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COLLEGE OF BUSSINESS AND ECONOMICS
SCHOOL OF COMMERCE

OFFICE OF GRADUATE STUDIES

Assessing Project Cost management practices of Local Contractors involved in the Construction of Federal Road Projects

Addis Ababa, Ethiopia

By

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A project work submitted to Addis Ababa University School of Commerece in Partial Fullfillment of the requirements for the Award of Master of Arts Degree in Project Management.

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DECLARATION

I, Asfawossen Teka Tarekegne, hereby declare that this project work having the title "Assessing Project Cost management practices of Local Contractors involved in the Construction of Federal Road Projects" is my original work. I also confirmed that this work has not been submitted by anyone else or by myself to any institution or to any other university at all for the award of any educational credentials including diploma or degree.

STATEMENT OF CERTIFICATION

This is to certify that the project work entitled "Assessing Project Cost management practices of Local Contractors involved in the Construction of Federal Road Projects", submitted by Asfawossen Teka Tarekegne for partial fulfillment of the requirements for the degree of Master of Arts in Project Management is carried out by him under my direct supervision and guidance. The contents embodied in the project work have not been submitted for the award of any other degree or diploma in this or any other university.

Name:-Tenkir Seifu (PHD)

Signature:-_____

Date: _____

APPROVAL SHEET

This is to Certify that the project work prepared by Asfawossen Teka Tarekegne, entitled: "Assessing Project Cost management practices of Local Contractors involved in the Construction of Federal Road Projects" submitted for partial fulfillment of the requirements for the degree of Master of Arts in Project Management complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Advisor:

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Internal Examiner

Name:

_____Signature:_____Date:_____

External Examiner

Name: _____Signature:_____Date:_____

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ABSTRACT

This research work has had the objective of assessing the practices of contractors pertaining to their project cost management plan, cost estimation process, budgeting and cost control processes.

To this effect, the project cost management practices of Local Grade I contractors currently involved in the construction of Federal Road Projects were assessed through questionnaire survey collected from Grade I local contractors. The assessment were made with respect to the four processes of Project cost management knowledge area, and basic element of project costs such as direct costs, indirect costs, profits and risks.

The research findings indicated that most contractors are using insufficient inputs and tools to run each part of the cost management knowledge area. Owing to the scarcity of inputs and limited use of tools, it has been noted that most of the contractor's output such as Cost management plan, basis of estimates, activity cost estimates, cost baseline, project's funding requirements, cost forecast, change requests etc., were not as detailed as the PMI standard dictates.

Moreover, the contractors ranked Risk allowances and Taxes as the most difficult and the least difficult items for estimation respectively .While, Equipment and Taxes were also ranked as cost item deserving the most and the least attention during cost estimation respectively.

Need for the work, competition among bidders and market trends were also selected as the first, the second and the third known main factors for the determination of Profit markup in the corresponding order shown above.

This paper concludes that most of the contractors donot have an well organized cost management system.Besides,most of them are using insufficient inputs and limited number of tools to run the processes of project cost management.

Finally,this paper recommends that contractors should focus on the proper establishment of their project cost management system so as to get the maximum benefit out of each process.

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ACRONYM

FDRE: Federal Democratic Republic of Ethiopia

ERA: Ethiopia Roads Administrations

AVE: Average

VAT: Value Added Tax

DB: Design Build

DBB: Design-Bid-Build

EFY: Ethiopian Fiscal Year

RSDP: Road Sector Development Program

PCMP-Project Cost Management Plan

CHAPTER 1 - INTRODUCTION

1.1 Background of the Study

Construction companies are project based organizations wherein their survival and development relies on the success of projects at hand. Due to the same, most construction companies strife for having sufficient number of projects so as to use their resources effectively, and to make sufficient profit amount at the completion of the Projects. To this effect, companies work hard to realize the success of each project undertaken with respect to Quality, Cost and time aspects among other success parameters.

Construction company effort related with getting sufficient number of projects and attaining the required profit margin requires a well-organized and integrated project cost management system. Having a well-articulated project cost management system also help to minimize cash flow problems thereby facilitating the progress of the project. (Abeselom, 2008)

The amount of profit to be secured by contractor at the end of the project normally depends on the original cost estimate of the works and the cost controlling system adopted during the execution stage of the project as discussed by Glenn A.Sears, S.Keoki Sears, and Richard H.Clough. (Sears et at, 2008)

On the other hand, Copare (1990) quoted by Abeslom(2008) indicated that inaccurate cost estimates, inadequate accounting records and insufficient cost controlling practices are the major factors which are capable of disrupting contractor's cash flow and ultimately compromising the profitability of the Business under consideration.

Moreover, (Youlin Li,2018), in his research paper discussed the following as factors contributing for poor cost management witnessed in the construction Industry of China :- insufficient awareness about market competition, inadequate awareness about quality standard of Engineering Projects, ignoring time management and project control system and Unscientific cost management system adopted to run the Project.

The writer of this paper was motivated to conduct a project work assessing the practices of contractors pertaining to their cost management, because contractors can make improvements in their cost management area if and only if they know their actual status. Moreover, as the writer of this paper could not find a research made on the overall Project cost management practices of Contractors involved in the Federal Road development

program of F.D.R.E, he believed that carrying out this study will pave a platform for further discussions and better works in the future.

1.2 Statement of the Problem

Most of Governmental Construction projects in Ethiopia are normally handled through a well-established contract delivery system whereby the contractor is responsible for the construction phase and in some cases for both design and construction aspects of the infrastructure project. Contractors get access to a new governmental construction projects through bidding process whereby contractors shall submit their bids and the least bid price which passes the technical evaluation shall get the job.

Contractor's project cost management process should normally start at bidding stage on which the contractors are expected to use a reasonable cost estimate that include costs of the project including sufficient markup for profit and overhead costs to ensure the successful completion of the project and maintain the profitability of the contractor.(Taddese,2006).In this journey, poor estimation of the project in general and major activities of works in particular, could lead to project failure in the perspectives of project constraints of time, cost and quality (Hatamleh,2018)

In addition to the impact of poor cost estimation at the early stage of the project, Contractor's insufficient project cost controlling practices during the construction phase of the project also resulted in cost over runs thereby adversely affecting the performance of the project (Ashebir et al, 2017). Due to the same, the benefit of the infrastructure targeted to be gained after completion of the project could not be materialized as planned. Rather, the contractor could go bankrupted and public grievances could emerge as a result of delays sustained in the delivery of the Project. Finally, termination of the contract and litigation associated with the same could be the consequence of these severely over cost Construction Projects.

As per PMI (Construction extension to the PMBOK guide, 2016),Project Cost Management in construction includes cost estimating, cost budgeting, and cost monitoring and control, and further entails managing the day-to-day project costs

This research will be carried out as an applied research type wherein it will be primarily tasked to apply and tailor existing knowledge to address a specific practical issue contractors

are facing pertaining to their project cost management system. Hence, the paper will attempt to identify problems of the cost management system and will provide recommendation as a way forward solutions. To this effect, the writer of this paper tries to assess and summarize the actual practices of local contractors pertaining to their Project Cost management Plan, Project Cost estimation, Project Cost budgeting and Project Cost Controlling systems.

1.3 Basic Research Questions

Through this Project work, the researcher is destined to answer the following basic Research questions;

1) What are the project cost management plan of contractors covered under this study?
2) What are the Inputs and techniques contractors use for project cost estimation?
3) What are the Inputs and techniques Contractors use for determining Projects budgets?
4) What are the Inputs and techniques contractors use to control project costs?
5) What are the shortcomings, drawbacks and limitations of these practices?

1.4 Objectives of the Study

1.4.1 General Objective

The General objective of this project work is to assess and then create clear pictures of the Project cost management practices being used by local grade I Contractors currently involved in the construction of Federal Road Projects and shortcomings associated with these practices. In doing so the general objective of this paper tries to assess practices related with project cost management plan, cost estimation, budgeting and cost control mechanisms in the construction project context.

1.4.2 Specific objectives

The writer of this research work has identified the following points as specific objectives of this Project work are:-

- Investigating into the actual practices of contractors pertaining to their project Cost management plan, Cost estimation, cost budgeting and Cost control,

- Assessing the project cost management :-Tools and techniques they are using;
- Identifying inadequacies, weaknesses and limitation of the current practices employed by these companies;
- Forwarding recommendation so as to show improvement on the existing system.

1.1 Significance of the study

Following the launching of the Road sector development Program (RSDP) in the 1997,the F.D.R.E invested above ETB 105 Billion till the end of 2013(Derige,2015).To this effect, it is believed that the Ethiopian Government has been using local, regional and international funds to finance these Road Projects.

On the other hand, local studies have shown that most of the contractors who have been engaged in the construction of Road projects are facing cost overrun (Fetene, 2008). And, as a result of the cost overruns contractors are facing, delay in the delivery of the project among other adverse consequences. (Ashebir et al, 2017)

This study intends to understand the actual cost management practices of contractors who are supposed to implement the Federal government Road sector Development Program. The writer of this paper believes that having clear understanding of contractor's practices pertaining to cost management practices will lead to one step towards getting solutions as regards to the shortcoming and drawbacks of their systems. This in turn could contribute for successful completion of these Road Construction Projects in general and profitability of the contractors in particular.

1.2 Delimitation/Scope of the study

Practices of Project Cost Management is one of the major blocks of Project management discipline (PMBOK, 2016) which is a common process in all types of project. Due to the same, it is worthy of analysis and research in different project context. This paper shall be confined to assessing Project Cost management practices of Contractors engaged on the construction of Federal Road Projects under Ethiopian Road administration (ERA).

However, this study doesn't cover the following aspects of Project cost management;

- The life cycle Cost of project which is commonly known as LCC .LCC deals with the wider view of the project cost management by attaching costs of the project to its individual lifecycle stages. In doing so, LCC involves acquisition, operating, and disposal costs when evaluating various project alternatives. (Harlord Kerzener, 2017).
- According to PMI (2016), project cost management involves the processes of planning, estimating, budgeting, financing, managing and controlling costs so that the project can be completed within the approved budget. Despite the above, this paper doesn't deal with financing and managing facets of project cost management processes;

Although the researcher has confided the boundaries of the research on the practices of Grade I Local Construction companies engaged on the construction of Road projects with ERA, more effort will be exerted to make the research data and findings worthy of references to similar studies.

1.3 Organization of the Paper

This Research is divided into five chapters, the first chapter which is an Introduction of the Research deals with the background of the study, statement of the problem, objectives of the study, significance of the study, scope of the study, organization of the paper and Definition of terms. The second chapter of the research focuses on the Literature review thereby consisting of an introduction, theoretical review, empirical review, gaps seen in the research done so far and Conceptual framework of the Research. The third Chapter divulges the Research design and methodological aspect of the research which is consisting of Research approach, Research design, census and sample survey, sample design, sources of data, research Instrument, method of data collection, procedures for data collection, data analysis, validity and reliability and finally about research topics. Chapter four deals with

data analysis based on the collected data, interpretation of the analysis and summary of the findings. Chapter five is about conclusions and recommendation derived from the research endeavor.

Finally, references used for this Research shall be presented in the reference section of the Research paper.

1.4 Definition of Terms

The following terms and phrases are defined so as to create mutual understanding between the researcher and readers.

Activity:-A distinct, scheduled portion of work performed during the course of a project.

Actual Cost:-the realized cost incurred for the work performed on an activity during a specific time period.

Assumption: - a factor in the planning process that is considered to be true, real, or certain without proof or demonstration.

Cost over runs: is the extra cost incurred above what has been envisaged by the contractor.

Enterprise Environmental factor:-Conditions, not under the immediate control of the the project team that has the potential to influence the project.

Lesson learned:-the knowledge gained during the course of the project.

Scope baseline:-the approved version of a scope statement, Work break down structure (WBS) and its associated WBS dictionary.

Time over runs: is the time incurred by the project beyond the completion date stipulated on the Contract.

CHAPTER 2 - LITERATURE REVIEW

2.1 Introduction

This chapter is devoted to develop a theoretical and empirical understanding of the project cost management and expected to divulge the gap witnessed in the area under study. To this effect, most relevant concepts and theories on Project management and its constituents (Project Cost Planning, Project Cost estimation, Project Cost budgeting and controlling of Project Costs) and elements of project costs shall be discussed under the Theoretical part of the research. Moreover, with the Empirical aspect of the literature study, studies undertaken pertaining to the research topic shall be deliberated. On the third part of this chapter, the study gap in the literature review shall be explained. Finally, conceptual frame work of the study shall be presented.

2.2 Theoretical Literature Review

2.2.1 Project Management

According to Harlord Kerzener (Kerzener,2017) a project can be considered to be any series of activities and tasks that have a specific objective with a focus on the creation of a defined business value within certain specifications ,time frame ,funding limits. And, to this effect, consume human and nonhuman resources (i.e., money, people, equipment) and multifunctional in nature. The 6th edition of PMBOK (PMBOK, 2016), reaffirm the above ,by saying that Projects are undertaken at all organizational levels and can involve a single individual or a group or a single organizational unit or multiple organizational units from multiple organizations.

Moreover ,as quoted by Chitkara (Chitkara,2017), The British Standard BS 6079: 2000 defines project management as the planning, monitoring and controlling of all aspects of a project and the motivation of all those involved in to achieve the projective objectives on time and to the specified cost, quality and performance. Similarly, Project management, according to ISO 10006: 1997(E), includes: the planning, organizing, monitoring and controlling of all aspects of the project in a continuous process to achieve its objectives.

According to PMI (PMBOK, 2016) time, cost, scope, and quality are the most important factors in defining the success of a Project. It is also much more reasonable to think that

project that meets the target with respect to Cost, Quality, Time and scope is a successful project. However, this doesn't always hold true as the success of a project depends on who the stake holder is (Harlord Kerzener, 2017)

2.2.2 Project Cost Management

As per Georgas, P. G. & Valance (G.V, 1986) Cost Management is one of the primary functions of Project Managers. When integrated with the scope/quality of the project and time management, these three functions form the core of Project Management. The cost management function maintains its important focus at every stage throughout the life cycle of a project. In listing the reasons for the success of a project, the management of cost is the most important as all other project aspects will be affected by this function.

Thus, it can be inferred that Project Cost management is one of the basic considerations requiring attention throughout the project life cycle as it determines the achievement of one of the success factor of the Project and at the same time, can affect other parameters of the project directly or indirectly.

Similarly, Chitkara (Chitkara, 2017) stated that "Cost management deals with the management of costs of Project Resources. It covers the effective implementation of cost management processes including estimating, planning, budgeting, monitoring and controlling costs with the objectives of project completion within the approved budgets along with authorized variations."

Jennifer Bridges (Bridges, 2017) seem to agree with the above assertion as she stated that Project cost management process begins in the planning phase of the project, where the costs are approved by executives before being implemented. Then, when the project is executed, the expenses are carefully monitored and recorded to make sure that they're aligned with the cost management plan.

Further to the above, as per PMI-Construction Extension to the PMBOK guide (2016) Project Cost Management in construction includes cost estimating, cost budgeting, and cost monitoring and control, and further entails managing the day-to-day project costs.

2.2.2.1 Components of Project costs

Construction costs incorporate direct and indirect costs. Direct costs are those that are directly linked to a particular work activity, and may involve equipment costs (e.g., a motor grader that is used exclusively for spreading of sub base material). Indirect costs are those costs that cannot be directly linked with one activity and are assigned in some proportional manner over multiple scopes of work found in a single project such as shared service vehicles, small equipment and small tools). PMBOK extension to Construction (2016)

Moreover, (Abeslom, 2008) referred & quoted Plither (1992)who said that the estimated cost of carrying out the work is consist of the direct cost of the work to which are added the site overhead costs. Plither further said that the estimated cost ,which he referred to as construction cost, together with general or company overhead costs, would form the ”net cost”.

Pertaining to the classification of Construction Costs, Tadesse (2006) stated that the cost of any construction project consist of direct cost which includes cost of material, labor, and Equipment and Indirect cost which include but not limited to site overhead cost and company overhead cost. According to Tadesse the total construction cost of a project is composed of four cost categories; direct costs, indirect costs, risk allowances and profit.

As briefly discussed above, Construction project cost is comprises of different cost components. Thus, an introductory description of each cost components are discussed as shown below;

2.2.2.1.1 Direct Costs

Direct costs are all costs that can be assigned to a specific activity in the project. Direct costs normally consist of the cost of materials, labor, equipment and subcontractors engaged to carry out a particular activity or a well demarcated piece of work. (Tadesse, 2006)

Moreover, as per Plither (1992), direct cost shall be obtained by first quantifying the quantities of the specific item of work, defining the resources and duration required for the accomplishment of the item of work and then finally applying cost rates to the quantities and durations.

a) Material costs

Material cost is the cost that has to be spent to provide the materials required for satisfying the construction requirement of a given design. Ostwald (2001).According to Tadesse (2006) direct material cost refers to the cost of materials including allowances for scrap and wastages, consumables and parts used for carrying out an activity. Moreover, as per Chitkara (2017), the direct material cost includes:-Purchasing cost, transportation cost, custom clearance cost, Insurance and handling expenses until it reaches to the project's site. Moreover, the direct material cost includes site manufacturing and fabrication cost to change the raw material into the final end products in line with the requirement of the contract.

b) Labor costs

Direct labor cost refers to the expense the company spend to the labor that transform the material from one state to another value added state. In the case of construction industry, Carpenters, masons, steel fixers, operators, mechanics, plumbers and electricians are typical titles for direct labor. (Ostwald, 2001).There are differences among scholars and companies as regard to the classification of Direct and Indirect labor.

For instance, Tadesse (2006) classified costs of insurances, medical expenses, benefits and statutory regulation and compensation expenses such as earned leave, provident fund entitled to employees as Indirect Costs whereas Chitkara (2001) considers all the above as direct costs.

c) Equipment costs

Cost of equipment is consist of the cost spent to own, operate, maintain, transport, set up and tear down a given equipment and equipment costs refer to the costs of machineries and plants used for the execution of a specific activity.(Taddese,2006) According to Ostwald(2001),Equipment costs related with the construction works can be calculated particularly for a given job or can be converted into a part of an overhead costs. However, treating equipment costs as direct cost is much preferable approach as it is easier to find the cost of equipment per an activity.

d) Subcontract costs

Whenever particular activity of the project is seconded to sub-contractors, the price of the subcontractor given for carrying of that specific activity shall be considered as the direct cost of the activity. (Tadesse, 2006)

2.2.2.1.2 Indirect Costs

Indirect costs include all costs which are attributable to the project but cannot be linked to a specific activity or work package. (Chitkara, 2017) In other words, all costs that are not direct costs shall be considered as Indirect costs.

In construction projects, indirect costs constitute a substantial portion of the total construction cost. As per (Chitkara, 2017), Indirect costs may vary from 7.5% to 35% of the total cost.

There are differences among scholars regarding the classification of indirect costs. For instance, Tadesse (2006), consider Indirect costs as Overhead costs and then subdivide them into site and head office overhead costs. Whereas, (Chitkara, 2017) classified indirect costs into production overhead costs, site overhead costs and head office overhead costs.

a) Production overheads

Production overheads constitute indirect material, labor and other indirect expenses. As per Chitkara, these cost include indirect material costs such as tradesmen's tools, minor equipment and consumable material. Ostwald (2001) said that these tools can be estimated to be 0.1% to 2% of the direct labor cost, though they seem to be insignificant.

b) Site overhead costs

Site overhead costs are expenses spent in connection with inputs that are important for the smooth operation of the site but cannot be attributed to any direct costs found in the project.(Taddese,2006)Thus, indirect costs shall be shared proportionally by all activities found within the project.

Each construction may have its own list of Site overhead items which are unique, but there are some items which can be common to the majority of the construction Project. Plither

(1992), list down the following typical site overhead items: - site management and supervision offices, canteen, storage sheds, cars and other transport, temporary roads and services and general labor not assigned to production.

c) Head office or company overheads

Company overhead, which is also called general and administrative overhead, shall include all costs incurred by the headquarter of the construction firm so as to stay in the business and support all projects run under it, but are not directly related to a particular Project of the company. (Assaf, 2001).However, as Tadesse (2006) indicated, these costs shall be shared proportionally by all projects under the Company.

Furthermore, according to Ostwald (2001), this overhead costs shall include general expenses such as head office rent, office insurance, light, supplies, furniture, telephone, legal expenses, donations, travel, advertising, bidding expenses and salaries of the executives and office employees.

2.2.2.1.3 Risk and allowances

According to Plither (1992), Contractors by the virtue of the nature of the works shall take care of risks such as; ability of the contractor to maintain the productivity of resources as assumed at the bidding stage, adverse weather conditions which could disrupt operations and resulted in rework, availability of construction materials, delays due to industrial disputes, the financial stability of the client and the performance of equipment.

Moreover, contractors are liable to risks in connection with change orders or changes to the scope of the contract. In this scenario, even if, the additional cost of the changed work is reimbursed, it is often difficult to validate and thus cover all the costs of delays and rescheduling. Thus, contractors should incorporate all these unlucky possibilities as risk allowances in their tender or construction price to take care of the eventualities of the risk factor mentioned above. (Tadesse, 2006)

To this effect, an assessment should be done on identification, evaluations and quantification of risk factor during the estimating or pricing stage. Following the assessment, allowances should be incorporated to form the total construction cost, the amount or proportion depends on the type, size and nature of the project, contractor’s experience and other related factors.

2.2.2.1.4 Profit

Profit is the sum of money that will remain with the contractor after the completion and handed over of the facility to the client. (Plither, 2001)In other words, profit is the incentives that brought the contractor into the works agreement and committed all his resources into it. Plither (2001) also noted that evaluation of risk is the most important factor that can influence the percentage of Profit. On the other hand, Tadesse (2006), stated that percentage of Profit completely depends on the competitiveness of the market and strategic of the Company.

Figure 1-1: Components of Construction Cost, Source Roy Plither, 1992

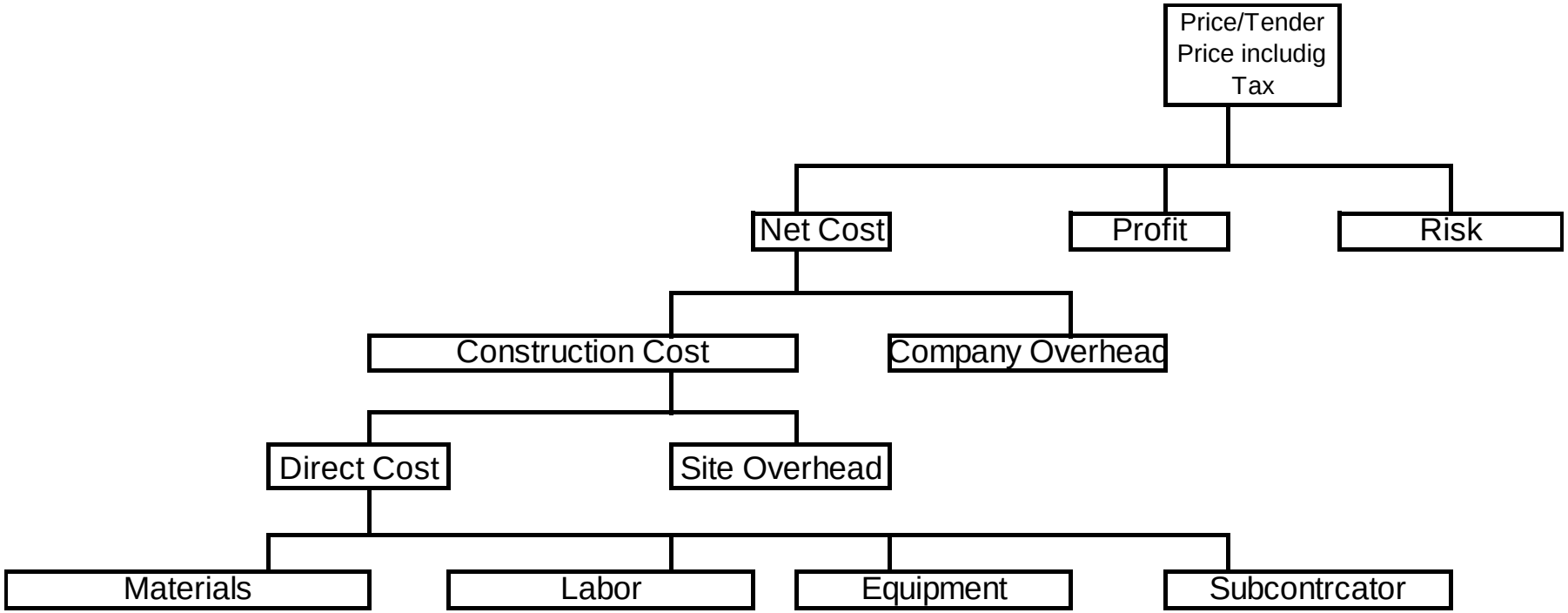

Fig1:Components of Construction Cost,Source Roy Plither,1992

2.2.2.2 Project Cost Management Processes

Project Cost Management includes processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget. PMI (PMBOK, 2017)

Moreover, the PMBOK guideline (2017) explained that the Project cost management knowledge area shall include the under listed processes:-

- Plan Cost Management—the process of defining how the project costs shall be estimated, budgeted, managed, monitored, and controlled.
- Estimate Costs—the process of developing an estimate of the financial resources required to finish the project work.
- Determine Budget—the process of aggregating or summing up the estimated costs of specific activities or work packages to form an approved cost baseline.
- Control Costs—the process of monitoring the status of the project to update the project costs and manage changes to the cost baseline.

Further to the above, Chitkara (2017) also stated that the Project Cost Management System includes processes relating to planning costs baseline for each work package, budgeting work package, controlling cost by analyzing direct and budgeted costs behavior, predicting trends and forecasting cost-at-completion. He further explained that these processes are interdependent and do overlap at the same time, though they use different tools and techniques.

Similarly, as stated by Paul Sanghera (2019) Cost management contains the Plan Cost Management process to generate a cost management plan according to which all the three other processes are performed. The Estimate Costs process generates the output items cost estimate and basis of estimates, which are used by the Determine Budget process to generate a cost baseline and project funding requirements, which are used in the Control Costs process.

The interaction among the four project cost management processes in the project cost management knowledge area is depicted under figure 2 shown below.

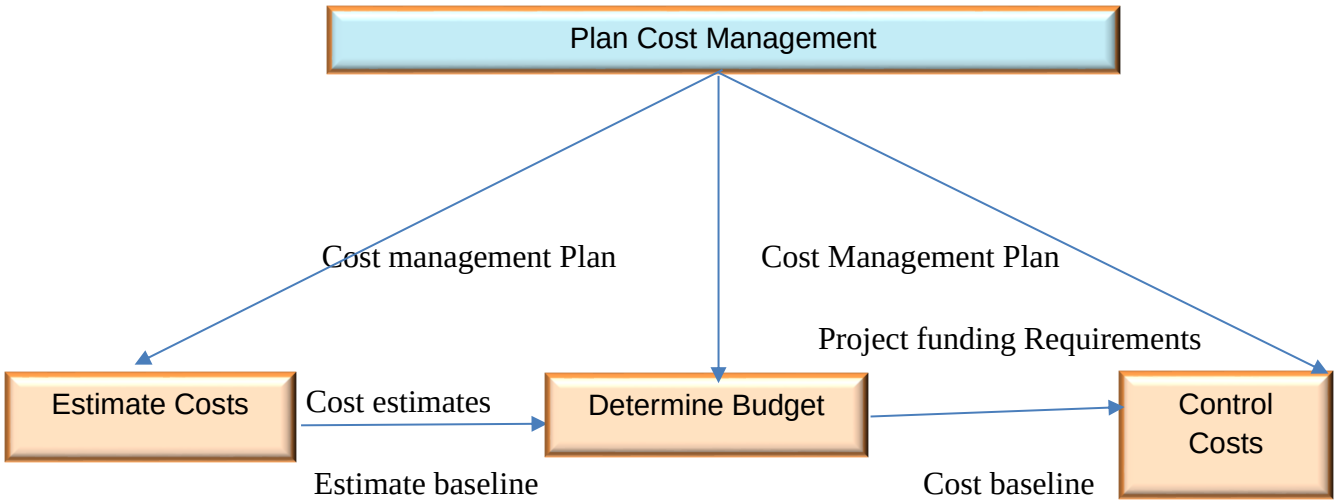

Figure 2-2: Big Picture of Cost Management (Adopted from Paul Sanghera 2019)

Table 2 shown below lists the Process of Cost management along with their process groups and major outputs. Adopted from Paul Sanghera, (2019)

Table 2-1: Process of Project Cost Management

Cost Management Process	**Process Group**	**Major Output**	**Perform**
Plan Cost Management	Planning	1)Cost management plan	Once or at predefined points in the project
Estimate Costs	Planning	1)Activity cost estimates 2)Basis of estimates	Periodically throughout the project
Determine Budget	Planning	1)Cost baseline 2)Project funding requirement	Once or at predefined points in the project
Control Costs	Monitoring and Controlling	1)Work performance information 2)Budget forecasts	Throughout the project

On the other hand, the Construction Extension to the PMBOK guidelines (2016) gives more emphasis to the three processes of Project cost management knowledge area: cost estimating, cost budgeting, and cost monitoring and control.

2.2.2.2.1 Plan Cost Management

Plan Cost Management is the process of defining how the project costs will be estimated, budgeted, managed, monitored, and controlled. The key benefit of this process is that it provides guidance and direction on how the project costs shall be managed throughout the project and shall be performed once or at a predefined points in the project. PMI (PMBOK, 2017)

The cost management plan presents a manual or a general guidelines on how to manage costs in general and also provides specific guidelines on estimating, budgeting, and controlling costs. Paul Sanghera (2019)

From the above, we can deduce that the plan cost management is the process by which the frame work of the overall project cost management is established. The cost management plan gives confidence, strong indication and hints to the client or sponsor of the project, how the project understand costs, control expenditure, account for expenditure and its ability to control costs. For a smaller project, this process group might be an element of the wider project management plan but as the project gets bigger the company might want to make this document independent by its own.

The contents of cost management plan may include:-Choice of Processes related with blending estimation and budgeting as one process or not, fixing units of Measurements, determining the use of WBS, Setting rules on how to Measure Performance, format and submission frequency of various cost reports, the maximum cost performance deviation allowed from the baseline.

Table 2-2 shown below shows Inputs, tools and techniques, and outputs of plan cost management process (PMBOK, 2017)

Table 2-2: The Plan Cost Management Process: Inputs, Tools and Techniques

Plan Cost Management		
Inputs	Tools and Techniques	Out Put
1. Project charter 2. Project management plan • Schedule management plan • Risk management plan 3. Enterprise environmental factors. 4. Organizational process assets	1. Expert judgment 2.Data analysis 3. Meetings	Cost Management Plan

As per Paul Sanghera (2019), the processes of performing plan cost management processes shall use the inputs, tools and techniques mentioned in the PMI(2017) shown above.

The plan cost management starts with getting inputs such as the project charter wherein the planner can get information pertaining to the preapproved resources to the project and other preexisting details such as the requirements of the project.

From the project charter: the planner can get information regarding the preapproved or set aside financial resources from which a detailed cost can be developed. Moreover, from the same document, it is possible to take out the project requirements which will later on determine the cost of the Project. From the schedule and risk management, the planner can get information about which processes and controls that may influence cost management of the project, like cost estimates. Enterprise environmental factors and organizational project assets have also the capacity of shaping the cost management plan.

Regarding the tools, the planner can use data analysis such as alternative analysis to choose which funding option or whether to make or buy, is appropriate to the project. Expert Judgement is also another tool wherein the expertise knowledge on cost management related topic shall be used. Finally, to get use of the inputs and tools mentioned above in a coordinated manner, the planner can hold meeting involving the relevant stake holders.

2.2.2.2.2 Project Cost Estimation

Cost estimating is defined by Gregory K.Mislick and Daniel A.Nussbaun (2015) as the process of gathering, retrieving and analyzing historical data and then applying different quantitative models, tools, techniques and data bases so as to forecast the future cost of an item of work or task.

Estimating is an essential part of project management, since it becomes the baseline for subsequent cost control. If the estimate for a project is too low, a company may well lose money in the execution of the work. If the estimate is too high, the company may well lose the contract due to overpricing. (Albert Lester, 2017)

From the above, it is clear that cost estimate shall be based on historical data and use quantitative approach so as to predict the future cost of an item or a product. Similarly, as per Chitkara (Chitkara, 2017) Cost estimation is the process of developing approximate monetary resources needed to complete the project work and a forecast that is based on the available information.

Hence, it can be concluded that an estimate is an assessment of future cost based on specific facts and assumptions pertaining to the final cost of a project. Due to the same, the result of the estimating process could vary with the type, amount, accuracy of scope , availability of data, time given to prepare the estimate, viewpoint of the preparer (contractor, designer, owner),skill of the estimator, calculation technique, cost accuracy desired and the business risk assessment involved in the system.

As per Dr.Mike Clayton (2019), there are two reasons why Project Estimation is a big deal for project managers. First, it’s extremely hard to do well as it deals with uncertainty of the future and second, poor estimates are often a primary reason for a project cost or schedule over-run.

Moreover, the estimating activity shall be compounded with integrity, information accuracy and calculation for uncertainty and risk, so as to be a transparent process and the information provided can be accurately represent the future risks. (Alula, 2020)

The inputs, tools and techniques, and outputs of this process are depicted in Table 3 shown below as adopted from PMI (PMBOK, 2017)

Table 2-3: Project Cost Estimating process

Estimate Costs		
Inputs	**Tools & Techniques**	**Outputs**
1. Project management plan 2.Project documents 3. Enterprise environmental factors 4. Organizational process assets	1. Expert judgment 2 Analogous estimating. 3 Parametric estimating. 4 Bottom-up estimating. 5Three-point estimating. 6.Data analysis 7 Project management information system. 8 Decision making • Voting	1-Cost estimates. 2-Basis of estimates. 3-Project documents updates • Assumption log • Lessons learned register • Risk register

I. Cost estimation approaches

To come up with an accurate cost estimates, an estimator may use different approaches and techniques that will deliver estimates having various levels of accuracy. As per Construction extension to the PMBOK guide (2016), the most prevalent construction estimating techniques are analogous, parametric, bottom-up, three-point estimating, and Monte Carlo simulation.

- **Analogous (Conceptual) Estimating**:-Analogous estimates are also referred to as preliminary, conceptual, top-down, order of magnitude (OOM), and rough order of magnitude (ROM). This tools make use of data related with the experience of past or similar projects.
- **Parametric Estimating**: - Uses project characteristics (parameters) in a mathematical model to predict project costs. (e.g., square footage in building construction) to calculate a cost estimate. For instance:-Labor requirements for $1m^3$ of Concrete work
- **Bottom-Up (Detailed) Estimating**: - Bottom-up techniques are the estimating tool of choice when the detailed project design becomes available. It consist of estimating individual work items from elemental bottom level and then roll it up.

- **Three-Point Estimating**: - Cost estimates based on three points with an assumed distribution provide an expected cost and help clarify the range of uncertainty around the expected cost.

2.2.2.2.3 Project Cost Budgeting

As per Samuel J. Mantel, Jr et tal (2001), Budgeting is the process of predicting what resources the project requires, how much will be required, when they will be needed, and how much they will cost.

As per Paul Sanghera (2019), cost is what is paid out by the user to get a product or service whereas Budget refers to an aggregate or sum up cost associated with a time line. Summing up the costs of all resources required to implement the project and providing a time line on it or in other words the availability of funds over time is called a budget.

Similarly, it can be understood that determining a project Budget is the process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline and the key benefit of this process is that it determines the cost baseline against which project performance can be monitored and controlled. PMBOK (2017)

Chitkara (2017) stated that the project budget is a planning document which reflects the financial plan of the project activities, with specific goals clearly out lined along with the costs expects to be incurred.

The primary purpose of developing project budget is to mobilize the resources needed to accomplish the project's objectives, setting a financial targets and resources to each activities of the project as a basis for controlling the performance of the project .Besides, a developed budget helps to make the members of the project cost conscious in their day to day operations. (Abeselom, 2008)

In support of the above, Samuel J.Mantel,Jr et tal(2001) explained that budgeting ties the project to the organization's aims and objectives through organizational policy by raising as

an example the production cost reduction achieved by NASA through a shift in organizational policy it had adopted earlier on.

In any construction projects, clients and contractors have separate budgets as their budgetary objectives differ .However, they both shared the project schedule of work and earned value as the common base line for these budgets.

The client's construction budget is primarily a capital budget. It is what the client has earmarked for the project. It includes the expenditure on preliminaries, procurement of land, client supply resources, consultant's fee, contractor's cost and the cost of working capital. Client cash flow forecasts time-phased funds requirement and the sources from which these funds are to be provisioned. On the other hand, a contractor's budget is earned value revenue and resources expenditure oriented. It includes quarterly statements of revenue and expenditure and forecast of financial statements of projected balance sheet, cash flow, profit and loss and performance measuring baselines. (Chitkara, 2017)

Determining Project's budget requires the Inputs, Tools and Techniques indicated in the table shown below so as to get the out pus indicated herein. (PMI, 2017)

Table 2-4: Determining Project Budget Process, PMI (PMBOK, 2017)

Determine Budget		
Inputs	**Tools & Techniques**	**Outputs**
1) Project management plan • Cost management plan • Resource management plan • Scope baseline 2) Project documents • Basis of estimates • Cost estimates • Project schedule • Risk register 3) Business documents • Business case • Benefits management plan 4) Agreements 5) Enterprise environmental factors 6) Organizational process assets	1) Expert judgment 2) Cost aggregation 3)Data analysis • Reserve analysis 4) Historical information review 5) Funding limit reconciliation 6) Financing	1)Cost baseline 2)Project funding requirements 3)Project documents updates • Cost estimates • Project schedule • Risk register

Budgeting tools and Techniques

- Expert judgment:-individuals or groups with specialized knowledge or training;
- Cost Aggregation: summing up cost of activities starting from elemental level along WBS.
- Data analysis:-Such as reserve analysis, which can establish the management reserves for the project.
- Historical information review:-Reviewing historical information can assist in developing parametric estimates or analogous estimates.
- Funding limit reconciliation:-The expenditure of funds should be reconciled with any funding limits on the commitment of funds for the project.
- Financing:-as a tool in budgeting dictates to conditions wherein funding is acquired for the project in stages along the timeline and to receive it, you have to meet certain conditions. For instance:-to secure funds at every stage, the project manager should show progress in the execution of the planned works.

2.2.2.2.4 Project Cost Control

Project cost control is part of a larger framework in project management which is known as project evaluation and control. A project evaluation and control involves measuring project performance and comparing against a project plan to ensure that the project is completed on time, within budget, and to the satisfaction of the customer. To this effect, Project cost control is specifically deals with understanding why the cost variances, both good and bad, have occurred.

Ignoring significant project cost variances may cause the project to suffer from budget shortages, additional risks, or scheduling problems. Therefore, when significant cost variances happen they must be recorded and investigated.

As per James P. Lewis (2007), Control is the act of comparing progress to plan so that corrective action can be taken when a deviation from planned performance occurs. This imply that control come in to view by comparing progress and plan with the motive of taking corrective actions.

Control Costs is the process of monitoring the status of the project to update the project costs and managing changes to the cost baseline and the key benefit of this process is that the cost baseline is maintained throughout the project. PMI (PMBOK, 2017)

Control processes focus on monitoring the status of the project cost, analyzing the cost variance from the baseline, determining the causes of cost change, generating information for making decisions and communicating decisions to the appropriate organizational units for action.(Chitkara ,2017)

Abeslom (Abeslom, 2008) quoted Plither (1992) who had stated that the cost control by contractors, has the following three functions:-

- The first and most important is a day-to-day use of a cost control system to track costly operations.
- The second function is to provide feedback to the estimator for future pricing.
- Thirdly, providing data for the valuation of variations that may occur.

All in all, up keeping of cost records facilitate the process of buildup of new rates.

As noted by Abeslom (Abeslom, 2008), Planning, executing, accounting, monitoring and re-planning (when necessary) is a continuous controlling process that goes on till the completion of a project. Moreover, Chitkara (Chitkara, 2017), noted that controlling involves monitoring of the performance and applying corrective measures in case of deviations from the plan is noticed. And as per Chitkara (Chitkara, 2017) the process of controlling is divided into the following stages:

Specifying the factors to be controlled, stating the methods of measuring control factors,

Creating systems for generating performance data, monitoring data received and formulating corrective options, applying corrective measures to put a plan on the scheduled path and rescheduling, when necessary.

Paul Sanghera (2017) says, Monitoring and controlling cost has two dimension to it, the first one is controlling the expenditure of costs in reference to the project's approved budget whereas the second one is controlling the expenditure of project funds with respect to work executed as a result of the budget there by checking relationship between the expenditures and the accomplishments. The cost performance of the project is found in the relationship between spending and execution. The other main aspect of Monitoring and controlling costs is to control the changes to the approved cost performance baseline." Paul Sanghera (2019),

Further to the above, Paul Sanghera (2019), explained that monitoring and controlling the project costs includes the following:-

- **Influence** :Controlling factors that can change the approved cost baseline
- **Monitor** :work executed against the funds spent and variance of cost performance from approved cost baseline
- **Prevent** any unauthorized changes from unapproved changes from entering into implementation, expenditures, and cost reports.
- **Act** to maintain the cost overruns within the planned acceptable limits.
- **Ensure** the following: change requests are handled appropriately and Expenditures do not exceed the approved budget in reference to timing and total amount. Finally, make sure any change to cost baseline must be approved before implementation.
- **Communicate** with the appropriate stakeholders about the cost associated with the approved changes.

Project cost can be monitored and controlled by the Control cost process presented in Table 2-5 shown below, in terms of Input, tools and techniques, and output.

Table 2-5: Project Cost Control Process, PMI (PMBOK, 2017)

Control Costs		
Inputs	Tools and techniques	Outputs
1. Project management plan • Cost management plan •cost baseline •Performance measurement baseline. 2. Project funding requirements. 3. Work performance data. 4 Project documents • Lessons learned register. 5 Organizational process assets	1) Expert judgment. 2) Data analysis • Earned value analysis • Variance analysis • Trend analysis • Reserve analysis. 3) To-complete performance index. 4) Project management information system	1 Work performance information. 2 Cost forecasts. 3 Change requests. 4 Project management plan updates • Cost management plan • Cost baseline • Performance measurement baseline. 5 Project documents updates • Assumption log • Basis of estimates • Cost estimates • Lessons learned register •Risk register

As per PMI (PMBOK, 2017) the inputs, tools and techniques, of the project cost control process are as discussed under (I), (II) & (III);

I. Control costs: Inputs for project cost control are;

a) Project management plan:- include but are not limited to:

- Cost management plan:-describes how the project costs will be managed and controlled.
- Cost baseline which is the approved version of the time-phased project budget and it shall be compared with actual results to determine if a change, corrective action, or preventive action is necessary.
- Performance measurement baseline: - it is an integrated scope-schedule-cost plan for the project work against which project execution is compared to measure and manage performance. When using earned value analysis, the performance

measurement baseline is compared to actual results to determine if a change, corrective action, or preventive action is necessary.

b) Project documents:-such as lessons learned register. Lessons learned earlier in the project can be applied to later phases in the project to improve cost control.

c) Project funding requirements: - The total funds required are those included in the cost baseline plus management reserves, if any

d) Work performance data: - data on project status such as costs invoiced, and paid.

e) Organizational process assets :-like Existing formal and informal cost control-related policies, procedures, and guidelines; Cost control tools; and Monitoring and reporting methods to be used

II. Control Costs:- Tools and Techniques

a) Expert judgment: Expertise inputs on: Variance analysis, Earned value analysis, Forecasting, and Financial analysis.

b) Data analysis:- this is a technique that can be used to control costs include but are not limited to: -

B-1) **Earned value analysis (EVA)**. Earned value analysis compares the performance measurement baseline to the actual schedule and cost performance.

B-2) Variance analysis, as used in EVM, is the explanation (cause, impact, and corrective actions) for cost, schedule, and variance at completion variances. Cost and schedule variances are the most frequently analyzed measurements.

B -3) Trend analysis:-Trend analysis examines project performance over time to determine if performance is improving or deteriorating. Graphical analysis techniques are valuable for understanding performance to date and for comparison to future performance goals in the form of BAC (Budget at Completion) versus estimate at completion (EAC) and completion dates.

2.3 Empirical Literature Review

As discussed in the theoretical literatures cited above, having proper project cost management system facilitates the completion of the project on time, on budget and within the required quality parameters.

Many researchers have disclosed that time and cost performance of many construction projects in different parts of the world are poor. For instance, j.d.Frame (J.d.Frame, 1997) quoted in Aftab et al (2012), in a study of 8000 projects 84% of the projects had sustained an overrun in either of the three performance criteria, i.e., time, cost and quality. Similarly ,as per the study conducted in transport infrastructure projects covering around 258 projects in 20 nations by Flyvbjerg,et al(2003) and quoted in Aftab & et al (2012) that "9 out of 10 Projects face cost overrun." Aftab and et al (2012), have also disclosed that time and cost performance are the fundamental factor for the success of any Project.

Many Contractors are facing difficulties to complete their project within the budget for different reasons. The causes of cost overruns may include: - scope change, incomplete designs, Inflation and inaccurate forecasting. Matty (2015)

A study conducted by Solomon Berhanu (2017) on the impact of Project Cost management practices on the success of the Project management undertaken by Heineken Brewery Share company, kilinto phase 2, it was disclosed that the project cost management subparts such as resource planning, Cost estimating, Cost budgeting and Cost control had significant impact on the overall success of the Project management.

Similarly, a study conducted by Harrison Njamu (2004) on evaluation of construction project cost management system for public works of Botswana, revealed that inadequate planning and control for project costs had a major role for cost inefficiency. Pursuant to the study, Njamu recommended that the government should provide a detailed specifications to confirm the project requirements and also provide a standardized cost control measures on public projects as a way forward of resolving the cost overrun problem.

From the study conducted on Critical factors affecting cost performance of Ethiopian public construction projects by E. G. Sinesilassie et al (2017), it was indicated that scope clarity, project manager's competence, conflict among project participants and project manager's ignorance and lack of knowledge are critical factors affecting cost performance of Ethiopian

public construction projects. As a solution the researchers advised that developing countries should target their investments in education and training aimed at producing professionals, technicians and skilled people suited to deliver the best possible public construction projects in the context of the country. Furthermore, the researchers advised that foreign consultancy firms in Ethiopia should also offer effective training programs at appropriate intervals to project participants in order to produce competent people in the sector thereby to enhance the domestic capability.

As related to the cost performance of Infrastructure projects like Road and Railway construction undertaken by the Federal Government of Ethiopia, the study conducted by Yenealem (2020) show that 80% of the 25 Asphalt Road projects and 100% of the three railway construction projects completed from 2014 to May, 2018 had sustained cost overruns of 15% and 8.83% respectively. Moreover, the same study revealed that Inflation of material cost, scope change with the change order, incomplete study before project approval, poor specification and bill of quantity, and poor project performance monitoring and evaluation were among top factors of cost overruns. Finally, the researcher recommended the following strategic approaches as wayward to resolving the cost overrun problems:- rewarding well-performed contractors, enhancing capability of project management staff, make selective Public-Private-Partnerships (PPPs) to increase construction competency and minimize government inefficiencies in the construction projects, enhancing performance monitoring and information sharing practices, and strengthening the linkages among construction Industries.

The study conducted by Ashebir et al (2017) pertaining to Causes of Cost Overrun in Federal Road projects of Ethiopia in case of Southern District, around 18 Road construction projects which were found under the southern district of Ethiopian Road Authority were identified to have six top rated factors as detrimental to their cost management among around 40 factors which had been selected earlier on. These six factors are material price fluctuation, cost underestimation, delay in supply of raw materials, inadequate review of contract documents, lack of coordination at the design phase and lack of cost planning during pre- and post- contract stage. These factors were found to have the highest impacts on the performance of project costs from the client's, consultants' and contractors' perspective. From the study, it has been identified that the magnitude of cost overrun among selected project extended from 4.16% to 83.2% while the average magnitude of cost overrun was

nearly 21.52% which is a significant amount when it compared with the number of projects covered under the study.

Abeselom Abraham (2008) revealed several issues pertaining to the practices of National Contractors on estimating and tendering, budgeting and cost controlling processes by looking into the practices of 34 general and building contractors through a questionnaire survey. From the survey and subsequent analysis carried out thereof, he has found out that the success rate of tender offers was below 50% for 80% of the surveyed contractors and 67% among these had a success rate less than 25%.The justifications for the less success rate of tendering were found to be correlated with tough competition and absence or lack of bidding strategy by the contractors. Moreover, the research showed that 86% of the surveyed contractors had got below 75% of the planned profit at the end of the project and among these 48% contractors had gained profit below 50 % of the anticipated amount. The major factors contributing for the reduction of profit, in the order of their influence were price escalation, delays caused by owners and/or consultants, inadequate financial planning practices, lack of cost controlling system and inaccuracy of the estimates prepared during the tendering stage.

According to the same research results (Abeselom,2008), factors contributing to the inaccuracy of cost estimates are mentioned as: unfamiliarity with different estimating methods, lack of up to date estimating manuals or standards on resources consumptions and productivity, inadequate search for information on project specific and contextual cost and non-cost items, improper estimation of overhead costs, failures to evaluate and incorporate and/or difficulties in forecasting and quantifying risk allowances and inadequate assessment of factors while determining markup amount or profit margin.

However, the writer of this paper has found out that the research made so far in the area of Project cost management in general and assessment of existing practices of contractors in particular lacks the following:-

- Most of the research were made from the side of the Employer;
- Most of the research which were made from the perspective of the contractors are either focused on building contractors or based on case studies;

- Most of the research papers were dedicated on one of the 4 processes of Project cost management rather than assessing the practices of contractors pertaining to the project cost management as a whole system;
- The writer of this paper has not find any research having the scope of assessing the project cost management of Road construction contractors despite the Federal government of Ethiopia has been heavily investing huge sum of money on the sector. Some of the research which had been done were rather fixated on studying causes of Cost over run or time and cost overrun prior to discussing the actual practices of cost management of contractors. Thus, the writer of this paper believes that assessing the real practices of contractor related with their project cost management will pave a way for further study in connection with identifying causes of cost over run among others

2.4 Conceptual Frame Work

Based on the literature review conducted in the foregoing section, the diagrammatic conceptual frame work shown below is illustrated. The Conceptual frame work indicates how the researcher of this project work would proceed and the sequential relationship between different project cost management processes. For instance, it shows how the output of one process like Plan cost management process delivers an input for the subsequent process, Cost estimation process. Moreover, the conceptual frame shows how the basic cost element of an activity such as direct cost, indirect Cost, profit , risk and tax are associated with the cost estimation process.

All in all, the diagrammatic representation of the conceptual frame work of the study, elaborates the relationship among the processes of Project Cost management, explains the logic underlying these relationships and describe the nature and direction of the relationship among processes of Project Cost Management.

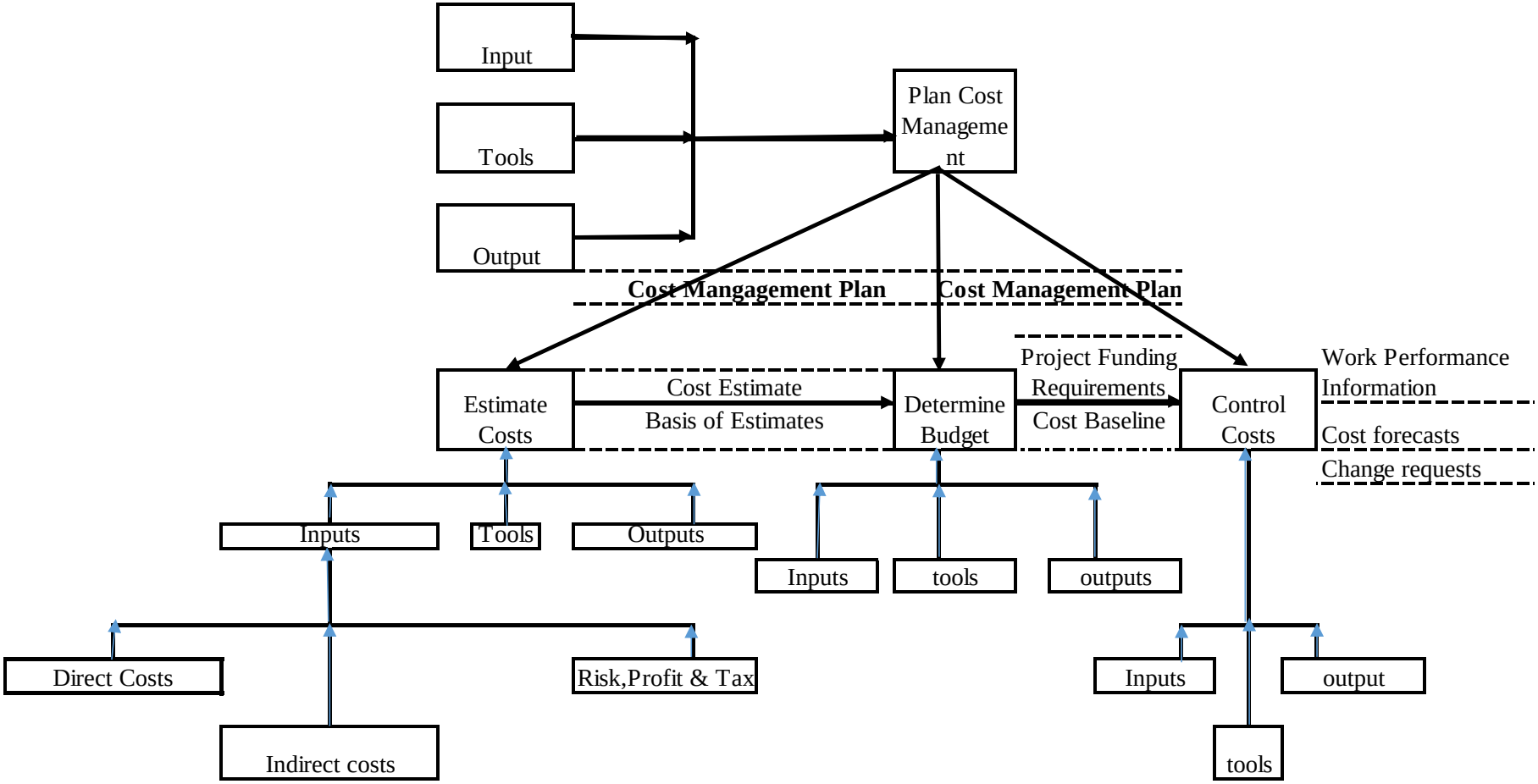

Figure 3-3: Conceptual frame work of Project Cost Management

CHAPTER 3 - RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

"Research in simplest terms is searching for knowledge and searching for truth. In formal sense it is a systematic study of a problem attacked by a deliberately chosen strategy which starts with choosing an approach to preparing blue print (design) acting upon it in terms of designing research hypotheses, choosing methods and techniques, selecting or developing data collection tools, processing the data, interpretation and ends with presenting solution/s of the problem" (Grover, 2015)

This section of the Project work deals with the research approach, design, population and sampling, how the project work ensures validity and reliability and the data collection and analysis method used for this research endeavor.

3.2 Research Approach

The research onion model developed by (Saunders et al, 2006) largely described the research approach as deductive or Inductive approach. In a very brief way, any researcher normally works with theory/theories and data .The theory part of the research is normally reflected in the theoretical literature study and the data is what the researcher would collect in the due course of conducting the research.

In the case of this research paper, deductive approach is a more appropriate as a theoretical background of the Project cost management processes has already been deliberated and it is then possible to assess the actual practice of cost management system of contractors with respect to the theory already discussed .Thus, collecting data related with the theories which have been discussed are crucial for running this project's work successfully.

3.3 Research Design

Based on the objective of the research or research questions raised by a thesis or a project work, research can be categorized as Exploratory, Descriptive and Explanatory.

In reference to the above, the design of the project work under discussion can be considered as an Exploratory type of research because it is the first type of a project work or thesis

which tries to explore the cost management practices of the local contractors engaged on the construction of federal Road Projects. Besides, the types of questions this project work tries to address are more of explorative in nature. However, as this project work intends to describe different factors and the position of the contractors as related to preparation of project cost plan and processes of estimating, budgeting and controlling, it has a nature of descriptive research too.

Furthermore, from the perspective of the type of data this project work intends to use, the design of the research shall be classified as Quantitative type of Research. At this juncture, it is worth to mention that Quantitative type of Research are the type of research wherein numbers are used as data and means for deriving theories. Moreover, the fact that this type of research goes with deductive research approach has been found logical.

All in all, as this project work is an exploratory type of research which has chosen a deductive research approach, it is much advisable to rely on numerical data. Thus, the research design shall conform to Quantitative type of Research.

3.4 Sampling Design

3.4.1 Census and sample survey

In any business research study, group of individuals or organizations or items planned to be studied is called Population or universe. Furthermore, a complete enumeration of all items in the 'population' is known as a census inquiry. (Kothari, 2004)

For this study the Population are grade I local construction companies who have had current contractual construction engagement with Ethiopian Road Administrations, ERA. From the official web site of Ethiopian Road Administration, www.era.gov.et list of local contractors having a project with ERA was retrieved and the total number of the local grade I contractors has been found to be 37.

In any research activity, studying the whole population may not be practical, economical and could also induce errors as the sizes of the population increases. However, in the case of this project works, census enquiry is a much preferable way of collecting data as the universe is a small one and it is no use resorting to a sample survey.

Table 3-1: List of Grade I local Contractors having Construction Contracts with ERA

No.	List of GC one Contractor
1	Yenecomand
2	Sunshine
3	ECWC
4	Gemeshu Beyene
5	Macro General Contractor and Trading
6	Defense Construction Enterprise (DCE)
7	Diriba Defersha General Contractor
8	Bridge Construction
9	ASER Construction Plc
10	Powercon
11	FAL General Construction PLC
12	Yotek Construction PLC
13	Senan Construction Plc.
14	Afro Tsion Construction Plc.
15	Rama Construction
16	Orchid Business Group
17	Enyi Construction
18	Yoseph Teketel G.C.
19	Eshetu Lemma Road Contractor
20	Melcon Construction Plc.
21	Markan Trading plc
22	Cross Land Construction
23	Alemayehu Ketema GC
24	NKH Construction Plc.
25	Samson Cherinet GC
26	Amara Road Work Enterprise
27	Beakea
28	DMC Construction PLC
29	Walabu Construction Share Company
30	Oromia Construction Corporation
31	Kibish Construction Plc.
32	Yonab Construction Plc.
33	Yirgalem Construction Plc.
34	Somali Roads Enterprise
35	Midroc Construction Ethiopia PLC
36	Tiks Construction
37	MCG Construction PLC

3.5 Types, sources and data collection methods

The type of data required to be collected for this research shall be quantitative data as the research design of this project work conform to quantitative research design.

Regarding sources of data, there are two sources Viz., Primary sources and secondary sources. As the name implies, primary data are those which are collected for the first time, and the secondary data, are those which have already been collected by someone else. In the case of this research work, the data should be collected from the primary sources only because there are no accessible secondary sources that can provide researchable data for this project work.

Concerning, data collection methods, information pertaining to the research questions shall be gathered through questionnaires designed to be filled by respondents from each Contractor's headquarter or project's office. Thus, the writer of this paper shall contact the head quarter of each contractor covered under this study to get sufficient researchable data.

3.6 Research Instruments

Research Instruments are measurement tools such as questionnaires, standardized tests, surveys or scales, etc., designed to collect data pertaining to the subject being researched. Survey, Observation and Experiments are well-known Research Instruments suitable for Quantitative research design.

Owing to the nature of the Project work, among the research Instruments said to be suitable for quantitative research design, survey work in the form of a questionnaire or structured interviews has been selected.

From the available types of surveys, both a structured and multi choice questionnaire has been selected for this project work.

3.7 Data Analysis

The type of data analysis the researcher intends to adopt depends on whether the research design is Quantitative or Qualitative or mixed. In the case of Quantitative Data analysis the researcher would use statistics to summarize and analyses the sample data and to make inferential estimates about the population and to test the hypothesis.

However, in the case of this project work, descriptive analysis such as frequency and mean have been found sufficient to analyze the research data. This is because, as this research paper is using Census survey on all Grade I local Contractors who are currently engaged on the construction of the Road Project with Ethiopian Roads administration, application of inferential statistics was not required at all.

3.8 Validity and Reliability

For quantitative data analysis, issues of validity and reliability are important. Quantitative researchers endeavor to show that their chosen methods succeed in measuring what they purport to measure. They want to make sure that their measurements are stable and consistent and that there are no errors or bias present, either from the respondents or from the researcher. (Dawson, 2007)

Hence, in view of the above assertions, issues related with the validity and the reliability of this project work shall be discussed as shown below;

a) Validity

There are three main ways of characterizing validity in research studies. These are external validity, internal validity and construct validity.

External validity is concerned with whether a study's research findings can be generalized to other relevant settings or groups or deals with the representativeness of the sample to the whole population. As this paper used census survey, all grade I Contractors engaged on the construction of the federal Road projects under Ethiopian Roads administration were included. This imply that the data collected and the analysis made thereof shall represent the whole population. Due to the same, the findings of this research work holds true for all its population. This further imply that this project work doesn't have any problems related with the external validity.

Construct validity is concerned with the extent to which the research measures what it claims to measure. From this point of view, this research full fills the construct validity requirements too as the method of data collection has been designed with respect to the theoretical context of project cost management so as to measure the real practices of contractor's' cost management system.

Internal validity deals with measuring causality between factors, like assessing the contribution of "x factor" to cause "y factor" to happen. As this paper is concerned with the exploratory nature of Research, there are no variables requiring assessment of causality.

b) Reliability

Reliability refers to whether the data collection techniques adopted and analytical procedures used would produce consistent findings if they were repeated on another occasion or if they were replicated by another researcher.

Any factor which adversely alters or affect the way in which a participant performs in responding or providing the requested information is known as Participant Error. Under this project work, respondents were given ample time to give responses so as to avoid participant error.

Factors which produces a false response from the respondents is known as Participant bias. However, the fact that the respondents were given sufficient time and space to bring forth their response without mentioning their name is believed to have minimized participant errors in this project work.

Moreover, factors which alter the Researcher's interpretation and induces bias in the Researchers' recording of responses are known as Researcher's error and Researcher's bias respectively. In these contexts, the writer of this project work has taken the maximum caution to avoid such errors and bias by adopting a clear data collection and interpretation mechanisms.

Thus, based on the foregoing discussions, the Research data and findings associated herein are believed to be reliable.

3.9 Research Ethics

The researcher would like to confirm that objectivity, integrity, carefulness, openness, confidentiality and respect for intellectual property shall be maintained as the basic ethical moral of the research.

CHAPTER 4 - RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter discusses about the results that are produced from the research work. It consist of five sub sections in line with the questionnaire format that has been used to collect research data. In section one, it explains in depth the general information gathered about the respondent's firm willing to provide responses as per the research questionnaire.

In the second section of this chapter data related with the Plan Cost management process is summarized and discussed. The third part of this chapter deals with data retrieved from the responders regarding the project cost estimation process. The fourth part of this chapter concerned with the determine budget process aspect of the Project Cost management..

The final and fifth portion of this chapter mainly focused on summarizing and analyzing data collected in the areas of Project Cost control Process.

At this juncture, it is worthy to mention that the researcher managed to reach around 33 Grade one local construction companies' out of the 37 companies who have had road construction engagement with ERA. The researcher could not give a questionnaire formats to 4 construction firms, since the offices of the three contractors are located out of Addis Ababa and the fourth contractor was not willing to receive questionnaire.

However, from the 33 list of contractors mentioned above, the researcher could obtain responses only from 28 contractors while the other five recipient of the questionnaires failed to respond at all. This makes the response rate to stand around 85%.

4.2 General Information about the Construction Firms covered under this Research

1. Category and Grade of Contractors:-all contractors covered under this research belong to Grade I. More ever, 26 of them are General Contractors (GC) while 2 of them are Road Contractors.
2. Experience of the Construction Firms working on a Federal Road Projects with ERA

From the collected data it has been learnt that above 78% of the contractors have experience of above 10years whereas 18% of the contractors have experience between 6 and 10 years. On the other hand, one contractor representing 4% of the contractors have less than 5 years' experience.

3. Annual Turnover of the contractors for the past 5 years

From the collected data, it has been learnt that 79% and 21 % of the contractors have had an average annual turnover of less than ETB 1 Billion and between ETB 1 Billion and 3 Billion, respectively in the past five years.

4. Common types of Construction Contracts

Around 79% of the contractors has chosen Design-Bid-Build Contract as their most common form of contractual engagement they have had with ERA, whereas 21% of them chose Design and Build (DB) as their commonly practiced form of contracts. On the other hand, none of the respondents have chosen Construction management form of contract.

It is clear that the type of contract plays a significant role on the contractor pertaining to cost estimation and final financial outcome. (Tadesse (2006).For instance the estimation of costs required for a fixed price contract of the types like Design-Bid-Build and Design-Build should be done in a more accurate manner than cost reimbursement type of contracts. If the contractor doesn't handle the bidding stage properly, he/she may either lose the work or could end up with no profit or loss.

On the other hand, if the type of contract were a Cost reimbursement type as the case of like Construction management and Management contracting, the economic risk would have been transferred to the owner and the contractors' profit could have been guaranteed.

As the contractors covered under this study are engaged on a fixed price type of Contracts, on one side they are expected to manage cost related risks starting from winning the works and then managing the execution costs wisely. On the other hand, a fixed price contract offers an opportunity to maximize profit if appropriate cost management system is in place.

4.3 Plan Cost management Process

1. Availability of Project Cost management plan:-Around 93% of the respondents said that they have Cost management plan.

The fact that contractors have project cost management plan (PCMP) as part of their general project management plan is a fundamental step to project cost management process. This is because PCMP provides guidance and directions on how the project cost shall be managed throughout the project. On the other hand, those contractor who don't have a project cost management plan as a separate management plan document may have faced difficulty in

connection with absence of defined and agreed upon procedures and guidance on their cost management endeavor. Due to the same, their cost management process could be subjective on the experience of individuals.

2. Inputs used for the Preparation of Project Cost management Plan

Regarding the inputs being used for the preparation of Project Cost management plan, the respondents were requested to choose among the list of inputs taken from PMI (2016) and provided in the questionnaire.

Accordingly, 42.31% of the respondents confirmed that they are using all of the Inputs shown in the questionnaire whereas 30.77%, 15.39%, and 11.54% of the respondents use four, three and two of the Inputs in the corresponding order shown above.

It can be also inferred that around 50% and 46% of the contractors don't use Enterprise environmental factors and Organizational Process assets respectively. Despite the above two inputs consist of information related with organizational culture, structure, market conditions and commercial information, financial control procedures, experience of previous projects, estimating and budgeting related policies and guidelines.

Hence, absence of these two inputs could make the Plan Cost Management process of these contractors, either incomplete or limited in scope.

3. Tools and techniques used for the Preparation of Project Cost management plan

The views of the respondents pertaining to the types of tools and techniques they have been using for the preparation of Project Cost management plan show that tools such as Expert Judgment, Data analysis and Meetings are chosen by 44%, 88% and 20% of the total respondents in the corresponding order shown above.

Moreover, fifteen of the twenty five respondents said that they are using only one tool for the preparation of the Project Cost management Plan. On the other hand, seven of the respondents said that they are using two tools while another three stated that they are using all the tools mentioned in the Questionnaire format.

Paul Sanghera (2019) explained that each tools have its own contribution to produce a complete project cost management plan. Data analysis help to analyze different funding

options such as make or buy analysis whereas expert judgment is needed on cost management related topics and to facilitate the whole process in an organized manner meetings including all stake holders are crucial.

Hence, of all the respondents, those who are using the three tools in combination is believed to have a complete management plan.

4. Contents of Project Cost management Plan

Respondents who said they have cost management plan as a document were also requested to specify the contents of their cost management plan. From the collected data, it can be inferred that the selection rate for most of the contents shown in the questionnaire were below 60%.Moreover,it has been construed that above 44% of the respondents have chosen less than five contents out of ten contents provided in the questionnaire.

However, the cost management plan is supposed to be a complete guide on how to manage costs, including estimating, budgeting, and controlling costs and lack of sufficient contents will definitely make the use of the document limited and poor. Hence, contractors whose content of the cost management plan has been found limited in content cannot use it as a full-fledged guideline.

4.4 Project Cost Estimation Process

4.5.1 Purpose of Cost Estimation Process

The respondents were requested to identify the purpose for which they are estimating costs of the project. From the collected data, Purposes such as “for bidding ”, “To monitor and control the project ”, “To identify projects to bid for”, and “To prepare a work schedule” were chosen as the first, the second, the third and the fourth ranked purpose of cost estimation processes in the corresponding order shown above.

Similarly, around 37% of the respondents had selected all purposes shown in the questionnaire as their objectives of project’s cost estimation process whereas around 19%, 33% and 11% of the respondents selected three, two and one purposes in the corresponding order shown above.

From project management point of view, purposes of cost estimation process can have multiple objectives and identifying them show that there is sufficient utilization of estimating procedures and tools.

Hence, those contractors who have selected all purposes are believed to have better understanding of the project's estimation purposes and this could help them to have better cost estimation system. On the other hand, contractors who had selected one purpose only are more likely weak in their project management system in general and cost management in particular.

4.5.2 The Cost Estimate Process

As per PMI (2016), this process group consists of Input, Tools and Techniques, and output. The results of the questionnaire survey work conducted in this regard is presented as follows.

a) Inputs used for the preparation of Project Cost estimates

From the collected data, it has been construed that inputs such as Resources requirements, Project time schedule, cost management plan, scope base line and Quality management plan were ranked as the first, the second, the third, the fourth and the fifth highly selected inputs in the corresponding order shown above. Besides, it has been determined that around 54% of the respondents use less than three Inputs out of nine inputs specified in the questionnaire.

However, as per the explanation given by Paul Sanghera (2019) all inputs shown in the PMI (2016) are crucial for an efficient and complete project cost estimate.

Hence, as the out of the Cost Estimate process is dependent on the Inputs being used, the final cost estimates to be produced by those contractors who had selected less number of inputs could not be as correct as required.

b) Cost estimation techniques Common in the Construction Firms

From the collected data, it could be construed that respondents have chosen Bottom-up, analogous, and parametric estimating tools as their first, second and third preferences.

PMI (2016) provides around eight tools and techniques an estimator can use. But, from the construction point of view Analogous, bottom up and parametric estimating methods are commonly in use with each having its own advantages and disadvantages but can be used independently depending upon the situations such as time limitation, purpose of estimation and nature of the works.

As per the local trend wherein most local construction companies rely on a detailed cost estimation methods so as to avoid risk of either losing a bid or trapped by under estimated costs, ranking of a Bottom-Up estimating technique as the first preference looks logical.

However, using tools such as three point estimating can help to incorporate the probabilistic situations found in some activities and could model the different scenarios so as to reach at reasonable cost estimate

c) Outputs of the Cost estimation Process

Cost estimates, Basis of estimates and documents updates were chosen as the first, the second and the third ranked outputs in the corresponding order shown above.

Similarly, it has been learnt that 50%%,35.72% and 14.29% of the respondents have revealed that they have three ,two and one out puts as deliverables of the cost estimation process in the corresponding order shown above.

However, from PMI (2016) it could be easily construed that any cost estimate process will produce out puts such as activity cost estimates, Basis of Estimates and project document updates.

Hence, from practical and literature point of view, 50% of the respondents who had indicated all the three given out puts as their cost estimating system deliverables are correct and other contractors especially those who thought the system deliverable is only one output should make appropriate investigation into their cost estimating process.

4.5.3 Ranking of Information as related to its contribution to Cost estimation

It is a well-known fact that level of attention given for different cost information varies based on the ultimate effects of the given information on the final activity cost estimate. This is mainly true as the cost of an activity can be more affected by one type of information

than another. For instance, for a road construction project wherein most of the works are being done by heavy duty equipment such as dozers, excavators and Graders, errors made in using the rental fees of an equipment will cause more damage than an error made on an adoption of labor rate.

It is with this understanding that the respondents were asked to rank the level of importance of cost information in the context of the Road construction projects being undertaken by their company.

Upon analyzing the data as depicted in the table shown below, it has been concluded that the respondents had chosen "Equipment costs", "Material Costs" & "Productivity of Equipment" as the first, the second and the third most important or top ranked type of information required for the estimation process.

From researcher point of view, the respondents' ranking has been found logical, since Road construction project's rely on the inputs of different equipment and Plants, cost of these heavy duty equipment is huge and making errors by taking the rental and productivity of equipment will cause disastrous effects on the company. Similarly, as Road construction projects consume large amount of expensive materials such as Cement, steel, bitumen, fuel and dynamite, making errors on costing the base price of these materials will have also huge negative Impact.

Table 4-1:-Rank of Information as related to its contribution to Cost estimation

S/N	Types of Information	Mean Value	Importance Index	Rank
1	Labor costs	3.52	70.33	5
2	Material Costs	4.1	81.94	2
3	Equipment costs	4.17	83.23	1
4	Productivity of Labor	3.46	69.040	6
5	Productivity of Equipment	3.81	76.13	3
6	Availability of Construction material	3.39	67.750	6
7	Distance of the Project from material sources	3.46	69.04	4
8	Site visits	3.39	67.75	9
9	Construction methodology	3.36	67.1	8
10	Site overhead costs	3.23	64.52	11
11	Company overhead costs	2.91	58.07	13
12	Project's Risks	3.23	64.52	10
13	Project location	3	60	12
14	Availability of Skilled labor	2.81	56.13	15

S/N	Types of Information	Mean Value	Importance Index	Rank
15	Statuary regulations	2.42	48.39	17
16	Sub-contractor prices	2.88	57.42	14
17	Historical data of similar works	2.68	53.55	16

4.5.4 Ranking of different cost elements

Cost elements can be ranked or prioritized in different ways with respect to various aspects. In this section, cost elements of an activity shall be ranked in reference to the difficulties they may pose to the estimator and the level of attention required for each cost elements.

4.5.4.1 Ranking with respect to the difficulties they posed to the estimator

Respondents were requested to rank list of cost elements as related to the difficulties they posed to the estimator. From the tabular data shown below, it can be learnt that estimating "Risk allowances" and "Taxes" are ranked as the most difficult and the least difficult respectively.

Estimating costs of risks require identification, evaluation and quantification of risks and uncertainties and the fact that cost related risks are to be borne by the contractors in the case of fixed price contracts of the types DB and DBB make the situation worse. Moreover, as the bid has to be prepared considering long duration of construction period with high chance of time extension, quantification of risks for this long time horizon is a complex endeavor. Thus, most cost estimator working in a local construction companies take allocation of risk allowances an intimidating experience and would resort to use intuition. Hence, the ranking given by the respondents look logical. As per the survey, the second and third ranks go to Equipment and company overhead respectively.

On the other hand, for most estimator, quantifying taxes is as simple as adding 30% markup on the indicated profit amount so as to come up with income tax value. Moreover, as all contracts under Ethiopian Road administration is subject to corrections based on any changes in legislative , the estimator does not have to worry about future changes in taxes or pensions as the cost shall be borne by the Government. Hence, giving the last rank for Taxes looks logical too.

Table 4-2:-Ranking of Cost element with respect to their difficulties

Cost element	Mean value	Rank	Remark
labor cost	3.75	6	
Materials	4.04	5	
Equipment	4.68	2	
Site overheads	4.21	4	
Company overhead	4.57	3	
Risk Allowances	5.32	1	most difficult
Taxes	2.89	7	least difficult

4.5.4.2 Ranking with respect to the level of attention

The respondents were also requested to rank different cost elements of the construction projects from their perspectives and the result summarized in the Table shown below revealed that Equipment and Taxes were ranked the first and the last cost element in the respective order shown above.

It is known that bottom-up cost estimating methods requires calculating the costs of material, equipment and labor in an independent manner and then the effects of site overheads, company overhead, Profit ,risk allowances and taxes shall be considered later on. However, costs related with the three factor, labor, material and equipment, take up the significant share of the overall costs. Hence, any error made in adopting raw cost data pertaining to labor, material and equipment will cause disastrous impact on the final cost estimate.

The reason behind the selection of Taxes as the cost element requiring the least attention may be related with the fact that the rate of tax is fixed by law and simple to incorporate it.

Table 4-3:-Ranking of Cost element with respect to the level of attention deserved

Cost element	Mean Value	Rank	Remark
Labor	4.68	3	
Materials	5.43	2	
Equipment	5.97	1	Receiving the most attention
Site overheads	3.97	4	
Company overhead	3.65	5	
Risk Allowances	4	6	
Taxes	3.04	7	Receiving the least attention

4.5.5 Source of Information for project cost estimation process

Preparation of detailed cost estimates for a specific project requires collecting, summarizing and manipulating of a large amount of data related with the execution of project's activities under consideration. This process starts with identifying potential sources which could provide cost related data and information in a timely manner.

Thus, major source of Information which are known were presented in the questionnaire format and the respondents were requested to choose the source/sources they rely on.

From the collected data, it has been learnt that 100% and 96% of contractors covered under this study selected market studies and data gathered from previous projects as a reliable source in the respective order shown above. Similarly, around 57% of the contractors and 68% of the contractors confirmed they are using published standards and professional guess as a source in the corresponding order shown above.

Road construction projects consume large volume of basic construction materials such as Cement, steel, dynamite, bitumen, fuel and others too depending on the particular requirements of road project's under consideration. Moreover, Road Projects substantially rely on out puts of trucks, equipment and plants and the inputs of labor force is also high. To properly estimate the unit cost of an activity, the estimator should rely have current market data pertaining to the hourly rate of equipment and man power. Besides, the estimator is expected to get hold of base price of basic construction materials at the bidding time. These data can only be accessed through market studies either in the form of web

based study or through contacting equipment and material suppliers. Hence, the fact that all respondents had selected “Market studies” as their most common source looks logical.

Similarly, companies in general and cost estimators in particular develop database system wherein productivity of labor and equipment and consumption of material per unit of measurement are stored up from the previous project so as to use it for future reference. In most cases, these types of information are taken as firm’s benchmark and shall be kept as one of the competitive advantage of the contractor to win the project. Hence, selection of this source by 96% of the respondents is also acceptable.

On the other hand, in our country’s construction sector in general and road construction in particular published standards are not common in use as a reliable sources. This is because, they are scarce in number, and most of them are outdated with respect to work methodology and model of equipment. Besides, there are no established system which provides contractors or cost estimator an up to date data either in a published or web based manner. The fact that around 57% of the respondents had selected published data as a source of data might be related with either using old published data taking into account recent methodological and technological differences or in some particular cases using manual of newly imported plants to estimate productivity.

The fourth type of source of information is Professional guess which was selected by 68% of the respondents .As per the view of the researcher, professional guess should have been selected by more respondents because productivity of equipment and labor and material consumption should be judged and questioned by professional intuition regardless of the source from which the data had been retrieved.

In addition to the above, the response distribution of the respondents as related to the number of information sources they rely on was analyzed. To this end, it could be construed that around 43%%, 36% and 21% of the respondents get information from four, three and two sources in the corresponding order shown above.

Utilizing multiple sources of information at a time as a cross reference or as a situation calls for is beneficial to increase the accuracy of the cost estimate.Thus,it can be said that contractors who are using more sources of cost information have the chance of having better cost estimates than who relied on less number of sources.

4.5.6 Comparing base data used for estimation with actual data

Comparing the raw data used for estimation with actually retrieved data from the project's site is crucial to update lesson learned register of the company and to make appropriate corrections in the future.

With the above assertion in mind, the respondents were requested whether they are checking the raw data with the actual data prevailing on the site.

The feedback of the survey show that 89% of the contractors are comparing the data whereas the remaining 11% do not.

Furthermore, respondents who said they are comparing actual data with raw data were requested to rank the severity of the deviation on the five point Likert scale. Then the same data was summarized and computed in an excel spread sheet and presented as shown below

Table 4-4: Deviation between Raw data and actual data

Cost Element	weight	Rank	Remark
Productivity of labor	3.20	4	
Productivity of Equipment	3.52	3	
Material consumption rate	2.88	6	least deviation
Price of Labor	2.92	5	
Price of material	3.68	1	highest deviation
Price of Equipment	3.56	2	

From the above table, it can be seen that the highest deviation is related with the "Price of material" whereas the least deviation has been noted to be on the "material consumption rate". Moreover, the second and third highest deviation were recorded in relation with price of equipment and productivity of equipment respectively.

Concerning the first and second deviation, the finding could be correlated with the construction material cost inflation being seen worldwide in general and in our country in particular in recent times.

However, as cost fluctuation happened on basic construction material such as Bitumen, Cement, fuel, steel and equipment are compensated through Price adjustment of the contract, the risk of price spike associated with these materials and equipment are shifted to

the Employer. Thus, the ranking of materials and equipment as first and second factors by the contractors could be related either with their overall concern or related with uncompensated cost items.

On the other hand, the third and the fourth deviation are seen in connection with the productivity of equipment and labor respectively. However, deviation in productivity of equipment and labor is not uncommon, it can be correlated with environmental and site organizational factors among others.

4.5.7 Factors contributing for the Inaccuracy of Cost estimates

Accurate estimation of project's direct costs require the pricing of materials, equipment and labor. Besides, the same process requires to have accurate data pertaining to consumption rate of construction materials like explosives, fuel, etc. Similarly, insufficiency of details provided on drawings and specifications, difficulty to quantify identified risks and incapacity to fully estimate overhead costs have also paramount impact on the accuracy of the final cost estimate.

The researcher had presented the above factors believed to have some contribution for the inaccuracy of the cost estimate for the opinion and ranking of the contractors. Accordingly, the respondents' opinion were summarized and calculated in an excel spread sheet and presented in the table shown below.

Table 4-5: Ranking factors as related to their contribution for inaccuracy of Cost Estimate

Factors	Ranking by Contractors					mean	Rank
	1st	2nd	3rd	4th	5th		
Shortage of accurate data such as resource prices	9	4	8	5	2	3.28	3
Insufficiency of accurate data e.g.:- consumption of materials,	4	13	7	4	0	3.6	2
Insufficiency of details shown on the drawings and specifications;	1	4	4	6	13	1.4	4
Difficulty in estimating overhead costs;	2	1	4	10	11	1.28	5
Difficulty to quantify costs related with potential risks	11	5	7	4	1	3.72	1

From the above, it has been observed that "Difficulty to quantify costs related with potential risks" is ranked as the 1st factor having the highest influence for the inaccuracy of the overall cost estimate .Moreover, Insufficiency of accurate data to determine consumption of materials and Shortage of accurate data such as resource prices are ranked 2nd and 3rd respectively.

As per the writer of this paper, the reasons behind the respondents inclination to rank risk as a first factor is somehow related with the local construction industry common difficulties with identification, evaluation and quantification of potential risks.

The "Insufficiency of accurate data e.g.:- consumption of materials," is also ranked as a second factor preceding other factors. However, this could be explained in relation with the difficulty estimator may face to quantify materials required to operate equipment and plants using inputs such as fuel, oils, tires despite costs related with the consumption of these materials are very huge. Thus, ranking of this factor as the 2nd severe element contributing for inaccuracy of costs is fair and logical.

4.5.8 Indirect costs

a. Method of Calculating Overhead Costs

Respondents were given options of calculating an overhead costs and requested to specify their own, if there is any.

As depicted in the Table shown below, 50% of the respondents revealed that they are taking a randomly selected percentage of the total direct costs as overhead cost.

From experience, it has been learnt that contractors would magnify the direct unit rate of an activity's cost by an arbitrarily fixed percent to account for overhead and profit. The fixed percent is in most cases determined based on experience, intuition and expected competition among bidders.

On the other hand, 35.72% of the respondents stated that they write down list of overhead costs and distribute the sum to all payable activities. In this case, contractors will have to write down list of sites and company's' overhead expense in detail and calculate the overall costs. This approach is much more accurate and reliable than using an arbitrarily fixed percent.

Similarly, 14.29% of the respondents also confirmed that they are calculating overhead costs in an activity based costing (ABC) system wherein the overhead cost is added to a relatively close activity or set of activities. This approach is also believed to be more accurate than using an arbitrarily fixed percent.

For instance:-cost incurred to buy Insurance premium for the vehicles assigned to a supervisor's office could be assigned to the Set of Activities group under bill item Engineers facilities.

Table 4-6: Method of Calculating Overhead Costs

Options	Method of calculating Overhead Cost	Frequency of Selection	
		Nos.	%
A	Writing down list of Overhead items with their corresponding costs and then distribute the sum to all payable project's activities.	10	35.72
B	Identify overhead costs which are related with each project activities and adding the cost to the same relevant activity (Activity based costing ABC)	4	14.29
C	Taking a randomly selected percentage of the total direct costs as overhead cost	14	50
Total No. of Contractors		28	

b. Amount of Overhead costs:-

The other question raised to the respondents in connection with overhead cost was to specify the amount of their total overhead cost with respect to the total direct cost. Accordingly, the response collected through the questionnaires were summarized and presented in the Table shown below.

From the tabular data, 60.71% of the respondents stated that their overhead cost falls between 15%-25% having an average mid-point value of 20% where as 10.71% and 28.57% of the respondents revealed that their total overhead cost fall in the ranges of 15-25% and 5-10% respectively. Moreover, the summarized data show that the overhead costs of contractor are neither below 5% nor above 25%.

The calculated overall **percentage*** is 20.04%.Whereas Wibshet (2007) stated that the average ratio of site's overhead costs to project's direct cost and average ratio of Company's overhead cost to project's direct project cost in Ethiopia shall be 13% and 4.5% respectively. The sum of the two shall be 17.5%.

Hence, comparing the respondents' data (20.4%) with what was recommended by Wibshet (17.5%) reveal that the former is higher by 2.54%.

However, as there is time difference between now and the time Wibshet conducted the study, it could be said that that the difference between the two Overhead costs is not exaggerated.

Table 4-7: Ratio of total overhead cost to total Project direct cost

Percentage of total overhead costs		Response distribution	
Range	Mid-Point	Nos.	Percentage
<5%	5	0	0
5%-10%	7	3	10.72
10%-15%	20	17	60.72
>25%	25	8	28.58
Total No. of Contractors	28		

*Overall ratio of OH to Project direct Cost= $\sum$ (Calculated Midpoint Percentage x Percentage)

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4.5.9 Risks

a. Including Risks into Cost Estimates

Around 71%% of the respondents confirmed that they are including allowance for risks whereas around 29% of the contractors covered under this study said that they don't include allowances for risks.

The fact that 29% of the respondents confirmed they don't consider allowance for risks, could be somehow related with our previous findings stated under section 4.5.4.1 wherein, it had been said that calculating allowance for risk is the most difficult estimating practice of all others cost element shown thereof.

Moreover, in conformity with our survey data being discussed, a thesis study conducted by Getachew yelema(2014) revealed that there is lack of proper risk allocation in the construction of road projects of Ethiopian Road Administration owing to lack of knowledge on the importance of proper risk management.

b. List of risks

As per the selection of the Respondents, risk related with inflation, adverse weather conditions and political stability in the project's area are ranked as the first, the second and the third types of risks in the corresponding order shown above requiring attention of the estimator.

Table 4-8: List of Potential Risks

List of potential Risks	Response Distribution		Rank
	frequency(Nos.)	%	
Adverse weather conditions,	15	75	2
Changes in design;	5	25	
Scope changes	4	20	
Errors in design or specifications,	2	10	
Productivity of labors,	8	40	
Inflation	17	85	1
Political stability in the Project's area	15	75	3
Total no. of respondents	20		

The reason behind ranking of "Inflation "as the first potential risk factor could be correlated with the financial risk which contractors are facing in the case of DBB and DB Contracts where by cost related risk shall be borne by the contractor. However, the researcher argued that price adjustment factor provided in all road construction contract are taken care of the Increment in the costs and devaluation of the local currency, Ethiopian Birr. Thus, as per the view of the researcher, it would have been more logical, had the respondents ranked adverse weather conditions as the top ranked risk factor. This is because costs incurred in connection with extremely adverse weather condition is not a compensable event in all particular conditions of the Contract administered by ERA.

On the other hand, ranking "adverse weather conditions" as the second risk factor could be explained to the facts that most of the construction activities require dry weather conditions. Moreover, as some of the particular condition of the Contracts implemented on recent projects don't allow extension of time owing to extremely adverse weather conditions, the risk of default on the contractor's side in connection with delay of the work has become high. Hence, it would have been better, if the respondents had placed "Adverse weather conditions" as the first highest risk factor.

Choosing political stability as the third high ranking risk factor has been found as a logical assessment, despite costs emanated from political instability and public unrest shall be borne by the Employer, ERA. Almost all contractors prefer to finish the works as per the contract's provision rather than claiming and arguing for their loss sustained by political unrest.

4.5.10 Profit

a) Profit range

From the tabular data shown below, the ratio of the profit amount to total project cost for 53.58% of the respondents falls between 8% to 10% range whereas 32.15% and 14.29% of the respondents have profit margins in the range of 10% <P≤15% & above 15% respectively. The calculated **overall percentage*** is 10.45%,a markup higher than the 6-8%,recommended by the Building Code of Ethiopia(1995) which was also quoted by Abeselom (2008)

Table 4-9: Ratio of profit margin to total project cost

Range	Response distribution		
	Mid-Point	frequency	percentage
<5%	5	0	0
5%-8%	6.5	0	0
8% <P≤ 10%	8	15	53.58
10% <P≤15%	12.5	9	32.15
>15%	15	4	14.29
Total No. of Respondents		28	

*Overall ratio of OH to Project direct Cost= $\frac{\sum (\text{Calculated Midpoint Percentage x Percentage})}{100}$

b) Factors which are important for the determination of a profit margin.

The respondents had also selected factors which are important for the determination of a profit margin from their company's point of view. Accordingly, the responses collected from each respondents is summarized in a tabular manner as depicted in the Table shown below.

Table 4-10: Factors that are important for the determination of Profit margin

Factors-important for the determination of a profit margin.	Response distribution		
	frequency	%	Rank
Risk	10	35.72	
Need for work,	15	53.58	1
Competition among bidders	13	46.43	2
Market trends	11	39.29	3
Similarity of the project with past/exiting ones	10	35.72	
Location of the project	10	35.72	
Complexity of the Project	10	35.72	
Project's duration	6	21.43	
Company's minimum profit margin	10	35.72	
Total No. of Contractors	28		

The decision regarding fixing the amount of profit markup is supposed to be made by assessing and evaluating several internal and external factors. As depicted in the table shown above, the respondents of this research gave first, second and third priority to need for the work, competition among bidders and market trends in the corresponding order shown above.

Need for the work is a pivotal point for companies to decide on issues such as amount of profit markup so as to get the work under consideration and thereby sustaining the life of their companies. In such scenario, construction companies lower their profit margin just to get the job and deploy idled resource or stay in the business for a while. On the other hand, if the company doesn't desperately need for the particular project or does have other sufficient works at hand, it will bid for a maximum profit. Hence, the rank given by respondents in this context looks logical and acceptable.

Competition among bidders refers to assessment of contractors participating in the bid such as their number, their previous history pertaining to pricing and bidding trends and other important information about them which are crucial to come up with a successful bidding strategy.

Similarly, market condition imply that studying the construction market or type and volume of works currently available in the market. For instance, if the Federal Government of Ethiopia has allocated sufficient budget to launch many more Road projects, the contractor

bidding for a particular Road project doesn't have to be desperate to win the project at a lower price as there are many more opportunity in the pipe line.

Thus, the ranking given by the respondents could be acceptable in view of the above discussions.

4.5.11 Taxes

All respondents of this research work said that they are considering tax allowances in their cost estimates. Then, they were also requested regarding the method of calculating the tax amount.

From the summarized data, it could be construed that around 64 % of the respondents added a fixed percentage like 30% for profit income tax. On the other hand, 25% of the respondents confirmed that they considered tax amount as an overhead costs whereas 11% of the respondents stated that they distributed an assumed lump sum amount.

In view of the researcher, the fact that above 64% of the respondents chose "magnifying the profit amount by a certain percentage in compatible with the tax rate" is a logical and simple approach. Moreover, as per the researcher views, many more contractor are practicing the same technique.

4.5 The Determine Budget Process

1. Preparation of Project Budgets

The respondents were requested if they are preparing budget for each project or not and the feedback shows that all contractors covered under this study are preparing budget for their project.

It is known that the particular conditions of contracts being in use for the administration of Road projects under ERA have a mandatory provisions whereby the contractor should submit detailed Master work program within 30 to 42 days of the commencement of the project's works. Moreover, one of the content of the work program is showing the allocated budget of the project and specifying the expected cash inflow from the execution of the contract and expenditures of cash associated with the same. Thus, the answers given by the

respondents are found to comply with the actual experience of the Road Construction sector in Ethiopia.

2. Purpose of project's budgets

The respondents were also requested for what purpose they are preparing project's budget. From the summarized response, as project's cost control base line, for allocation of funds and for soliciting of funds were selected as the first, the second and the third objectives in the corresponding order shown above.

By making further assessment on the respondents' responses, it has been learnt that 32.15% and 53.58% of the respondents had selected three and two objectives as their purpose of budgeting process. While, 14.29% of the respondents had chosen one objective only.

The utilization of project's budget as a means of soliciting or petitioning funds for the use of the project did get only around 35.72% of the overall respondent's attention, despite it is common to use an approved budget as a basis for requesting budgets. One reason why less number of respondents had selected this objectives could be that the budget the projects get from the head quarter may not strictly in compliance with the cost base line requirement.

3. Commonly Known Types of budgets in the Road Construction Projects

Project budget is one of the parts of Master work program required to be prepared by the contractor within short period of the commencement of the Project's works. Then after, the same budget will have to be updated whenever there is revision of master work program.

However, the contractor may have additional and more detailed budget plan which can be used as a financing and controlling documents between the project's office and the head quarter of the construction company.

Keeping the above in mind, the respondents were requested to specify the types of project's budget commonly in use at their construction site. The response of the contractors is summarized in the table shown below.

Table 4-11: Commonly utilized Types of Project's budgets

Type of Project's Budget	Response distribution	
	Frequency (Nos.)	%
Revenue/cash inflow Budget:-		
a)Payments from the execution of the Project Works	28	100
b) Other income like renting of equipment	7	25
Cash outflow budget		
a)Material requirements budget,	23	82.15
b)Labor requirement Budget,	20	71.43
c)Overheads budget	18	64.29
d)Equipment and plant requirement budget	24	85.72
e)Sub-contractor charges budget	17	60.72
Working capitals:		
a)Cash reserve –budget	15	53.58
Total Nos. of Contractor	28	

From the above, it can be seen that all respondents are preparing cash inflow budget related with payments to be collected from the execution of the project's works. On the other hand, cash reserve budget for working capitals has been noted to be the least familiar type of budget.

4. Inputs for the Preparation of Project's Budget

The most important inputs for the preparation of project's budget are cost estimates and basis of estimates which were determined in the project cost estimate process, while additional important inputs come from other knowledge areas such as Scope, Time, and Human resource, Risk, and Procurement management.

Based on the alternatives provided in the questionnaire, the respondents selected the type of Inputs they normally use for developing a project's budget.

From the collected data, basis of estimates, cost estimates, resource management plan, project schedule and cost management plan were ranked as the first, the second, the third, the fourth and the fifth most used inputs in the corresponding order shown above.

On the other hand, WBS, Risk register and agreements were chosen as the sixth, the seventh and the eighth Inputs in the respective order shown above.

The above data revealed that the attention given for WBS, Risk register and agreements as inputs of the budgeting process are poor.

Moreover, from the collected data, it has been noted that around 14.29% of the respondents had said they are using all the Inputs shown in the Questionnaire while 17.86%, 25%, and 21.43% had selected six, five and four inputs as their Inputs of Project's budgeting process in the corresponding order shown above.

Paul Sanghera (2019) explain that all inputs specified in the PMI for the Project cost budgeting process are important to have a complete Project's budget. However, apart from around 14% of the respondents, all the rest are using only parts of the Inputs specified in the PMI (2016).

5. Tools and techniques used for the Preparation of Project's budget

As per PMI (2016) there are about six tools and techniques that can be used to prepare a project's budget. These include, Cost aggregation, expertise judgment, historical information, data analysis, funding limit reconciliation and financing options.

The survey conducted revealed that around 93% of the respondents use cost aggregation as budgeting tools whereas the use of other tools specified in the PMI do not have sufficient attention.

As per PMI (2016), all tools have specific application area wherein the utilization of the particular tool would supplement what could be lacking from the other tool. In this context, it would have been much beneficial had contractors use other tools in combination with cost aggregation whenever the situation calls for.

6. Deliverables from Developing Project's budget Process

The whole process of developing project's budget process shall give birth to the following three deliverables:-Cost baseline, Project funding requirements and project documents updates. PMI (2016)

From the collected data it has been learnt that Cost baseline and Project funding requirements are the most acknowledged out puts of the process as their frequency of selection reached 85.72% and 75 % respectively.

Moreover, it has been known that 17.86%, 57.15% and 25% of the respondents said that they have got one output, two out puts and three outputs from their project's budgeting process in the corresponding order shown above.

Cost baseline dictates what costs will be incurred and when. This output is essential as the project manager will have to use it as a basis of requesting funds from the head quarter at a specified time interval. Besides, it is also an input to prepare project funding requirement.

On the other hand, as Project funding requirements deals with the cash flow needs of the project including management reserves and contingencies, respondents who said their budgeting process delivered Project funding requirements could be taken as having Cost Baseline too.

Thus, it is possible to say that 75% of the respondents covered under this study are producing a proper Cost base line and Project's funding requirements, while 46.43% of them are also updating project documents such as cost estimates, risk register and project schedule.

7. Prioritizing Budgeting approach

Responders were requested to prioritize the budgeting approach in reference to their own companies' experience. Then the responses provided by them show that the bottom -up budgeting approach and Top-Down approach ranked first and second respectively.

The bottom up approach uses the employees who have had the detail skill of the project's works and the process shall start from the lower level of the work breakdown structure and hence believed to have more accuracy than the top down approach. However, as this type of budget amount is fixed by employees having lower to medium authority in the company, it may not be fully acceptable by the top management.

The other points raised in the questionnaire was budget for the advance payment and time interval on which project's budgets were updated. All respondents stated that they are preparing budgets for an advance payment by disbursing the advance payment for covering major expense of the Project.

Finally, the respondents were requested to specify the frequency at which the budget of the project get updated or reviewed. As per the feedback, around 54% of the respondents stated that they are updating the project's budget at fixed interval while the rest asserted that they

updated the project's budget if there is change in the scope of the project and if there is significant slippage.

The researcher know that most construction companies prepare annual fiscal action plan at the beginning of Ethiopian fiscal year, in the month of July. It is at this time that the budget requirement of the project will be decided for the coming year. Thus, 54% of the respondents are most likely referring this generally practiced trend of Road construction projects being administered under ERA.

However, Contractors are expected and are also contractually liable to change the allocated budget based on the change in the scope and slippage sustained between actual and planned work so as to effectively utilize the contractual duration of the Project.

4.6 Project Cost Control Process

I. Interval on which the costs of the Project is controlled

Determining the optimal timing of project's cost control point throughout the life cycle of the project is a major endeavor require sufficient attention.

The respondents were requested to specify the interval on which they are controlling the cost performance of the Project. From the responses of the respondents ,it has been learnt that the around 43% of them run cost controlling activities between three and six months.Whereas,14% and 36% of the respondents perform cost controlling operations in the period of less than one month and b/n one and three months respectively.

It is known that Unit costs of an activity is composed of Direct and Indirect cost elements. The direct cost of an activity include labor, material and equipment cost. The level, interval and severity of controlling required for maintaining the cost of material, labor and equipment differ from activity to activity. The impact of having close controlling on one of the direct cost of an activity could create difference on the monthly expenditure of the project.

For instance, a project manager may have to devise a close cost control mechanism in the case where a costly equipment is working on the Project. In this case, he/she will have to

check the rental cost of the equipment versus the quantity of work produced at a close time interval.

Thus, it is more advisable to check on labor and equipment costs at frequent time interval, preferably either on a daily or at a maximum of weekly basis. Pierce (2006) also suggested that much more close control is for labor and equipment costs than Material costs. He suggested that controlling material costs at a monthly interval could be sufficient.

However, the reply of the respondents showed that the contractors are controlling the cost of the project at a very long time intervals apart from 14.29% of the respondents who said they are controlling cost in less than one month time.

II. Inputs for Cost Controlling process

For Project cost control process, inputs such as Cost management plan, Cost baseline, Performance measurement baseline, Work performance data, & Lessons learned register are required among others.

The contractors were requested to select their Input, among the items enumerated in the Questionnaire. From the collected survey, it has been learnt that work performance data, performance measurement baseline and cost baseline were ranked as the first, the second and the third highly selected inputs in the corresponding order shown above. Whereas, Cost performance baseline and lessons learned register were ranked as the fourth and the sixth inputs respectively

However , we could construed that the person in charge of conducting the cost control process should not at least miss out inputs such as cost baseline, Performance measurement baseline and work performance. Moreover, having the other two inputs too, namely, Cost management plan and lesson learned register will also further facilitate the process and make the output complete.

By checking the number of inputs selected by the respondents, it can be construed that 53% of the respondents use all inputs shown in the PMI (2016).Where as 29%, 7% & 11 % of the respondents said that they are relying on one input, two Inputs, and four inputs in the corresponding order shown above.

However, those who selected Inputs excluding Cost baseline, Performance measurement baseline and Work performance data cannot run this process at all due to lack of data.

III. Tools and Techniques for Cost control Process

Using appropriate tools and Techniques is paramount for the success of a project cost control system. In related with the same, the respondents were requested to select among the cost control tools and techniques shown in the PMI (2016) and indicated in the questionnaire survey.

From the collected responses, it can be learnt that Data analysis is the most widely practiced method of cost controlling tools as it is selected by 86% of the respondents whereas and expert judgment and To-Complete performance index come as the second and third commonly used tools.

From the collected data, it has been learnt that 60%, 36% and 4% of the respondents rely on one tool, two tools and three tools as a means of controlling project's costs in the corresponding order shown above.

IV. Outputs of Project Cost control Process

As per PMI (2016), out puts of project cost Control process consist of work performance Information, Cost forecasts, project management plan updates and change requests. In relation with the same, the respondents were requested to select output of their cost control process. Accordingly, the response given by the respondents are summarized in the table 62 and 63 shown below.

From the collected data, it has been known that cost forecasts, work performance information, change requests and project management plan updates are the first, the second, the third and the fourth most widely known out puts from the Cost control process in the corresponding order shown above.

Similarly, 43%, 25%, 21% and 11% of the respondents confirmed that their cost control process delivered four outputs, three outputs, one output and two out puts in the corresponding order shown above.

CHAPTER 5 - CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Chapter 5 of this Research work is dedicated to give Conclusion for the long journey of this research work by providing recommendation from the process undertaken so far. To this effect, the chapter is sub divided into:-summary of findings, conclusion, Recommendation, research limitation and Areas of further research

5.2 Summary of findings

After having summarized the data collected through the questionnaire survey, an in depth discussions were held in chapter four by analyzing the results of the survey and providing interpretation in the context of the local Road Construction industry in general and common practice of the Contractors in particular.

However, unless the analyzed and interpreted data cannot be further cross referenced with the research question, it is difficult to identify the findings of this research endeavor. It is with this understanding and motive that the researcher embarked on summarizing the findings.

I. Plan cost management Process

It is known that this process is tasked to formulate the policies, procedures, and documentation for planning, managing, spending, and controlling project costs there by providing guidance and directive on the estimating, the budgeting and the controlling processes.

Although most of the respondents had said that they have a cost management plan, upon further checking the Inputs and tools being used and also the Output of their cost management process, it has been noted that their cost management plan is not as detailed as the PMI standards.

The root causes for the poor quality of the Project cost management plan are found to have direct relationship with lack of inputs and relying on a single tool for the preparation of the cost management plan.

II. Project cost Estimation process

As discussed in the previous chapter, inputs to the estimate cost process being used by most of the contractors weren't sufficient, this insufficiency of Inputs adversely affected the end result of the estimate cost process.

Related with estimation techniques, it has been learnt that most of the contractors relied on the bottom up estimating techniques. However, PMI (2016) reveals that using other tools as situation calls for is crucial. Besides, using more than one tool is believed to facilitate the accuracy of the estimates and help to estimate cost elements such as risk whereby it is difficult to model and calculate it by a tool like bottom-up technique.

As per PMI (2016) the estimate cost process delivers three outputs, namely, cost estimate, basis of estimate and project document updates. However, around 50% of the respondents failed to acknowledge the fact that this process group delivered the above three outputs. From the in-depth analysis of the collected data, it has been found that most contractors failed to update the project's documents such as assumption log, Risk register and lesson learned register upon finalizing the cost estimate process.

Ranking of cost related Information with respect to their contribution to the result of the accuracy of cost estimate was also analyzed based on the feedback collected from respondents. Accordingly, information concerned with Equipment cost, material cost and Productivity of equipment are ranked by the contractors as the first, the second and the third in the corresponding order shown above. The respondents' selection has been found logical as these cost elements cover the major portion of the direct costs of activities and mistake done in picking up wrong data information related with them will have devastating negative impact on the accuracy of the estimates.

Similar to the above, different cost elements were also ranked by the respondents with respect to their difficulties to be estimated .The finding show that "Risk allowances" is the most difficult and estimating "cost of " taxes is selected as the least difficult cost item. This finding looks logical as most of the local contractors have had less experience in the preparation risk management plan in general and identification of risks in particular.

Besides, by comparing different cost elements with respect to the level of attention they deserved, the result reveal that cost of equipment, material and labor are the first, the second and the third cost element requiring top attention in the corresponding order shown above. The respondents response in this regard could be justified in connection with the fact that

cost of equipment, material and labor are major part of direct costs deserving highest possible attention.

The Practice of comparing actual cost data with the raw data were also checked and the feedback show that around 89% of the contractor participated under the study are doing the comparison. Furthermore, the response gathered about the level of deviation between actual and raw data reveal that material, equipment and productivity of equipment are the first, the second and the third areas wherein highest deviation are recorded in the corresponding order shown above. The researcher believed that these differences are the outcome of the Inflation being witnessed currently.

Factors contributing for the inaccuracy of cost estimates were also ranked by the respondents and the result of the same show that difficulty to quantify costs related with potential risks, insufficiency of accurate data related with material consumption and shortage of accurate data are the first, the second and the third ranking factors in the corresponding order sown above. The researcher believes that contractors are facing difficulties in the Identification and evaluation of risks at the time of estimating project costs because most of them don't pay attention for the preparation of risk management plan. Similarly, absence of standards is also believed to create difficulties for the estimation of material consumption such as fuels and contributed a lot for the cost deviations.

It has been also learnt that 50% of the respondents uses a randomly fixed percentage value to calculate overhead costs, whereas the remaining 50% said that they explicitly calculate overhead costs rather than using intuition. On the other hand, the ratio of total overhead costs to total project's direct costs specified by the respondents and what was recommended by Wibshet (2007) were found to be 20.04% and 17.5% respectively, implying that the respondent's O.H amount is higher by 2.54%.

It is quite extraordinary that around 50% of the contractors relied on intuition to estimate the amount of the overhead costs despite the average amount of their overhead cost is around 20 % of the total direct cost and more than the industry's average value suggested by Wibshet (2007).

Furthermore, respondents selected that inflation, adverse weather condition and political stability in the project's area as the first, the second and the third high ranking risk factors in the corresponding order shown above. The selection of inflation as the first risk factors

could be explained with respect to the current material price escalation and devaluation of the Ethiopian currency, birr. Despite all grade I contractors engaged on the construction works under ERA are being compensated for the inflation of costs related with basic materials such as fuel, cement, steel, bitumen and equipment, the inflation is still a grave concern for many companies as the amount of compensation doesn't cover all cost items. Similarly, taking weather and political stability of the project's area as the second and the third risk factors are also logical as the nature of the road projects are easily affected by inclement weather conditions, riots and political instability prevailed in the project's area.

Need for a work, competition among bidders and market trends were selected as the first, the second and the third most determinant factors for fixing a profit amount in the corresponding order shown above. It is logical to think that need for a work is much more influential than the second, the third and other factors mentioned above. Because, if a company doesn't have sufficient work volume to engage all its resources, it will be exposed to cost overruns related with overhead costs and depreciation. Thus, it is acceptable that the company opted for a lower profit margin to the extent of winning the project at a breakeven cost.

III. The Determine Budget process

It has been noted that around 14% of the respondents had said they are using all the Inputs shown in the Questionnaire while 18%, 25%, and 21% selected six, five and four inputs as their Inputs of Project's budgeting process in the corresponding order shown above. Moreover, 93% of the respondents had said that they are using cost aggregation as budgeting tool and 15% of the respondents' pool confirmed they are using different types of tools in line with the situations and type of budgeting required to be developed.

However, the writer of this project work believed that insufficiency of Inputs have the potential to adversely affect the end result of the Determine Budget process. Especially, the fact that most contractors don't give attention for inputs such as Work break down structure (WBS), can make the utilization of cost aggregation as the budgeting tools difficult and erroneous.

From the respondents' reply, it has been learnt that Cost baseline and Project funding requirements are the most acknowledged out puts of the cost budgeting process. However,

it is has been seen that updating of project's documents didn't get sufficient attention from the contractor's end.

Responders were also requested to prioritize the budgeting approach in reference to their own companies' experience. The result show that bottom up budgeting approach has been selected as the most widely used approach than Top-Down approach. Although both approach have their own pros and cons, the respondents' response goes hand in hand with the cost aggregation budgeting tool they had selected earlier on.

IV. Controlling Project's Costs

The time interval on which the project's costs get controlled were specified by the respondents and the feedback show that 43% of them run project's cost controlling activities between three and six months.Whereas,14% and 35% of the respondents perform cost controlling operations in the period of less than one month and b/n one and three months respectively. Although, it is advisable to control project's cost on a daily basis for direct cost element, close interval cost control are also required for other type of costs including overhead costs. Otherwise, it would be too late to remedy the cost overrun of the project.

Inputs selected by the respondents for the cost controlling process were also checked and it has been learnt that 53% of the respondents use all inputs shown in the PMI (2016).Whereas, 29%, 7% & 11 % of the respondents said that they are relying on one input, two Inputs, and four inputs in the corresponding order shown above. However, it is clear that the deliverable of the cost control process cannot be as complete as the PMI dictates unless the Inputs are complete.

Moreover, it has been noted that around 86% of the respondents selected data analysis as their tool of controlling project costs whereas 46 % & 11 % of the respondents confirmed they are using expert judgment and to-complete performance index respectively. Moreover, it has been seen that around 61%, 36% and 3% of the respondents rely on one tool, two tools and three tools in the corresponding order shown above as a means of controlling project's costs.

From the practical point of view, it is much more preferable to use data analysis tool such as earned value analysis (EVA) as the contractor can control the performance of the project

with respect to time, cost and progress at a time. Thus, the position of around 86% of the respondents are logical and good for the success of their respective companies.

V. Shortcomings of the Contractor's Project cost management system

a) Absence of Project cost management plan and other related plans such as Risk management plan, a well prepared schedule management plan, etc.
b) Failure in fully understanding the Project cost management Processes, Inputs, tools and outputs and terminology associated thereof: plan cost management, Estimate costs, determine costs and control costs
c) Failure to use sufficient inputs and different tools for the estimation of costs.
d) Relying on a randomly fixed percentage to calculate Overhead costs despite the average percentage of the overhead cost is around 20% of the direct construction cost.
e) Failure in identifying, evaluating and quantifying project's risks so as to sufficiently incorporate in the cost estimates.
f) Failure to use all required inputs and different tools for the development of project's budget
g) Most of the surveyed contractors have confirmed that there is no a budget reserved for working capitals such as cash reserve-Budget despite having budget as working capitals is very essential for the smooth operation of the project's works.
h) Absence of close interval cost monitoring and controlling schemes.
i) Failure to use sufficient inputs and different tools to run the project's cost control process.
j) Failure to update documents such as cost management plan, risk register, etc., at the end of each project's cost management processes.

5.3 Conclusion

The General objective of this project work is to assess the cost management practices of National Contractors involved in the construction of Federal Road Projects. To this effect, data from 28 Grade I local Construction companies had been collected, and then analyzed and discussed in the previous sections of this paper.

This Conclusion presents what has been derived from the interpretation and analysis of the data with respect to the research objectives, Research Questions and theoretical literature review made so far.

The thematic approach of the conclusion shall follow the results and discussion part of the paper and will be presented as simple as possible.

a) Cost Management plan

Most of the contractors do not have a properly organized plan cost management process. This has been noted with respect to the utilization of insufficient inputs and tools. Moreover, it has been noted that most of the contractors do not have a properly and resource ful cost management plan.

b) Project cost Estimation process

It has been noted that insufficient inputs are used by most contractors to initiate the cost estimation process. Moreover, most of the contractors confirmed that they are mainly using the bottom up estimating techniques which is traditional but accurate for estimation of direct costs. However, using tools such as three-point estimating techniques is believed to help for incorporating the effects of risk and uncertainties into the direct unit rate cost. Similarly, using data analysis is also helpful to consider the cost of quality, among others. Thus, contractors are advised to use other tools to make the estimation process fast and more accurate.

The fact that the respondents had chosen Equipment cost, material cost and Productivity of equipment as the most important information looks logical considering the impact of these direct costs on the end result of direct cost of an activity. This, implies that the local contractors are aware of the Impacts of these three cost element on their overall price.

Estimating risk allowances has been taken as the most difficult endeavor and at the same time a factor contributing for the inaccuracy of the cost estimate, among other factors. Thus, contractors need to work more on risk management plan to resolve these problems.

c) Determining Project's budget

Most of the respondents correlated the objectives of their cost budgeting process with allocation of funds and as project's cost control base only. Around 14% of the respondents

had said they are using all the Inputs shown in the PMI (2016), despite the insufficiency of Inputs could adversely affect the end result of the Determine Budget process.

On the other side, most of the respondents confirmed that they relied on cost aggregation as budgeting tools whereas 15% of the respondents' pool confirmed they use all tools as the situation require which is helpful in different aspects. Using More than one tool helps to make the output of this process realistic. For instance, combining Cost Aggregation and funding limits reconciliation should go in parallel wherein there is budget cap allowed for the project.

d) Controlling Project's Costs

Although respondents had specified different time interval, the best interval is the one which is not far apart. Specially, direct costs of labor and equipment needs close follow up, if possible on a daily basis. However, it has been learnt that 42.86% of the respondents run project's cost controlling activities between three and six months.Whereas,14.29% and 35.72% of the respondents perform cost controlling operations in the period of less than one month and b/n one and three months respectively.

Most of the contractors revealed that they are using less number of Inputs to run the cost control process and this is believed to have affected the output. On the other hand. Around 86% of the respondents confirmed that they are using data analysis as a tool for controlling costs, which is a good and reliable technique.

5.4 Recommendation

It is well known that this research work has been initiated and then tailored to assess the practices of Cost management undertaken by contractors in their effort to construct the Federal Road Projects. Thus, upon finalizing this research endeavor, the following recommendation has been made from what have been mentioned and discussed so far;

1. Contractors are advised to prepare a cost management plan through which project's site office could get sufficient guidance on cost estimating, budgeting and Controlling of Project's costs.
2. Contractors are advised to familiarize their staffs about the overall Project cost management knowledge area of PMI in in the context of construction Industry.

3. As project cost management plan cannot be established and be effective without other plans, attention should be given for other plans and documents too.
4. Contractor are also advised to explicitly write down, quantify and then estimate site and company's overhead rather than magnifying the direct cost by an arbitrarily fixed percentage.
5. Contractors are advised to properly identify, evaluate and quantify risks and uncertainties and to have a proper records for future reference.
6. Project's budgeting should be as complete as possible and unbudgeted expenditure of project's finance should be discouraged.
7. The cost of the project should be controlled at a close interval, otherwise it will be late to remedy any severe damages sustained due to delayed mitigation actions.
8. Utilization of data analysis such as the Earned value management methods are more efficient in identifying the status of the project in view of cost, time and progress (scope) at a time. Hence, contractors are advised to make use of such types of tools in the future.
9. Cost estimating formats, budgeting formats and cost control formats should be properly designed so as to be used effectively at the project's level.

5.5 Research Limitation and areas of further research

This section discuses about the limitation of this research paper and also indicate areas where further research could be undertaken.

5.5.1 Limitation of the Research

This study does have the following limitations;

1 Although the research is focused on assessment of Project's cost management, it doesn't deal with life cycle cost of projects commonly known as LCC;

2 PMI (2016) defined Project cost management as an endeavor involving the processes of planning, estimating, budgeting, financing, managing and controlling of costs. However, this project work doesn't cover financing and managing part of the project cost management.

3 This research work doesn't discuss the application of estimating soft wares or any other computer programs in the area of cost management.

4 This research doesn't discuss an in-depth application of tools and techniques of each Cost management Processes

5.5.1 Future Research

The writer of this project work would like to recommend the following topics as a potential research areas;

1. Developing a work break down and activity coding system as per specification of ERA/2014 with an objective of Controlling Project's Costs.
2. Application of probabilistic estimating techniques for estimating construction works;
3. Costs of wastages, rework, and inefficiency on Road Construction project and ways to minimize it.
4. Enhancing the Productivity of Construction Crew through different mechanism
5. Building up Performance bench mark related with different construction activities in the case of the construction of Asphalt Road Projects.
6. Improving Productivity of Road construction projects through Kaizen/Quality circle.
7. Implementing Performance Related Pay system in the Road Construction Project.

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ANNEXES

Annex-A: Questionnaire

ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

OFFICE OF GRADUATE STUDIES

Questionnaire Survey: Assessing Cost management practices of National Contractors involved in the Construction of Federal Road Projects

Dear Respondents

The aim of this questionnaire is to collect data for a project work I am engaged on, as a requirement for MA in Project management. The title of the research is "**Assessing Cost management practices of National Contractors involved in the Construction of Federal Road Projects**".

I would like to assure you that all data included in this questionnaire shall be used only for academic research purpose only and will be strictly maintained confidential

Finally, I humbly and wholeheartedly thank you in advance for your kind, invaluable and timely cooperation as a respondent of this questionnaire survey.

If you have any queries or seek clarifications, please contact me by a phone or a telegram at **0911-672371 or email at:asfawossenteka@gmail.com**

Sincerely yours,

Asfawossen Teka

General Instruction:-

- **Please use, tick mark (√) for questions having choices and numbering for questions requesting for ranking**.
- **You can select more than alternatives provided for each questions**.

Part One: General Information

1.1 Name of Construction Firm (Optional)_____

1.2 Category and Grade of Construction Firm_____

1.3 How long has your organization been involved in the Construction of Road Projects under Ethiopian Roads Administration?

☐ Less than 5 years ☐ 6 - 10 years ☐ More than 10 years

1.4 Average annual turnover in ETB, over the past 5 years:-.

☐ Less than 1B ☐ b/n 1Bln & 3Bln ☐ b/n 3Bln & 5bln ☐ above 5Bln

1.5 Rank the Common type of Construction contract you are involved in.

☐ Design, Bid & Build (DBB) ☐ Design-Build (DB)

☐ Cons. management and management Contracting

☐ Any other, _____

Part Two: Plan Cost Management Process

2.1 Does your company has a Cost management plan for its Projects?

☐Yes ☐No

2.2 Select Inputs you use for cost management plan of the project:

☐ Project Contract documents ☐ Schedule management plan

☐ Risk management plan ☐ Enterprise environmental factors

☐ Organizational process assets such as financial control procedures

☐ If other, _____

2.3 Tools and Techniques you use to develop project cost management plan:-

☐Expert judgment ☐Data analysis ☐Meetings

☐Any other, _____

2.4 Select the Content of the Project Cost management plan of your project:-

☐Choice of Processes b/n costing and budgeting

☐ Fixing units of Measurements

☐ Precision levels ☐ Accuracy levels ☐ Use of WBS.

☐ Measure Performance (EVM technique) ☐Type of cost tracking mechanisms

☐ Format and frequency of various cost reports; ☐ Recommended funding options

☐ Setting the maximum allowable cost performance deviation from the baseline;

☐ If any other please specify, _____

2.5 Are there formats in your project related with the following :-

a) Cost estimating formats:- ☐Yes ☐No

b) Budgeting Format:- ☐ Yes ☐No

c) Cost monitoring and Controlling formats ☐Yes ☐No

Part Three: Project Cost Estimation Process

3.1 What are the Purpose of Cost estimation?

☐ To identify projects to bid for ☐ for bidding

☐To monitor and control the project ☐ to prepare a work schedule

☐ Any other, _____

3.2 Select the Inputs you use for the preparation of project cost estimate:-

☐ Cost management plan, ☐ Quality management plan,

☐ Scope baseline ☐ Lessons learned register, ☐ Project time schedule

☐ Resources requirements ☐ Risk register,

☐ Enterprise environmental factors ☐ Organizational process assets

☐ If other, _____

3.3 Select estimating techniques common in your Firm. Rank them by numbering

☐ Analogous estimating/estimates based on experiences of similar;

☐ Standard /Bottom-up estimating, also known as detailed estimates

☐ Parametric estimating: - project parameters in a mathematical model

☐ Three-point estimating, averaging: Pessimistic, Most likely, optimistic, Estimates;

☐Learning curve method to determine rate of production

3.4 Select the outputs you get from the cost estimation process

☐Cost estimates ☐ Basis of estimates ☐Project documents updates

☐ If other, _____

3.5 Give Importance level of the following information as related to cost estimation, by ticking (√)

Types of Information	Importance Level				
	Very High	high	Medium	Low	Very Low
Labor costs					
Material Costs					
Equipment costs					
Productivity of Labor					
Productivity of Equipment					
Availability of Construction material					
Distance of the Project from material sources					
Site visits					
Construction methodology					
Site overhead costs					
Company overhead costs					
Project's Risks					
Project location					
Availability of Skilled labor					
Statuary regulations					
Sub-contractor prices					
Historical data of similar works					

3.6 Rank (by numbering) the under listed elements of cost related with difficulties and level of attention, they pose to the estimator

Cost element	Rank (1,2,3,..) with respect to	
	Difficulty faced to estimate	Receiving more attention during estimation
Labor		
Materials		
Equipment		
Site overheads		
Company overhead		
Risk Allowances		
Taxes		

3.7 Specify the source of Information for material consumption standards, costs of equipment, labor, productivity of labor and equipment?

☐Market studies, ☐Published standards

☐Data gathered from previous projects ☐Professional guess

☐If other, specify pleas, _____

3.8 Do you compare the data used for estimation with the actual data? ☐Yes, ☐No

3.9 If the answer for the above question(No.3.8) is yes, specify the level of deviations between actual and estimated data by ticking(√)

	Deviation between Actual data and estimated data				
Cost element	Very high	high	Medium	Low	Very Low
Productivity of labor					
Productivity of Equipment					
Material consumption rate					
Price of Labor					
Price of material					
Price of Equipment					

3.10 Prioritize by numbering factors listed below, as related to their contribution for the inaccuracy of cost estimates. Rank them by numbering:-

☐ Shortage of accurate data such as resource prices

☐ Insufficiency of accurate data e.g.:- consumption of materials,

☐ Insufficiency of details shown on the drawings and specifications;

☐ Difficulty in estimating overhead costs;

☐ Difficulty to quantify costs related with potential risks

☐ If others. Please specify the same, _____

3.11 Overhead Costs

I. How do you incorporate overhead costs in to your cost estimates?

☐ Writing down list of Overhead items with their corresponding costs and then distribute the sum to all payable project's activities.

☐ Identify overhead costs which are related with each project activities and adding the cost to the same relevant activity (Activity based costing ABC)

☐ Taking a randomly selected percentage of the total direct costs as Overhead

☐ If other, _____

II. What percent does your overhead cost represent related with the total cost?

☐< 5%, ☐5% - 10% ☐10% - 15% ☐ 15% - 25% ☐>25% ☐ Not known

3.12 Profit

I. In which range your profit margin falls with respect to the overall cons. cost?

☐≤ 5% ☐ 5 %< P≤8% ☐8 %< p≤10% ☐10 %< P≤15% ☐p>15%

II. Which factors are important for the determination of a profit margin?

☐ Risk ☐ Need for work, ☐ Competition among bidders

☐ Market trends ☐Similarity of the project with past/exiting ones

☐ Location of the project ☐ Complexity of the Project ☐ Project's duration

☐Company's minimum profit margin

3.13 Taxes

I. How do you consider government taxes in your Project Cost?

☐ As indirect or overhead costs

☐ As a fixed profit margin (e.g. 30% of the fixed profit amount, for income tax)

☐ Distributing the fixed lump sum as a percentage of the total project cost

☐ Not considered

3.14 Risks

a) Do you include allowances for risks, in your cost estimates? □Yes □No

b) Of the risks mentioned below, which of them are considered in your cost estimates?

☐ Adverse weather conditions, ☐ Changes in design; ☐ Scope changes

☐ Errors in design or specifications, ☐ Productivity of labors, ☐ Inflation

☐ Political stability in the Project's area

Part Four: Determine Budget Process

4.1 Preparation of Budgets

I. Do you prepare budget for your projects? ☐Yes ☐No

II. What are the details of your budgets?

- Revenue/cash inflow Budget:-

☐ Payments from the execution of the Project Works

☐ Other income like renting of equipment

- Cash outflow budget

☐Material requirements budget, ☐Labor requirement Budget,

☐Overheads budget ☐Equipment and plant requirement budget ☐Sub-contractor charges budget

- Working capitals: ☐Cash reserve –budget

4.2 Budget for the advance payment

I. Do you prepare budget for the advance payment? ☐Yes ☐No

II. How do you prepare budget for the advance payment?

☐ Disburse it for major expenses ☐linearly distribute it over long duration

☐ If other:-……..

4.3 How often do you update the budget of the project?

- ☐ Whenever there is change in the scope of the Project;
- ☐ When there is significant slippage between works done and plan of the Project
- ☐ At fixed interval
- ☐ Any other period, _____

4.4 For what purpose do you often use the Budget plan of the Project?

- ☐ For soliciting of funds ☐ for allocation of funds
- ☐ As project's cost control base line
- ☐ Any other, _____

4.5 Select the Inputs you use for project budget plan:

- ☐ Cost management plan, ☐ Resource management Plan
- ☐ Project Schedule, ☐ Risk register, ☐ Agreements
- ☐ Basis of estimates ☐ Cost estimates ☐ WBS

4.6 What are the tools and techniques you use for Project budget preparation?

- ☐ Expert judgment ☐ Cost aggregation ☐ Historical information review
- ☐ Data analysis (Reserve analysis: management and contingency reserve)
- ☐ Funding limit reconciliation ☐ financing options

4.7 What are the outputs you would get from the determine budget process?

- ☐ Cost performance baseline ☐ Project funding requirements
- ☐ Project documents updates: - Cost estimates, project schedule, risk register

4.8 Prioritize/rank the Budgeting approach common in your company;

☐Top-Down approach wherein the budget is prepared by top management;

☐ Bottom-Up budgeting wherein developed starting from elemental tasks

☐ Using Activity-based costing costs are initially assigned to project activities

Part Five: Project Cost Control Process

5.1 At what Interval do you control the costs of the Project?

☐< one month ☐ b/n one and three month's ☐ b/n three and six months

☐B/n six months and 1 year ☐ at the completion of the Project's milestone

5.2 Which Inputs do you use for the controlling of project's cost?

☐Cost management plan ☐Cost performance baseline

☐ Work performance data. ☐Lessons learned register

☐ Performance measurement baseline

5.3 Tools and techniques you use for the control of Project Costs:-

☐Expert judgment. ☐To-Complete Performance Index

☐ Data analysis: - (Earned value analysis, Variance analysis, etc)

5.4 What are the outputs of project Control process?

☐ Work performance information, ☐ Cost forecasts

☐ Project management plan updates ☐ Change requests

End of the Questionnaire.

Thank you So Much!