project success and project organization productivity.

Project Schedule Management

One of the many tasks of a project manager is to make sure that the scheduled end date of the project can be met and to find ways to do so. This requires a good knowledge of time management. There are six processes in the project schedule management knowledge area, all of which belong to the planning process group, with the exception of the control schedule. The processes performed during planning are schedule management planning, activity definition, activity sequencing, activity estimation, activity duration estimation, and schedule development.

The scheduling method can be pseudo-static, such as the critical path method (CPM), or dynamic, meaning it can be changed over time (agile) (PMI, 2017).

Project Cost Management

Project cost management is a practice that includes processes for cost planning, cost estimating, budget allocation, project financing, and cost control, with the goal of completing the project within the planned budget (PMI, 2013). There are four processes in the knowledge domain of project cost management, all of which belong to the planning process group, with the exception of cost control. The processes in the planning process group include cost management planning, cost estimating, and budget setting. Cost estimation is an assessment of all costs for the activities of a project in accordance with the agreed scope (R.E. Westney, 1997).

2.2. Practices and Challenges in Infrastructure Construction Project Time Management

A successful construction project is an integrated effort of people with diverse skills to ensure that it is completed within the allotted time, without exceeding the allotted budget, and within the established quality and standards. However, for a variety of reasons, project success in construction, especially in developing countries, does not always occur due to delays and cost overruns. There are many causes of delays and cost overruns in construction projects. Several studies have highlighted various factors based on conditions such as project type, specific location, and project size.

The critical success factors for successful completion of the project are time, cost, and quality, especially in developing countries because public projects are undertaken with limited resources (Nega, 2008). However, most public works projects experience huge schedule delays. There are several variables that can affect project objectives differently. These include: the dynamics of the external environment, frequent changes in technology, organizational structure and size, project complexity, project cost, organizational culture, people involved, and strategy. Minimizing project cost and schedule overruns due to unforeseen events in both budgets and schedules plays an important role in providing the project manager with the necessary estimating caution. To significantly reduce and control the contingencies in a project, effective planning and allocation of these contingencies is important for any project manager (PMI, 2010).

In Ethiopian construction practice, it is very rare for construction projects to be completed in the specified or agreed time. Delays are commonplace on construction projects in Ethiopia, with

most projects experiencing delays between 100% and 460% of the original contract time. Delay in construction is when actual progress in the various phases of a construction project falls behind schedule or when the project deadline is not met (CIOB, 2008). The term "construction delay" refers to prolonged construction time and interruptions of events that disrupt the construction schedule. Delays are generally considered to be the most dangerous, costly, common, and complex problems in project delivery (Cheung et al., 2001). Construction projects are notorious for their delays. Experience with infrastructure construction projects around the world shows that, almost every project experiences delays on a regular basis (Ahmed et al., 2003). The major processes of project time management are:

- i. Plan Schedule Management - The plan contains various information on how the schedule will be created, who will be responsible for it, how aggressive it will be, and under what conditions it will be changed.
- ii. Define Activities – Projects are usually divided into different activities. Those activities involved in the project should be identified and defined in a way that in each task is handled in a better way.
- iii. Sequence Activities – After defining the activities, they should be sequenced in an orderly manner and the relationship between them is established. The activities of the project are tasks are “sequenced” that is, they are ordered and the relationships between them are established. These relationships take the form of Finish-to-Start (FS), Finish-to-Finish (FF), Start-to-Start (SS) and Start-to-Finish (SF). However if the projects are small, these forms are not necessary (PMI, 2010).
- iv. Estimate Activity Resources - Once the tasks are sequenced, each activity must be assigned the necessary resources which are needed the successful completion of the project.
- v. Estimate Activity Durations - A time which is needed to complete the activities specified should also be estimated.
- vi. Develop Schedule - In order to determine the critical path, network diagram should be produced and next a graphical bar chart schedule is created with each activity on their early start dates and finally the resource usage is plotted.
- vii. Control Schedule. The schedule needs to be controlled regularly to determine the status of the project.

2.2.1. Practices of Infrastructure Construction Project Time Management

Construction delay refers to exceeding a contracted project completion date or exceeding a contracted project delivery date (Assaf & Al-Hejji 2006). In Ethiopia, delays occurred in 94% of 52 public works projects surveyed that were constructed by local contractors between 1995 and 2005 (Abdo, 2006).

2.2.1.1. Classification of Delays

Delays can be classified based on its source, compensation events, nature and responsibility.

i. Types of Delays by Source

Construction delays are usually caused either by the parties to the contract, such as the client, contractor, and consultant, or by factors beyond the control of the parties, or by force majeure (Alhaji & Danladi, 2012).

a. Client

Delays are caused by actions of the principal that result from his need or actions that are contrary to the provisions specified in the contract. Examples include late payments to the contractor, change orders, differing site conditions, interference, late decision making, etc. In this case, the contractor is entitled to demand an extension of time and financial compensation (Saeed, 2012).

b. Contractor

Delays are also caused by the contractor's failure to perform activities due to problems for which the contractor is responsible, which eventually leads to time and cost overruns. Examples include inadequate experience, poor site management, problems associated with subcontractors and suppliers, shortages of materials, labor, and funds, improper project planning, construction errors, etc. In this case, the Contractor is not entitled to an extension of time and financial compensation, but must pay liquidated damages to the Owner.

c. Consultant

In fact, delays may be due to problems of the consultant, e.g. planning errors, late approval of tests and drawings, poor project management, etc. In this case, the Contractor shall be entitled to claim an extension of time or/and financial compensation, while the Client shall not be entitled to claim liquidated damages, since the Contractor is the Client's representative and is under the Client's control.

d. Force majeure

Delays are caused by force majeure beyond the control and without fault of the Client or the Contractor. Examples include the unforeseeable act of a third party for which the Contractor is not responsible, a governmental prohibition preventing performance of the contract, a natural disaster such as an earthquake, lightning strike or flood, international war or civil war, and the death or serious accident or unexpected serious illness of the Contractor. In this case, the contractor is not entitled to financial compensation, but to an extension of time for completion of the project. Furthermore, the contractor does not have to pay the client liquidated damages (ECC, 1960)

ii. Types of Delays by Compensation

Construction delay is classified into two major types of delay based on compensability such as non-excusable (contractor-caused) delay and excusable delay. The excusable delay is further classified into compensable (client-caused) delay and non-compensable (force majeure-caused) delay from contractor perspective (Alhaji & Danladi, 2012).

iii. Types of Delays by Nature

Construction delays are classified into three categories such as independent delay, serial delay and concurrent delay based on their time of occurrence (Arditi & Robinson, 1995; Stumpf, 2000).

a. Independent delays

An independent delay is defined as a specific delay that occurs alone and without concurrency with other delays (Arditi & Robinson, 1995). Analysis of this type of delay is straightforward, and the impact can be easily determined by inserting the delay into the project schedule, but an independent delay can result in serial delays. An example is when a contractor fails to deliver only materials.

b. Serial delays

A serial delay is a series of consecutive, non-overlapping delays that are interrelated; it is caused by the action or inaction of one of the parties (Raid et al., 1991). Measuring the effects of serial delays is comparatively simple because none of the individual delays affect each other. An example is when the client fails to pay the contractor and the contractor subsequently fails to deliver the material sequentially (Arditi & Robinson, 1995).

c. Concurrent delays

Concurrent delays are defined as two or more delays occurring at the same time, any one of which would result in a delay to the project. Concurrent delays can be caused by a combination of delays as follows (Kraeim, 1987):

iv. Types of Delays by Responsibility

Responsibilities for delay are categorized as principal responsible, contractor responsible, neither party responsible, and both parties responsible to determine which party is entitled to compensation (Ahmed et al, 2002).

2.2.1.2. Determinants of Project Delay

Determinants of delays in public sector construction projects are: Construction materials, project financing, project planning, contractor experience, and work monitoring. According to the Project Management Institute (PMI, 2010), project time management includes the following elements:

- i. Schedule Management – The process of establishing policies, procedures, and documentation.
- ii. Activity Definition - The process of identifying and documenting the specific actions that must be performed for project deliverables.
- iii. Sequencing of Activities - The process of identifying and documenting the relationships between project activities.
- iv. Estimating Task Duration - The process of estimating the number of work periods required to complete individual tasks with the estimated resources.
- v. Develop Schedule - The process of analyzing the task sequence, duration, resource requirements, and schedule constraints to create the project schedule model for monitoring and controlling project execution.
- vi. Schedule Control - The process of monitoring project status to update the project schedule and manage changes to the schedule baseline.

Construction is an industry that transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development. It encompasses the process by which said physical infrastructures are planned, designed, procured, constructed or manufactured, altered, repaired, maintained, and demolished (MUDC, 2012).

2.2.2. Challenges in Infrastructure Construction Project Time Management

A construction project is commonly considered successful if it is completed within the specified time, at the specified cost, and to the satisfaction of the client (Assaf and Al-Hejji, 2006). In contrast, delays are a common phenomenon in most construction projects, negatively affecting the employer, contractor, and other stakeholders? (Abdul-Rahman, 2006). It is obvious that project delays lead to additional costs and consequently affect the quality of the project. However, the impact of delays is not limited to the project itself, but also affects the overall economy of the country and is therefore at the heart of a country's economic development efforts (Divya and Ramya, 2015).

In the case of Ethiopia, more than 60% of government investment funds go to the construction sector, making it the largest recipient of the budget, according to the Ministry of Finance and Economic Development (MoFED, 2016). However, a major problem affecting the country's planned economic development is significant delays in these public construction projects (Zinabu, 2015).

Construction projects experience recurrent delays, but the extent of these delays varies from project to project. An empirical study on the major determinants of construction delays was conducted with the aim of identifying the important dimensions of construction delays, and nine dimensions related to design, equipment, personnel, labor, experience, government, material, finance, and owner were identified (Abinayasri, Anandakumar & Krishnamoorthy, 2017).

Factors affecting project performance include: Delays due to border/road closures leading to material shortages, unavailability of resources, low project management skills, escalation of material prices, unavailability of highly experienced and skilled personnel, and poor quality of available equipment and raw materials (Enshassi, Mohame, & Bushaban, 2009). Delays can lead to many negative impacts, such as cost overruns, and are of great concern to all those involved in the construction industry.

Causes and effects of delays in the Malaysian construction industry and identified the top ten causes: (1) improper planning by the contractor, (2) poor site management by the contractor, (3) insufficient experience by the contractor, (4) insufficient funds and payments by the client for completed work, (5) problems with subcontractors, (6) shortage of materials, (7) shortage of labor, (8) availability and failure of equipment, (9) lack of communication between parties, and (10) errors during the construction phase (Sambasivan and Soon, 2007).

The factors identified in the study show that the main critical factors causing construction delays in Ethiopia are as follows: (1) difficulty in obtaining project financing from a contractor; (2) escalation in material prices; (3) ineffective project planning; (4) problems in scheduling or resource management; (5) delay in progress payments for completed work; (6) lack of skilled construction management personnel; (7) fluctuating availability of labor from season to season/seasonal availability of labor.

The challenges of the construction sector in Ethiopia are: Lack of skilled and unskilled labor, machinery and tools, lack of appropriate standards and guidelines, lack of strong institutional capacity to oversee the construction industry, lack of construction project management and control. These challenges have contributed to poor performance levels in the industry, resulting in delays, cost overruns, and poor delivery quality. Corruption and unethical actions among the key players in the industry are the known obstacles resulting from low implementation capacity. Therefore, the main challenges can be summarized as low implementation capacity in terms of labor, material and machinery supply, and organizational and systemic issues. Improving the capacity of domestic contractors and consultancies and enhancing the performance of the public sector and private developers in implementing management controls, as well as ensuring the application of cost-effective and innovative technologies and practices to support socioeconomic development, are among many recommendations (Hailemeskel, 2013). Project delays and cost overruns are the most important problems in the construction industry, and cost overrun factors are positively related to construction project delay (JIA, 2015).

2.3. Practice and Challenges of Infrastructure Construction Project cost Management

In the construction projects implemented in recent years, cost overrun is one of the main problems in Ethiopia (Fetene 2008: Abubekir 2015: Zinabu and Getachew 2015). This problem, in turn, creates difficulties in financing upcoming projects, in the timely use of the facility by the public, and in the relationships between the actors involved in the construction process (client, contractor, and consultant).

There are some measures which are used to overcome the problems of cost overruns (Kaliba et al., 2009).

- Proper Project Costing and Financing
- Competent Personnel
- Appropriate Scope Definition

- Proper Cost Control
- Risk Management during Project Execution
- Appropriate Contractual Framework
- Increase Supply of Materials
- Realistic Cost Estimation
- Efficient Management

2.3.1. Practices in Infrastructure Construction Project Cost Management

Project cost management includes the processes of estimating, budgeting, and controlling costs so that the project can be completed within the approved budget (PMI, 2010). It is primarily concerned with the resource costs for the activities included in the schedule and is often referred to as life-cycle costing, which is described as the process of allocating costs to individual life-cycle phases of the project. Acquisition, operating, and disposal costs are considered when evaluating various project alternatives (Ibid).

Project cost management has four phases, (PMI, 2013);

i. Resource planning

It is a matter of determining what physical resources (people, equipment, and materials) should be used, in what quantities, and when they are needed to carry out the project activities. For example, the construction team needs to be familiar with local building codes. This knowledge is often readily available from local vendors.

ii. Project Cost Estimation

The main objective of the project cost estimate is to develop the financial resources necessary to complete the project activities on time, cost and scope and quality constraints. The inputs for estimation of project cost are human resource management plan, scope baseline, project schedule, risk register and project's Scope Statement and Work Breakdown Structure (WBS) (PMI, 2013). On the other hand, the most common methods to develop estimates are through comparison of project to previous efforts, using historical data and statistical models, or bottom-up estimation with each task, expert judgment and project management software. In addition, cost estimation should be based on the project scope, WBS and be connected to the project plan. To reach a correct estimation it is important that each activity is estimated based on the conditions of the execution of the specific activity (Olawale & Sun, 2010).

The accuracy of project cost estimate can be improved by using “three-point model”, which is derived from “expert judgment and past experience, has come to be known as the program evaluation review technique (PERT) and uses three estimates to determine the approximate range of costs of the project. The range consists of the Most Likely (CM), Optimistic (CO), and Pessimistic (CP) estimates” (Ibid), which will give a weighted average estimation as follows:

$$CE = (CO + 4CM + CP) / 6$$

iii. Project Cost Budgeting

Cost budgeting is the process of adding up the costs of individual work packages to create an authorized cost baseline that will serve as a benchmark for evaluating the success of the project. The project cost budgeting stage might be combined with the project cost estimation stage in smaller projects. But when creating the project budget for large projects, it's important to budget for contingencies and other expenses as well (Owen et al, 2007).

For the proper establishment of the budget, the contingency and allowance are crucial cost components to account for risk or unforeseen expenses. Ignoring these cost factors could compromise the successful completion of the project. Develop and communicate the cost build-up process within the organization as one way to address such issues with project cost management. Clear understanding of the budgeting components, such as the base estimates, contingency estimates, allowances, and budget reserves, is the first step in creating a budget (Ibid).

iv. Project Cost Control

Comparing actual spending to baseline cost plans in order to identify variances, consider potential solutions, and take the necessary action is known as cost control. Cost control should examine the earned value for each cost incurred in the project in addition to comparing the planned value and actual cost of each work package (Guo-li, 2010). To accurately forecast future and final project costs, a performance analysis of the current financial situation is required. According to the PMBOK, a project's cost can be monitored and controlled using a variety of techniques. Earned Value Management (EVM), total to-Complete Index (TCPI), forecasting, variance analysis, and performance reviews are a few examples of advanced techniques.

a. Earned value management (EVM) is a methodology that combines scope, schedule, and resource measurements to assess project performance and progress. It is a commonly used method of performance measurement for projects. It integrates the scope baseline with the cost

baseline, along with the schedule baseline, to form the performance baseline, which helps the project management team assess and measure project performance and progress. It is a project management technique that requires the formation of an integrated baseline against which performance can be measured for the duration of the project. The principles of EVM can be applied to all projects in any industry. EVM develops and monitors three key dimensions for each work package and control account:

Planned value: Planned value (PV) is the authorized budget assigned to scheduled work.

Earned value: Earned value (EV) is a measure of work performed expressed in terms of the budget authorized for that work.

Actual cost: Actual cost (AC) is the realized cost incurred for the work performed on an activity during a specific time period. It is the total cost incurred in accomplishing the work that the EV measured.

Variance analysis: Variance analysis, as used in EVM, is the explanation (cause, impact, and corrective actions) Cost variance is the most frequently analyzed measurement for cost ($CV = EV - AC$).

Cost variance: Cost variance (CV) is the amount of budget deficit or surplus at a given point in time, expressed as the difference between earned value and the actual cost. It is a measure of cost performance on a project. It is equal to the earned value (EV) minus the actual cost (AC). The CV is particularly critical because it indicates the relationship of physical performance to the costs spent. Negative CV is often difficult for the project to recover. Equation: $CV = EV - AC$. The CV values can be converted to efficiency indicators to reflect the cost performance of any project for comparison against all other projects or within a portfolio of projects.

Cost performance index: The cost performance index (CPI) is a measure of the cost efficiency of budgeted resources, expressed as a ratio of earned value to actual cost. It is considered the most critical EVM metric and measures the cost efficiency for the work completed. A CPI value of less than 1.0 indicates a cost overrun for work completed. A CPI value greater than 1.0 indicates a cost under run of performance to date. The CPI is equal to the ratio of the EV to the AC. The indices are useful for determining project status and providing a basis for estimating project cost and schedule outcome. Equation: $CPI = EV/AC$.

b. Forecasting: the EVM helps to forecast the future performance of a project. The forecast is based on the current actual performance. The forecasting method helps to determine the schedule delay and the corrective action, such as Crashing, required getting the project back on track.

c. The Variance Analysis: is the comparison of expected project performance to the actual cost performance. This analysis is believed to be helpful for the project manager to understand the causes of variance, if any and preventative and corrective actions are determined based on the variance analysis.

d. Performance reviews: Performance reviews compare cost performance over time, schedule activities or work packages overrunning and under running the budget, and estimated funds needed to complete work in progress.

There are different types of costs including; labor cost, material cost, plant and machinery costs, administration costs and other expenses. In order to identify costs associated with an activity, construction costs are classified into; Direct costs and Indirect costs or Overhead costs.

Direct Costs: Direct costs are costs incurred to a specific activity or a work item, which is being done or produced. Direct cost of permanent work item = Direct material cost + Direct labor cost. Direct material costs cover all costs related to materials, which are incorporated into regular works of the project. Direct labor costs include, net expenses for procurement, maintenance, and wages of all categories of workers employed at the work site for the execution of a project.

Indirect Costs: Indirect costs include all costs, which are attributable to a given project but cannot be identified in a specific activity or a work package (Fetene, 2008).

2.3.2. Challenges in Infrastructure Construction Project Cost Management

Construction project cost overruns have a variety of causes, some of which are not only difficult to predict but also to manage [Morris and Hough, 1991]. Inflationary pressures, increases in labor costs and material costs, challenges in obtaining construction materials, delays in the construction process, flaws in cost estimates created by public agencies, and unforeseen subsoil conditions were found to be the main causes of cost overruns. (Arditi, et al., 1985).

The accuracy of the initial cost estimate, the extent of governmental regulation and control, the timing of construction completion, the number of design changes, and labor-related issues like employee availability, skill levels, and wage increases can all contribute to cost overruns. Project owners identified five causes of project cost overruns: inadequate pre-planning, rising material costs, delayed decisions, and a high number of change orders (Robert, 2007). Construction

project costs can fluctuate over time due to a number of factors, including poor project management, design changes, unforeseen ground conditions, inflation, material shortages, currency fluctuations, hiring the wrong contractors, funding issues, and force majeure.

Lack of proper phasing of construction projects can cause the economy to overheat in developing nations. Due to the fact that demand will outpace supply, there will be a shortage of construction materials. As a result, the price of these materials will rise. This will inevitably result in project cost overruns, which will have an adverse impact on inflation and the efficiency of the construction industry [Mansfield, Ugwu and Doran, 1994].

Project cost overrun is the amount by which the actual cost exceeds the budgeted original target cost of a project. Cost Overruns are also defined as the additional amount of budget which actual costs exceed estimate. It is represented as;

Cost Overrun = Actual Cost – Estimated Cost.

Most significant causes of cost overrun

i. Lack of or poor scope definition

In order to increase the precision of cost, time, and resource estimates, the major project deliverables are divided into smaller, more manageable components through the scope definition process. Projects with unclear directions, features, goals, or even purposes are the result of poor scope definition. It is crucial to understand that if the initial steps of creating a thorough scope statement and work breakdown structure are carried out incorrectly, they effectively render any attempt to realistically estimate project costs as a fruitless exercise.

Poor scope definition will inevitably result in changes that disrupt project rhythm, require rework, extend project time, and lower employee morale and productivity, which will raise project costs in the end. Poor scope definition often leads to an inaccurate project estimate, which results in cost overruns and significant delays in construction projects.

ii. Unanticipated technical difficulties

Inadequate initial design is typically where this issue originates, but it is not always the case. Testing frequently leads to revelations that may not have been immediately obvious during the initial design stage, usually in the form of issues and technical issues that need to be fixed. Since adherence to technical requirements is essential to the performance and acceptability of a product, the only option available when these problems arise is to incur additional costs.

Project's successful implementation and completion depend on its proper project design. Such design plans are regarded as the foundation of construction projects. Cost overruns are undoubtedly the result of poor project designs. Error in project design results in rework of items, demolition of already built works, cost overrun, and project delay.

iii. Low initial cost estimates

The performance and duration of project tasks are frequently evaluated in isolation, without taking into account the impact of nearby activities. This leads to an incorrect assumption that everything will go according to plan, underestimating the scope and complexity of the task at hand and failing to foresee potential future issues.

One of the myths surrounding low initial cost estimates is the project manager's belief that it is political gamesmanship to present low costs to decision-makers in the hopes that they will be accepted. The unfortunate result of this is that projects that lack a solid basis for cost estimates are approved, which leads to cost overruns.

iv. Specification changes or scope creep

During the project development process, a number of factors, such as dynamic market changes, newly perceived customer requirements, and new legislative mandates related to the product, may require specification changes.

Initial cost estimates are essentially meaningless due to specification changes. While requests for specification changes during the course of the project occasionally come from within the project organization, external sources are more frequently the source of these requests.

v. External factors

Delays brought on by international politics can result in significant increases in the actual project costs incurred in the case of multinational public sector projects. Actual project costs may also increase as a result of outside variables like inflation, interest rates, environmental problems, and changes in currency exchange rates.

2.4. Construction Project Delay and Cost Overrun Factors

Problems like poor quality, high costs, and time overruns are prevalent in Ethiopia's construction industry. These include overproduction during construction, change orders because of client-requested improvements, inflation or increases in the cost of construction materials, poor planning and coordination. Construction of buildings, roads, and bridges are just a few examples of the sizable public and private projects in Ethiopia that address these issues.

In order to address a well-known issue with project performance, such as accomplishment rates, time, quality-related problems, and cost overruns, research has shown that new methodology and approaches are required for the construction sector globally.

The completion of private and public construction projects in Ethiopia on schedule, within budget, and to the desired level of quality is uncommon. In Ethiopia, a lot of construction projects are underway but are not performing well. Up to 30% of construction costs are attributable to subpar performance, according to research, which also shows that human and material resources are wasted at an alarmingly high rate in developing countries. Construction cost overruns have been a problem in Ethiopian projects, which have been primarily caused by schedule delays, payments that were made later than expected, poor supervision, construction errors, poor coordination and communication, issues with the design and specifications, reworks, a lack of materials and equipment, a labor supply shortage, and inflation (Zinabu and Getachew, 2015).

The project's size, the gap between the lowest bid and the engineer's cost estimate, the choice of delivery method, the degree of competition, the standard of the contract documents, and the nature of interpersonal relationships on the project are all factors that can affect cost overrun rates. The amount of cost overrun depends on the size of the construction project. Large projects are typically more complex, and because of the possibility of items being overlooked during the planning and design phases, complexity may increase the rate of cost overrun. On larger projects, care may be taken from the project's conception to completion, though the stakes are higher. Cost overrun rates decrease as the contract amount increase, cost overrun rates increase with increase in the contract amount of construction projects. The size of the project is highly related to the duration of the contract (Abderisak, 2017).

The construction industry is enormous, intricate, and necessitates significant capital expenditures. One of the biggest issues facing the construction industry is project delays. These delays can cause serious issues for project participants, resulting in expensive disputes and poor working relationships. Every construction project experiences delays, whose importance varies significantly from project to project. Numerous researchers have investigated the reasons behind project delays in the public construction sector.

Planning, design, and engineering-related factors, procurement-related factors, financial related factors, human resource related factors, project execution related factors, contract management related factors, and external related factors have all been identified as potential causes of delays in Indian construction projects (Prasad et al., 2019). The top delay causes included claims

settlement delays, contractor financial issues, owner delays in paying for additional work or variations, late payments from contractors to suppliers or subcontractors, owner variation orders or changes to the project's scope during construction, and owner changes to the design. The study's findings for road projects in particular indicated that delays in transportation projects were primarily caused by delays in land acquisition and utility-related delays. Following are the reasons for delays in road projects, listed in order of frequency and seriousness: the contractor's faults, the owner's causes, Consultant-related causes factors involving services and utilities, causes connected to government regulations, causes connected to government regulations, Environmental factors have been identified as contributing factors (Hasan, et al, 2014). Lack of planning, a lack of resources (both human and financial) on the contractor's end, a suspension of work, a lack of funds on the owner's end, a delay in decision-making, and a lack of experience on the consultant's end are the major causes that were discovered from the other categories, and remarkably, recommendations were made on them.

CHAPTER THREE

RESEARCH METHODOLOGY

This topic states methodology detailing includes description of the study area and target population, description of the study variables, research design, sampling technique and sampling size, sources of data, way of data collection, types of data collected and methods used for data analysis and evaluation, reliability and validity analysis as well as ethical considerations.

3.1. Study Area

The Study area is located to Bishoftu City which is located in Oromia National Regional State, East Shewa Zone at a distance of 47 Km southeast of Addis Ababa and is astronomical location is 8° 43'- 8° 46' North Latitude & 38° 56'- 39° 01' East Longitude on an average elevation of 1,920 meters (6,300 ft.). The town was founded in 1917. Bishoftu is one of the reform towns in Oromia region and has a city administration, municipality and nine kebelles. The town has a structure plan which was prepared in 2010.

Documented data show that the Bishoftu city covers nearly 20,574.45 hectares of land based on the 2010 Revised Structure Plan of the City prepared by Oromia Urban Planning institute. There are varying figures concerning the population size of the city. According to the 2013 Population projection of Central Statistics Agency (CSA), Bishoftu city has a total population of 128,408 but as per Ethiopian urban studies of 2015; the population of the city is 140,039 and sources from the city administration show that total population of the city is 200,064 in 2016.

3.2. Research Design and Approach

The study adopted a mixed methods approach comprising both quantitative and qualitative techniques with the purpose of gaining benefits of the strengths in each to determine and propose effective practices and challenges of project time and cost management system with descriptive and analytical research designs to describe and examine the findings to come up with conclusions and recommendations for implementation. The descriptive type was used to describe the existing condition and practices and challenges of time and cost management in infrastructure construction projects.

3.3. Target Population, Sampling Size and Techniques

Target populations are specified group of people or object for which questions can be asked or observation made to develop required data structures and information. Therefore, for this study, the target populations were employees of Bishoftu city infrastructure department particularly involved in planning, implementation and control of infrastructure construction projects in the city which are actually 22 in number. In addition to the client, 4 representatives of consultant and 6 representatives of contractors shall also be purposely selected depending on the variety of projects they perform.

Census survey was conducted to the deliberately selected participants of the study which are actually 32 in number, including consultant and contractor representatives, in order to get the right respondents who are capable of giving the relevant and accurate information based on the practical experience they have regarding the issues under study. The selection of participants of the study particularly focused on peoples involved in the study and contract administration of infrastructure projects in the city. So that particular subsets of the community were accessed as all participants of a study are selected because they fit a particular profile to conduct uncontrolled observation and personal interview.

Target population for the study is shown in the table 3.1 as:

Table 3. 1: Target Population

It No	Unit or Department	No of Participants
1	Infrastructure department	12
2	Procurement Unit	4
3	Design Unit	6
4	Representatives of Consultants	4
5	Representatives of Contractors	6
	Total	32

The numbers above are the total number of participants involved in the planning, design and contract administration process of the city.

3.4. Data Collection

3.4.1. Source of Data

The study uses both primary and secondary data sources. Majority of the primary research data were collected through desk review, questionnaires and interview. The secondary data were collected from available reports, documents and published articles, journals, books, magazines, and brochures. Report available in the construction departments, planning documents,

procurement plan, study design drawing and reports, manuals, guidelines and other relevant sources were also used as a secondary data.

3.4.2. Data Collection Method

The study employed both qualitative and quantitative data collection method. Formulations of interview by semi-structure interview, observation checklist, guided by the literature review and the objectives of the study were employed to collect pertinent descriptive information.

Primary data were collected through both close and open-ended questionnaire which are used to get essential information from respondents, through structured/semi-structured interview. Desk review and observations were also conducted by the researcher himself to collect the data using observation checklists to be prepared for this study.

Secondary data were gathered from different sources that is related to the study, Such as; books, published articles, journals, magazines, brochures and others sources like city infrastructure and procurement department reports, city design documents, guidelines and manuals for review.

Questionnaires were distributed to workers of infrastructure department, design unit, procurement unit and workers of the contractors and consultants involved in infrastructure construction projects with the aim of grasping perspective of practices and challenges in project time and cost management. The study adopt a structured questionnaire based on (Jamal, 2007) and (Lisa and Margaret, 2015) because the questionnaires used by the mentioned author is more closed with aim of this study and different validity measurement that is applicable internationally.

The researcher conducted an interview session with infrastructure department head, contract administration team leader, design team leader and procurement department head to explore new issues in-depth. The primary advantages of in-depth interviews were to provide much more detailed information than what is available through other data collection methods, such as surveys and questionnaires.

Both questionnaires in depth interview as well as survey questionnaires were prepared for Bishoftu city infrastructure construction area professionals to identify: practices and challenges of the city related to time and cost management in infrastructure construction projects.

The responses which are gathered through the questionnaires are tabulated and analyzed by using descriptive statistics namely percentages besides the common Microsoft office software for close ended questions. In addition proper content analysis shall be conducted to the open ended in-depth interview question responses.

3.4.3. Data Validity and Reliability

Validity is the most critical criterion and indicates the degree to which an instrument measures what it is supposed to measure. The validity of the instrument as well as the data will be checked for its validness based on content validity, criterion-related validity and construct validity while preparing observation check list and interview questionnaires. In addition the validity of the data shall be checked by the construct validity by checking the degree to which scores on a test can be accounted for by the explanatory constructs of a sound theory.

Reliability of the instruments was checked before the instruments were taken for measurements of the data, based on the international standards and guidelines of the subject area. In addition results obtained from both qualitative and quantitative approach were triangulated and used for reliability.

To make sure the research's reliability of the questionnaire the researcher conducted Cornbach's alpha reliability test by using SPSS (Statistical Package for the Social Sciences) and found that 0.96 Cornbach's alpha and it is generally considered as an excellent.

Table 3. 2: Cornbach's Alpha

Questionnaire Area	Cornbach's Alpha	N of Items
Practices of Time Management	0.96	9
Challenges of Time Management	0.96	8
Practices of Cost Management	0.94	7
Challenges of Cost Management	0.98	11

3.5. Data Presentation and Analysis

As such, a good research makes a perfect plan of processing and analysis data. The following procedures and activities were taken during data analysis process. Secondary reference documents stated above were used as a source document to help the researcher understand the status of the city in regard to infrastructure construction performance against standards. Information collected through desk review, interviews, open and close ended questionnaire and other secondary data were analyzed qualitatively and quantitatively. An interpretation was done based on the common points and conceptualizing and explaining issues interrelated to one another in the themes. The analysis is mainly descriptive and the information collected from both primary and secondary sources were processed with the help of Microsoft excel in addition to content analysis and the analyzed data were presented using tables, percentiles, standard MS project and graphs.

3.6. Research Ethics

To reach an agreement with all participants including in the study informed consent form were orally read before the interview started. The informed consent incorporated information's such as the voluntary nature of the research, purpose of the research, extent and procedure of confidentiality and anonymity.

The informants' consent was also confirmed before doing the data collection, and they were informed on how it was planned to handle it. Participants were sincerely acknowledged for participating and contribution they made for the interview conducted for the purpose of the research work only. If possible (based on the consent of the respondents) Tape recording were tried to be undertaken using mobile phones and note-taking were carried out to let the participants feel at ease to share their view.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the result of the data obtained from the respondents using questionnaire and interview. The results are presented by using descriptive statistics. To analyse the collected data Microsoft excel was used.

4.1. Descriptive Statistics and Respondents Profile

The questionnaire was developed using Likert scale; where 1 represents Strongly Agree, 2 Agree, 3 Neutral, 4 Disagree and 5 Strongly Disagree for the quantitative data. In addition, qualitative data collection questions were developed which supported same. Among the 32 (100%) questionnaires that were distributed to the Infrastructure department, design unit, procurement unit, contractor representative and consultant representative's 30 (93.75%) questionnaires were filled and collected.

Descriptive statistics was used to analyse the questionnaires that were collected. The collected questionnaires were analysed and presented in the form of frequency and percentage using Microsoft excel. For further understanding of the subject matter unstructured interview was also conducted with the infrastructure department, procurement unit, design department, contractor and consultant representatives. The questionnaire and the interview questions which used for the interviewee are attached to this research paper under appendix section.

4.2. Characteristics of the Respondents

Respondent's characteristics include their educational level, age, sex, overall work experience areas, experiences in areas of project planning. The responses of the respondents and the implications are illustrated hereunder.

Table 4. 1: Characteristics of the respondents

S/N	Description	Details of Description	Count	Percent
1	Age	≤20	0	0%
		21-30	4	13%
		31-40	20	67%
		41-50	6	20%
		≥50	0	0%
2	Sex	Male	24	80%
		Female	6	20%
3	Educational Background	Diploma	0	0%

S/N	Description	Details of Description	Count	Percent
		Degree	24	80%
		Masters	6	20%
		PhD	0	0%
4	Work Experience	≤5	2	7%
		06-10	4	13%
		11-15	18	60%
		16-20	6	20%
		≥20	0	0%
5	Profession	Engineering	20	67%
		Planner	4	13%
		Procurement specialist	6	20%
		others	0	0%
6	Experience in Project planning	Yes	24	80%
		No	6	20%

Source: own survey, 2023

Among the 30 respondents that are part assessment 4 (13 %) are aged between 21-30, 20 (67 %) are aged from 21-40 while the remaining 20 % are aged from 41-50. Responses from the assessment show that 80 % of the respondents are degree holders while 20 % are master level educated, from which 20 % are female. This implies that most of the workers of the infrastructure department as well as design and procurement units are minimum degree holders and there will not be expected knowledge gap in the area. From the 30 respondents 80 % have experience in project planning of which 67 % are engineers, 13 % are planning specialists while the remaining 20 % are procurement specialists. In addition, this respondents have total experiences of ≤5 years are 7 %, 6-10 years are 13 %, 11-15 years are 60 % while the remaining have 20 % have 16-20 years of experiences.

Table 4. 2: Response Rate

It No	Category	Questionnaires Distributed	Returned	Response rate	Rate from Total Response
1	Infrastructure department	12	10	83.33%	33.33%
2	Procurement Unit	4	4	100%	13.33%
3	Design Unit	6	6	100%	20%
4	Representatives of Consultants	4	4	100%	13.33%
5	Representatives of Contractors	6	6	100%	20%
	Total	32	30	93.75%	100%

Response rate refers to the number of people who participated in survey. A total of 32 questionnaires were distributed off which 30 were collected having been filled completely. This constituted a response rate of (93.75 %) which is adequate for analysis according to Mugenda (1999) that states a response rate of 50 % is adequate for analysis and reporting. Table 4.2 is a summary of the response rate in this study.

4.3. Desk Reviews on Practices and Challenges of Project Time and Cost Management

Before assessing the practices and challenges of project time and cost management, desk reviews has been conducted to identify the practices and challenges of the city on project time and cost management. During desk study ten sample projects are taken from different categories of infrastructure based on their size and methods of construction and assessed their estimated completion time and actual completion date then calculated the rate of time delays if any in addition to cost overrun.

The data was collected via reviewing project documents in the city infrastructure department. On the basis of data gathered from the desk study, the entire project evaluated in desk study registered time and cost overrun. The rate of time overrun ranges from a minimum of 17 % to the maximum of 152 % of the contract time. Cost overrun, on the other hand, ranges from a minimum of 2 % to the maximum of 137 % of the contract amount for individual projects. Based on the result found in desk study, the name of selected infrastructure construction projects, Planned Procurement date for contract signature, Actual contract signature date, contract duration, contract amount, actual completion time/duration, actual completion cost, rate of time overrun and rate of cost overrun are described as shown in Table 4.3.

Table 4. 3: Desk Review on Project Information

It No	Project Description and reference number	project time and cost estimation evidences	Procurement plan date	Actual Contract agreement date	Contract Amount in Million	Contract Duration in days	Completion Duration in days	Final Cost in Million	Time Delay during planning in days	Time overrun	Cost overrun
1	Office Building (ULGDP/Bish/BI/2/19/20)	No time estimation but cost estimation breakdowns	8/11/2019	19/5/2020	56	365	920	105.6	161	152%	89%
2	Sanitary Landfill (ULGDP/Bish/LF/1/19/20)	No time estimation but cost estimation breakdowns	20/12/2019	16/4/2020	15	365	870	35.5	116	138%	137%
3	Market Center (ULGDP/Bish/BI/1/20/21)	No time estimation but cost estimation breakdowns	19/10/2020	19/01/2021	29.28	240	540	37.98	90	125%	30%
4	Greenery (ULGDP/Bish/Gr/15/21/22)	No	27/10/2021	10/1/2022	4.45	90	150	5.36	73	67%	20%
5	Street Light (ULGDP/Bish/SL/08/21/22)	No	13/11/2021	24/1/2022	26	120	165	33.56	71	38%	29%
6	Drainage (ULGDP/Bish/Dr/17/21/22)	No	27/10/2021	10/1/2022	4.3	90	180	5.55	73	100%	29%
7	Bridge (ULGDP/Bish/Br/07/21/22)	No	13/11/2021	5/1/2022	12.98	120	170	13.49	52	42%	4%
8	Gravel Road (ULGDP/Bish/Gr/06/21/22)	No	13/11/2021	5/1/2022	19.8	120	180	22.89	52	50%	16%
9	Cobblestone (ULGDP/Bish/CS/04/21/22)	No	27/10/2021	29/12/2021	1.49	90	110	1.52	62	22%	2%

It No	Project Description and reference number	project time and cost estimation evidences	Procurement plan date	Actual Contract agreement date	Contract Amount in Million	Contract Duration in days	Completion Duration in days	Final Cost in Million	Time Delay during planning in days	Time overrun	Cost overrun
10	Cobblestone (ULGDP/Bish/CS/02/21/22)	No	27/10/2021	29/12/2022	1.9	90	105	2.1	62	17%	11%

Source: own survey, 2023

From the table we can also explain that there is also much delay in infrastructure projects during planning stage to the extent of the contract duration dates as indicated in Table 4.3.

4.4. Practices of Project Time Management

In case of Bishoftu city project plan starts from kebele representatives, as per the standards from the city indicated. At this level different stakeholders have been participated among which elders, youth, women, and different organization representatives are the earmarked once. And at the city level, endorsing committee, kebele representatives, different focal persons are participating. Finally, after getting approval from the city council; Capital Investment Plan, Procurement plan, Revenue enhancement plan, Asset management plan and other planning documents shall be finalized for approval of the regional government. Collected data from the questionnaire also indicated that 67 % of the respondents Agree that the planning process passes through consultation of different stakeholders. While 17% are neutral to the response and the remaining 17 % disagree on the steps of the process.

During Planning the city considers importance of coordination to enhance participations of community, transparency and accountability. Additionally the city uses Baum's project life cycle model; that means identification (consultation & prioritization), Preparation (feasibility, Design and BOQ), Appraisal (CIP, AMP, REP), Implementation (Time, cost & quality) and M&E (feedback information), as they are enforced by the World Bank Project team to get funds for infrastructure construction projects.

Project planning tools and techniques are not properly applied during planning process, 60% of the respondents of the questionnaire disagree that proper planning tools are applied while 33 % and 7 % are neutral and agree respectively on its applications. During project planning the client is responsible for Proper project feasibility study, project plan, right of way problem, detail design and specification should be prepared from initiation to closure. The contractor shall prepare appropriate time schedule and resource management schedule, good site management, skilled technical and managerial labour skills. The consultants' rare case participating in initiation but well engaged at planning, execution, monitoring and closure to ensure that contract process is dully followed, thus, approval of drawings, documentation and others to reduce variation during construction. Additionally it is expected that other stakeholders, like offices parallel to infrastructure department, shall also participate during project planning process to enhance ownership to projects as per the guides from the city, but it is seen less in practices.

Table 4. 4: Practices of time management

It No	Description	Satisfaction Level in Percent										Mean
		SA		A		N		D		SD		
		F	%	F	%	F	%	F	%	F	%	
A. Questions related to Practices of project time Management												
1	Projects are planned based on consultation with proper stakeholders including community representatives.	0	0%	20	67%	5	17%	5	17%	0	0%	2.50
2	Project planning tools and techniques were applied while planning of projects.	0	0%	2	7%	10	33%	18	60%	0	0%	3.53
3	Schedule activities were specifically identified and enough time was assigned for each activity.	0	0%	2	7%	8	27%	20	67%	0	0%	3.60
4	Realistic time was imposed for the project based on WBS.	0	0%	2	7%	5	17%	20	67%	3	10%	3.80
5	Activity durations and deficiencies are properly conducted during estimation of activity sequencing.	0	0%	2	7%	4	13%	18	60%	6	20%	3.93
6	Enough time was given to project Planning based on the nature and complexity of the projects.	0	0%	4	13%	8	27%	18	60%	0	0%	3.47
7	The project team didn't have any difficulty meeting deadlines during project planning, execution and control.	0	0%	1	3%	5	17%	20	67%	4	13%	3.90
8	The project manager ensured the deadlines were met and changes to the original schedule were handled efficiently.	2	7%	6	20%	9	30%	13	43%	0	0%	3.10
9	Project team members received proper guidance and support from superiors to avoid any time delays.	0	0%	3	10%	6	20%	18	60%	3	10%	3.70
Aggregate Mean											3.50	

Source: own survey, 2023

From Table 4.4 respondents have given their opinions on, 67 % disagree that schedule activities were specifically identified and enough time was assigned for each activity, while 27 % have neutral opinion and 7 % of the respondents agree that proper schedule are prepared and enough time is also given to projects. 67 % of the respondents agree that there is no realistic time imposed for the project based on WBS, 17 % have neutral opinion and 7 % disagree and believe that there is realistic time estimates. But, document reviews to the city infrastructure department misses evidences up on which schedules are set.

According to the Project Management Institute (PMI, 2008), project time management includes Plan Schedule management, define activity, sequence activities, estimate activity duration, develop schedule and control schedule. One of the basic project activities planning process is determination of activity durations and deficiencies, 20 % of the respondents strongly dis-agree that activity durations are properly conducted during estimation of activity sequencing while 60 % disagree and 13 % have neutral opinion with 7 % agreeing on the proper activity duration estimations. 67 % of the respondents agree that there is also no enough time given to project Planning based on the nature and complexity of the projects, with 27 % neutral and 13 % dis-agree on the opinion and believe in that enough time was given. As project team members didn't receive proper guidance and support from superiors, the team have difficulty meeting deadlines during project planning, execution and control and there observed time delays during planning process as evidenced during some document reviews.

4.5. Challenges of Project Time Management

Project plan development is more than opening a project plan and typing tasks that need to be completed to get the job done. It requires thoughtful activity definition, sequencing, and resource estimating and their direct integration with the program's detailed development life cycle. Developing and using standard estimating models and templates aligned to the program's development life cycle is critical and one of the first steps in successfully building a plan that can provide true status of progress (Brisgone, A. 2007). Project managers are responsible to ensure stakeholders that the planned project end date can be achieved and finding ways to accomplish this. Off this assessment has been made whether there is lack of complete definition of project scope and inadequate definition of project complete requirements and 7 % of the respondents strongly agree and 67 % Agree, that there is inadequate definition of project scope, while 20 % and 7 % are neutral and dis-agree respectively on the opinion. Document reviews showed that the bigger the projects the more it is difficult to define the project scope and manage as per the plan. 13 % of the respondents strongly agree and 63 % agree that complex and large projects are more difficult to manage over small projects to be completed as per scheduled, while 17 % are with neutral opinion and 7 % dis-agree and believe in that there is no difference between bigger and smaller projects scoping and management once there is proper planning.

Once project scope is determined and work breakdown structure (WBS) is created, the next step is to create delivery timeline. For each of the deliverable work item identified in the work break down structure (WBS), project planner needs to identify list of activities to be performed and follow on the achievement of the prior activities before the start on the next preceding activity.

There is much delay between design and procurement phases of the infrastructure construction projects. 40 % of the respondents strongly agree and 53 % agree to the assessment made on delay in the earlier phases (i.e. pre planning and design phase) and delay in procurement of materials will make the project time management challenging and 7 % of the respondents are neutral to their opinion.

Table 4. 5: Challenges of project cost management

It No	Description	Satisfaction Level in Percent										Mean
		SA		A		N		D		SD		
		F	%	F	%	F	%	F	%	F	%	
B. Questions related to Challenges of project time Management												
1	There is lack of complete definition of project scope and inadequate definition of project complete requirements.	2	7%	20	67%	6	20%	2	7%	0	0%	2.27
2	Complex and large projects are more difficult to manage over small projects to be completed as per scheduled.	4	13%	19	63%	5	17%	2	7%	0	0%	2.17
3	Delay in the earlier phases (i.e. pre planning and design phase) and delay in procurement of materials will make the project time management challenging.	12	40%	16	53%	2	7%	0	0%	0	0%	1.67
4	There is much delay between design and procurement phases.	2	7%	15	50%	11	37%	2	7%	0	0%	2.43
5	Additional work to mitigate design changes will cause significant delays during the implementation phase.	5	17%	13	43%	9	30%	3	10%	0	0%	2.33
6	Changes to project scope and emerging new requirements will cause projects not completed on time.	7	23%	17	57%	5	17%	1	3%	0	0%	2.00
7	Delay in decision making (project team members, Effecting of payments, right off ways,...) create time overrun.	13	43%	15	50%	2	7%	0	0%	0	0%	1.63
8	Incomplete and error in original design (inadequate or lacks detail and definition, badly developed, incomplete, or incorrect) creates more delay over implementation delay.	0	0%	15	50%	13	43%	2	7%	0	0%	2.57
Aggregate Mean											2.13	

Source: own survey, 2023

From Table 4.5, 17 % of the respondents strongly agree and 43 % agree that additional work to mitigate design changes will cause significant delays during the implementation phase while 30 % and 10 % are neutral and dis-agree on the questions raised. Even if there are no standard delay analysis techniques in proposing and claiming extension of time during implementation of infrastructure construction projects, there are evidences seen during some contract document review which shows projects are delayed off to mitigate design changes as well as change in design scopes to emerge new requirements. 23 % of respondents strongly agree and 57 % agree that changes to project scope and emerging new requirements will cause projects not completed on time while 17 % and 3 % are neutral and disagree on their opinion respectively.

Project time delays may not be avoided but minimized through improvement of contractors' financial capability, the financial institution shall support them as well as government shall support tax free on construction material while importing and motivate construction material production industry, the contractor shall prepare appropriate time schedule and resource management schedule, good site management, skilled technical and managerial labor. Arrangement of meeting with contractor and consultant to know the courses for delay and follow the next procedure, enhancement of strong communication skills, increasing decision making skills. 43 % of the respondents strongly agree and 50 % agree that delay in decision making (project team members, Effecting of payments, right off ways,...) create time overrun while 7 % are neutral to their opinion.

Incomplete and error in original design (inadequate or lacks detail and definition, badly developed, incomplete, or incorrect) are believed to creates more delay over implementation delay. 50 % of the respondents believe that error in original design creates more delay over implementation delay while 43 % of the respondents are neutral of their opinion while 7 % disagree and believe in that implementation delays are more than error in original design.

4.6. Practices of Project Cost Management

Project cost management includes the processes involved in estimating, budgeting, implementation, and controlling of costs so that the project can be completed within the approved budget (PMBOK, 2004). Having this for the question raised to respondents on realistic cost estimation was developed for the project through pre-defined procedures, 3 % strongly agree, 10 % agree, 17 % are with neutral opinion while 63 % and 7 % disagree and strongly disagree. While it is seen on table 4.2 (desk review project information) that the cost estimates and the final costs of the projects significantly vary indicating that there is no realistic cost

estimation processes. The estimated cost was not properly allocated to individual work items effectively using WBS. 17% of the respondents strongly disagree that there is proper allocation of realistic cost estimates to WBS, while 77 % disagree, with 7 % neutral responses.

Table 4. 6: Practices of project Cost management

It No	Description	Satisfaction Level in Percent										Mean
		SA		A		N		D		SD		
		F	%	F	%	F	%	F	%	F	%	
C. Questions related to Practices of project cost Management												
1	Realistic cost estimation was developed for the project through pre-defined procedures.	1	3%	3	10%	5	17%	19	63%	2	7%	3.60
2	The estimated cost was allocated to individual work items effectively and properly using WBS.	0	0%	0	0%	2	7%	23	77%	5	17%	4.10
3	There is a contingency plan to projects involving new technologies.	0	0%	2	7%	3	10%	25	83%	0	0%	3.77
4	The project manager closely monitored the cost performance of the project.	2	7%	7	23%	11	37%	10	33%	0	0%	2.97
5	Sizes of project have no effect over the cost management of projects.	0	0%	0	0%	2	7%	18	60%	10	33%	4.27
6	Project procurement plan, cost estimations are done properly, and identify which project needs can be best met by procuring projects.	0	0%	1	3%	8	27%	20	67%	1	3%	3.70
7	The project teams are pre-planning for properly tackling cost and time management using EVM.	1	3%	1	3%	2	7%	24	80%	2	7%	3.83
Aggregate Mean											3.75	

Source: own survey, 2023

Contingencies are allotted to project cost estimations especially it is difficult to determine the scope of the project during the project resource planning phase. 83 % of the respondents disagree that there is a contingency plan to projects involving new technologies while 10 % are neutral about the opinion and 7 % agree that there is contingency plan for projects involving new technologies. For the project to be effective in its cost management system there shall be proper internal control system, off this the internal assigned teams have to be strong in their follow up to successfully manage the costs of projects. Though 7 % of the respondents strongly agree and 23 % agree the project manager closely monitored the cost performance of the project, 37 % and 33 % are neutral and disagreeing on the opinion respectively.

As can be seen on Table 4.6 the sizes of the projects have an effect over the cost management, 33 % of the respondents strongly disagree with and 60 % disagrees with the statement while only 7 % are neutral to their opinion that negate this statement. For an effective implementation and success of a project procurement plan, cost estimations shall be done properly, and identify which project needs can be best met by procuring projects. 7 % and 80 % of the project teams strongly disagree and agree respectively that there are pre-planning for properly tackling cost and time management using EVM in the city, there is also 7 % neutral opinion and 3 % agreement as well as 3 % strong agreement on the statement that there is proper management of projects using EVM.

4.7. Challenges of Project Cost Management

Challenges of Cost Management can occur in any phase of project development. The most common causes for cost overruns are proposal phase failure to understand customer requirements, Unrealistic appraisal of in-house capabilities and underestimating time requirements. Planning phase omissions, inaccuracy of the work breakdown structure, misinterpretation of information, use of wrong estimating techniques, failure to identify and concentrate on major cost elements and failure to assess and provide for risks. Negotiation phase forcing a speedy compromise, procurement ceiling costs and negotiation team that must “win this one”. Contractual phase contractual discrepancies SOW different from RFP requirements and proposal team different from project team. Design phase accepting customer requests without management approval, Problems in customer communications channels and data items, Problems in design review meetings. Production phase excessive material costs, specifications that are not acceptable and manufacturing and engineering disagreement (Kerzner H.2009).

From Table 4.3 (desk review on sampled projects) indicated that there is a cost variation from a minimum of 2 % to maximum of 137 % which indicates that the variation of projects are not properly managed this is also confirmed by respondents which agree on the statement. Responses of the interviewee indicated that 7 % Strongly agree and 70 % of respondents agree that risks were not planned for and improperly managed with respect to costs and 23 % respondents are with neutral opinion where only 10 % disagree dis-agreeing the statement.

Table 4. 7: Challenges of project cost management

It No	Description	Satisfaction Level by Frequency and in Percent										Mean
		SA		A		N		D		SD		
		F	%	F	%	F	%	F	%	F	%	
D. Questions related to Challenges of project Cost Management												
1	Variations to the project cost were not managed properly.	1	3%	21	70%	7	23%	1	3%	0	0%	2.27
2	Risks were not planned for and improperly managed with respect to costs.	2	7%	18	60%	7	23%	3	10%	0	0%	2.53
3	Change in project scope and rework as well as additional works created much cost management challenges.	4	13%	17	57%	9	30%	0	0%	0	0%	2.17
4	Unclear, unstable and incomplete requirement statement and inappropriately assigned cost will increase challenges with cost management.	5	17%	19	63%	6	20%	0	0%	0	0%	2.03
5	Most of Project cost overruns are created because of Contractors fault.	8	27%	18	60%	4	13%	0	0%	0	0%	1.87
6	Most of Project cost overruns are created because of Consultants fault.	1	3%	21	70%	5	17%	3	10%	0	0%	2.33
7	Most of Project cost overruns are created because of Clients fault.	5	17%	20	67%	5	17%	0	0%	0	0%	2.40
8	Project cost overruns are created because of all stakeholders' joint fault and communication problem.	9	30%	19	63%	2	7%	0	0%	0	0%	1.77
9	Project Cost overruns are significantly managed during Planning phase of the project.	7	23%	17	57%	6	20%	0	0%	0	0%	1.97
10	Project Cost overruns are significantly managed during execution phase of the project.	5	17%	15	50%	10	33%	0	0%	0	0%	2.17
11	Project Cost overruns are significantly managed during controlling phase of the project.	0	0%	15	50%	13	43%	2	7%	0	0%	2.57
Aggregate Mean											2.19	

Source: own survey, 2023

From table 4.7, 13 % of the respondents strongly agree and 57 % agree that change in project scope and rework as well as additional works created much cost management challenges while 30 % are with neutral opinion. Unclear, unstable and incomplete requirement statement and inappropriately assigned cost will increase challenges with cost management, 17 % of the respondents strongly agree, 63 % agree and 20 % are neutral to the opinion.

Even if there is some shifting of blames to contractor that cost overrun are created by the fault of the contractor, actual cost overruns are created by all the three stakeholders (Client, Consultant and contractor). For the questions raised to the respondents about the project cost overruns are created because of all stakeholders' joint fault and communication problem, 30 % strongly agree, 63 % agree and 7 % are giving neutral opinions. Even all the stakeholders are not using the commonly uses S-Curve to compare the amount of money spent to the budgeted cost to measure the performance of the projects.

It is also believed that projects need to be planned before its implementation both in time and cost and things that may impose cost overrun are incomplete design, poor technical capacity, poor M&E, site change, right of way problem, inability to select & check suitable site for the proposed projects, inability to complete site survey, failure to complete environmental investigations. Cost overrun are created during all phase of the projects (planning, execution, and control), but projects that are not well planned shall have the most outlying probability of both time and cost overruns. This is also confirmed during desk review and from the responses of the respondents.

CHAPTER FIVE

SUMMARY OF MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter is the final part of the study. First, important findings are summarized from the previous chapter. Then, based on the summary of findings conclusions are inferred. Finally, recommendations have been provided as per the findings of the study to help similar studies and future areas of study.

5.1. Summary of Major Findings

The study clearly indicated that Projects are planned based on consultation with proper stakeholders including community representatives.

- Project planning tools and techniques were not applied while planning of projects. Schedule activities were not specifically identified and enough time was not assigned for each activity. Realistic time was not imposed for the project based on WBS.
- Activity durations and deficiencies are not properly conducted during estimation of activity sequencing. Enough time was not given to project Planning based on the nature and complexity of the projects.
- The project team have difficulty meeting deadlines during project planning, execution and control. The project manager did not properly ensure the deadlines were met and changes to the original schedule were handled efficiently. Project team members did not receive proper guidance and support from superiors to avoid any time delays.
- There is lack of complete definition of project scope and inadequate definition of project complete requirements.
- Complex and large projects are more difficult to manage over small projects to be completed as per scheduled.
- Delay in the earlier phases (i.e. pre planning and design phase) and delay in procurement of materials will make the project time management challenging. There is much delay between design and procurement phases.

- Additional work to mitigate design changes will cause significant delays during the implementation phase. Changes to project scope and emerging new requirements will cause projects not completed on time.
- Delay in decision making (project team members, Effecting of payments, right off ways,...) create time overrun. Incomplete and error in original design (inadequate or lacks detail and definition, badly developed, incomplete, or incorrect) creates more delay over implementation delay.
- Factors contributing to delay are mainly payment delay, incapability of contractors and consultants in managing projects, site condition, right way problems, weather condition, and scarcity of construction materials and change of priorities by client.
- Project requirements are based on priority of the community and the budget on hand by the government. Availability of budget by the project owner, resource on hand by the contractor, market, weather and site condition is considered during project scheduling.

Finally, Risks were not planned for and improperly managed with respect to costs. Variations to the project cost were not managed properly. Change in project scope and rework as well as additional works created much cost management challenges. Unclear, unstable and incomplete requirement statement and inappropriately assigned cost will increase challenges with cost management. Project cost overruns are created because of all stakeholders' joint fault and communication problem. Project Cost overruns are significantly managed during planning phase of the project.

5.2. Conclusions

The assessment results show that project planning stages takes the city 102-162 days; while it takes procurement team to award the contract from 54-191 days even after the planning is completed. These results indicate that even if the time passed for preparation is much, there are no real activities conducted during this stage for the implementation preparation except wasting time.

There was no sufficient communication among the stakeholders in the project planning process. Project scopes were not adequately defined. Ccontingency plans were not properly included in

the project plans and the project plans were not detailed to the extent understandable by all the stakeholders.

There is poor practices of both project time and cost management in the city. Projects are delaying from 2 % - 137 % and cost overrun of these projects are from 17 % - 152 %.

Different stakeholders have greater input for final success of a project; Clients' roles are proper project feasibility study, project plan, right of way problem, detail design and specification should be prepared from initiation to closure. The contractor shall prepare appropriate time schedule and resource management schedule, good site management, skilled technical and managerial. The consultant's rare case participating in initiation but well engaged at planning, execution, monitoring and closure to ensure that contract process is dully followed, thus, approval of drawings, documentation and to reduce time and cost overruns during implementation. Time and cost related contractual obligations are managed using the contract agreement document.

The techniques used in planning and managing the project's cost estimation is based on cost break down budgetary estimates, that means take material cost (quantity*unit price), labor cost index (No*UF*wage), machinery rental cost (No*UF*Rental) + profit and overhead cost estimation.

Respondents have also forwarded the following delay causing factors with open-ended questionnaire, besides the ranking factors. These are: Design problems, right of way problem and lack of material supply on time, machinery problem, change in design, Selection of insufficient contractor, delay in payment of executed work, delay in design approval, inadequate site investigation before the project started, Lack of integration with utility providers, lack of Proper planning (planning at procurement stage/both design and supervision, consultant selection, design stage and implementation stage), contractors site management problem.

Incomplete design, poor technical capacity, poor M&E, site change, right of way problem, Inability to select & check suitable site for the proposed projects, Inability to complete site survey, Failure to complete environmental investigations are the factors that contribute to cost overrun among many in the city.

Challenges of project planning have a significant effect on the project performance and outcome as well as projects usually exceed their original completion schedule and often require additional budget for completion.

The involvement of clients is crucial at all stages of a project. Setting a clear interest on the assumed project, defining the proposed project plan and putting their feedback on the plan, financing and conducting a close follow up on the project, responding timely during execution or ensuring the sense of urgency, and ensuring the availability of all documents that are required for closing the project.

Since most projects are awarded by competitive bidding, the role of a contractor in project initiation is very rare. In planning, a contractor plays a great role by preparing a master schedule by considering the client budget, availability of resources on hand, and weather condition so that the project can be performed within its scope. At execution stage, the contractor is responsible for performing all the tasks by assigning all types of resources in order to complete the project within the scope. During the monitoring stage, a contractor has to ensure the project is on the right track. Assessing risks, communicating with the stakeholders of the project and ensuring quality control are also some of the roles expected from a contractor. At project closure, contractors must work on a lot of paper works in addition to completing the project and handing over it to the client. Documenting the lessons learned, preparing as built drawings, conducting performance evaluation, and other closure related documents should be performed by the contractor at the project closing stage.

At project initiation consultants give guidance and expert opinion about the project. They also conduct the feasibility of the project and set the objective of the project. At planning stage, consultants provide their opinions by identifying the methods by which the project can be delivered by suggesting the technology that must be used to accomplish the project within the intended budget, time and quality. Following the day to day activities of the project, assessing risks, ensuring qualities, comparing the progress of the project and revising schedules are some of the roles consultants have to play in the execution and monitoring of a project. Working on the hand over and various project documentations are expected from consultants at the closing stage of a project.

A close follow up of the project, communication with those performing the project, providing feedbacks and assistances are expected from other stake holders in the entire stage of a project.

5.3. Recommendations

For effective project management using the PMI guideline will deliver effective results. Plan for all the elements in the PMBOK; scope, time, cost, quality, procurement, risk, communication, human resource, stakeholder and integration. So that it could serve as a guideline for implementation and corrective actions. Identification of personnel's who will be involved in the project and project planning and assign what his role will be to make sure that no parts of a project activities fall through the cracks. The project managers should also review their initial personnel decisions immediately after they have created the project's goals, processes and timelines.

- Use of project management tools and techniques for planning, executing and control of the project cost and time is important for effective management of the time and cost.
- Involve all the stakeholders in making project related decisions regarding cost and time. The project team members, the end users, top management; anyone who affects or who is affected by the project should be involved.
- Application of project management strategy techniques from initiating, planning, executing, controlling and to closing to achieve a specific goal and meet specific objective in a specified time are critically important to tackle for project delay and cost overrun.
- Make use of computerized planning tools such as spread sheets and project management software (MS Project), PREMAVERA, and others so that it will help to make working with different time and cost estimation tools easier.
- Develop and maintain effective communication channels between the stakeholders so that delay in decision can be minimized and also for effective time and cost control.
- Involving experts who have experience in this area can help with minimizing design errors and ill-defined requirements. In addition this can help make the project idea more clear and understandable. This is also important for sharing knowledge.

- Providing training to the project team will also reduce misunderstandings and misconceptions which will in turn help them make decisions quickly and deliver the project on time and within budget.
- It is also good to have study related to assessment of practices and challenges of project time and cost management to dig more details in the area and better to cover larger areas as this two are the most critical part in infrastructure construction projects successfulness.

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APPENDICES

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE

Consent Form

My name is Belay Demissie Bekele and I am currently working on research survey concerned with “Assessment of the practices and challenges of project time and cost management; A case study of Bishoftu City infrastructure Construction Projects.” to help me complete my Project Work.

If you participate in this study, there may not be direct benefit to you. But your participation on this study has a greater input for the management of future challenges related to time and cost overrun in infrastructure construction projects. You will not be provided any incentive or payment to participate in this study and there is no harm to you from answering the questions. Your response is completely secret; your name will not be written on the form. The information you provide will never be used in connection with any other purpose. Only the researcher and his advisor with invigilator will have access to the data.

Finally the researcher would like to thank you in advance for your help and assure you that the information’s you provided will be treated with highest degree of confidence and only used for academic purpose.

Are you willing to participate in this study? Yes No

If yes, Please answer the following questions as précises as possible from your educational background and experience.

Thank For Your Cooperation!

Questionnaires related to the Practices and challenges of time and cost management.

Part I: Questionnaire for Qualitative data collection

A. Respondents' background information

1. Sex: Male Female
2. Age (year): ≤ 20 21 – 30 31 -40 41-50 ≥ 50
3. Educational background: Diploma BA/BSc MA/MSC PhD
4. Work experience in construction sector (year): ≤ 5 6-10 11-15
16-20 ≥ 20
5. What is your profession? Civil Engineer Planner
 Procurement Specialist other
6. Did you experience in Planning of different projects? Yes No
- If yes, what were your occupations? Project manager Site Engineer
 Planner Designer Other
- If other, specify _____.

B. Technical questions for professionals

i. Discussion points related to practices and challenges of time management

1. How was the projects planned and who are involved in project planning and scheduling Process?
2. What are the things you consider during planning and scheduling process?
3. Do you think the city uses proper planning and scheduling techniques during project initiation, planning, execution, monitoring and control and closure?

Yes No

If yes, what are the techniques used in projects?

_____.

4. What do you think the roles of client during project initiation, planning, execution, monitoring and control and closure of projects?
5. What do you think the roles of contractor during project initiation, planning, execution, monitoring and control and closure of projects?

6. What do you think the roles of consultant during project initiation, planning, execution, monitoring and control and closure of projects?
7. What do you think the involvement of other stakeholders during project initiation, planning, execution, monitoring and control and closure of process?
8. What do you think are the factors that contribute to delay?
9. How was the requirement for the project determined? What were the things considered when you determined the project schedule?
10. How efficiently was resources (manpower, money, material, equipment, ...) distributed for the projects during initiation, planning, execution, monitoring and control and closure of project?
11. Do you think there are standardized or formal documented processes on how to manage time within the projects?

Yes No

If yes, what are the standard methods of establishing sequential relationships of activities?

_____.

12. Do you think there are standard methods of activity duration estimation?

Yes No

If yes, what are the standard methods of establishing sequential relationships of activities?

_____.

13. Do you think that the standard time management techniques/methods (such as Bar chart, Critical Path Method (CPM, PERT, or Other) are in place for project from planning to control?

Yes No

If yes, what are they? And how are they used?

_____.

14. Do you use scheduling software (such as Microsoft project, Primavera, Project commander or others) are used in project scheduling in the city?

Yes No

If yes, what are they? And how are they used?

15. Do you think there are standard method of identifying time related contractual obligations and requirements in the project implemented in the city?

Yes No

If yes, what are they?

16. Do you think there are standard methods of contractual requirements on updating the construction work program of city projects?

Yes No

If yes, on what bases and interval are they updated?

17. Do you think that the city uses S-curve in the evaluation of project progress?

If yes, how are they using?

If no, what is the method of progress evaluation? Does it reflect the actual progress of the projects?

18. Do you think the city have standard delay analysis techniques in proposing and claiming extension of time in this project?

If yes, how are they using?

19. What tools/techniques do you use to expedite the project when you encounter delays?

20. At what stages do you think projects show significant delay?

21. Do you think that both time and cost overruns can be avoided or minimized?

Yes No

If yes, how? _____.

ii. Discussion points related to practices and challenges of cost management

1. How do you think the project resources are planned (people, equipment, material) and who are involved in project resource planning?
2. How do you think that the resources (money, manpower, material...) are efficiently distributed for the projects in the city?
3. What are the things you consider during planning and what are challenging factors in the resource planning process?
4. How do you think the cost of the project determined?
5. What do you think are the techniques used in planning and managing the project's cost estimation?
6. What do you think about standard method of activity resource estimation?
7. Do you think that for every project, the Cost Estimation will be prepared?

Yes No

If Yes, Which of the cost estimation technique was used?

Rough order of magnitude budgetary estimate Definitive estimates

If others, specify _____.

8. What do you think about things that are considered during project cost budgeting?
9. During the period of any project implementations do you think the Cost Budgeting be prepared based on a proper budget allocation to work packages?
10. Do you think there are Cost Control systems during the project implementation/execution period?

Yes No

If Yes, What are the techniques specify?

_____.

11. How do you think the cost variances arise during implementation of the project will be managed?
12. What do you think are the factors that contribute to cost overrun?
13. Do you think that there are techniques to tackle both delay and cost overrun?

Yes No

If Yes, What are the techniques please specify

_____.

Part II: Questionnaire for Quantitative data collection

Please use a tick (✓) mark to answer the following statements as SA=(Strongly Agree), A=(Agree), N=(Neutral), D=(Disagree) and SD=(Strongly Disagree) to rate the factors to show your satisfaction level.

If you your level of agreement is high tick on SA, if the level of agreement is moderate tick on A, If the level of agreement is neutral tick on N, If you are not agreeing on the case tick on D, and if you strongly dis-agree and oppose the statement tick on SD.

It No	Description	Satisfaction Level					Remarks
		SA	A	N	D	SD	
A. Questions related to Practices of project time Management							
1	Projects are planned based on consultation with proper stakeholders including community representatives.						
2	Project planning tools and techniques were applied while planning of projects.						
3	Schedule activities were specifically identified and enough time was assigned for each activity.						
4	Realistic time was imposed for the project based on WBS.						
5	Activity durations and deficiencies are properly conducted during estimation of activity sequencing.						
6	Enough time was given to project Planning based on the nature and complexity of the projects.						
7	The project team didn't have any difficulty meeting deadlines during project planning, execution and control.						
8	The project manager ensured the deadlines were met and changes to the original schedule were handled efficiently.						
9	Project team members received proper guidance and support from superiors to avoid any time delays.						
B. Questions related to Challenges of project time Management							
1	There is lack of complete definition of project scope and						

It No	Description	Satisfaction Level					Remarks
		SA	A	N	D	SD	
	inadequate definition of project complete requirements.						
2	Complex and large projects are more difficult to manage over small projects to be completed as per scheduled.						
3	Delay in the earlier phases (i.e. pre planning and design phase) and delay in procurement of materials will make the project time management challenging.						
4	There is much delay between design and procurement phases.						
5	Additional work to mitigate design changes will cause significant delays during the implementation phase.						
6	Changes to project scope and emerging new requirements will cause projects not completed on time.						
7	Delay in decision making (project team members, Effecting of payments, right off ways,...) create time overrun.						
8	Incomplete and error in original design (inadequate or lacks detail and definition, badly developed, incomplete, or incorrect) creates more delay over implementation delay.						
C. Questions related to Practices of project cost Management							
1	Realistic cost estimation was developed for the project through pre-defined procedures.						
2	The estimated cost was allocated to individual work items effectively and properly using WBS.						
3	There is a contingency plan to projects involving new technologies.						
4	The project manager closely monitored the cost performance of the project.						
5	Sizes of project have no effect over the cost management of projects.						
6	Project procurement plan, cost estimations are done properly,						

It No	Description	Satisfaction Level					Remarks
		SA	A	N	D	SD	
	and identify which project needs can be best met by procuring projects.						
7	The project teams are pre-planning for properly tackling cost and time management using EVM.						
D. Questions related to Challenges of project Cost Management							
1	Variations to the project cost were not managed properly.						
2	Risks were not planned for and improperly managed with respect to costs.						
3	Change in project scope and rework as well as additional works created much cost management challenges.						
4	Unclear, unstable and incomplete requirement statement and inappropriately assigned cost will increase challenges with cost management.						
5	Most of Project cost overruns are created because of Contractors fault.						
6	Most of Project cost overruns are created because of Consultants fault.						
7	Most of Project cost overruns are created because of Clients fault.						
8	Project cost overruns are created because of all stakeholders' joint fault and communication problem.						
9	Project Cost overruns are significantly managed during Planning phase of the project.						
10	Project Cost overruns are significantly managed during execution phase of the project.						
11	Project Cost overruns are significantly managed during controlling phase of the project.						