ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

SCHOOL OF COMMERCE

Factors causing project cost overrun in construction sector: In case of Mekasha Ambaw Building Contractor

A project work submitted to the School of Graduate Studies of Addis Ababa University, Faculty of Business and Economics School of Commerce in partial fulfillment of the requirements for the award Master of Arts Degree in Project Management

By: Hana Amser

Advisor: Teklegiorgis Assefa (Asst.prof)

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ADDIS ABABA UNIVERSITY

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MA PROGRAM IN PROJECT MANAGEMENT

FACTORS CAUSING PROJECT COST OVERRUN IN CONSTRUCTION SECTOR: IN THE CASE OF MEKASHA AMBAW BUILDING CONTRACTOR

BY: HANNA AMSER

Approval board of committee

Advisor **Signature**

Teklegiorgis Assefa (Asst.prof)----------

Internal Examiner **Signature**

Atsede Tesfaye (Phd) **----------**

External Examiner **Signature**

Ch.Venkata (Phd)----------

Statement of Declaration

I, Hanna Amser Shumbeza, declare that the thesis titled **"**Factors causing project cost overrun in construction sector in the case of Mekasha Ambaw building contractor**"** is my original work.I have carried out the present study independently with the guidance and support of the research advisor, Teklegiorgis Assefa (Asst.prof). This study has not been presented for a degree in any other university and all sources of materials used for the study were properly acknowledged.

Hanna Amser

Signature----------

Date----------

Letter of certificate

This is to certify that Hanna Amser has carried out this project work entitled **"**Factors causing project cost overrun in construction sector in case of Mekasha Ambaw building contractor" under my supervision. This work is original and suitable for the submission in partial fulfillment of the requirement for the award of Master of Arts Degree in Project Management.

Teklegiorgis Assefa (Asst.prof)

Signature----------

Date----------

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Lists of Acronyms

FI - Frequency Index

SI – Severity Index

II – Importance Index

SPSS – Statistical Package for Social Science

PMBOK – Project Management Body of Knowledge

UAE- United Arab Emirate

ABSTRACT

Cost is among the three project parameters and a project cost overrun is a situation when the actual project cost exceeded the planned amount. There are many studies conducted to identify the causes of cost overrun. The purpose of this study is to identify factors causing project cost overrun in construction sector in case of Mekasha Ambaw building contractor. The study used a descriptive research type and data collection technique used is quantitative. Both primary and secondary data were used, primary data through structured an open ended and closed ended Likert type questionnaire and secondary data from reports of previous studies and literatures. The research adopted a purposive sampling technique and the sample size of 32 employees was taken to distribute the questionnaire. The data obtained from the questionnaire was analyzed by computing their frequency, severity and importance indexes by using SPSS version 20. The findings from the analysis were ranked based on their level of importance index and the five factors which have high level of importance index are unpredictable weather condition, lack of coordination with sub-contractors, lack of experience of technical consultants, the rise of price of materials and complexity of the construction project. The factors which have high frequency index are poor quality management, the rise of price of materials, unpredictable weather condition, lack of coordination with sub-contractors, lack of experience of technical consultants, lack of training program and poor planning. Factors with high severity are wrong cost estimation technique, lack of training program, lack of coordination, lack of experience of technical consultants, lack of coordination with sub-contractors, unpredictable weather condition, complexity of the construction project, poor communication with sub-contractors and damage of materials. Finally based on these findings the researcher concluded that, the company's most significant factors causing the project cost overrun comes from the construction phase of the project andthe three measurements, frequency, severity and importance are related in that factors which have high frequency and severity indexes have high importance index, since importance index is the product of the two. Finally it is concluded that, factors which are significant to the company's cost overrun are interrelated and had an impact on the project time that the contractor cannot accomplish the project work within a specified time and the contractor is obliged to incur additional cost beyond the initial contract amount due to the rise of price of materials. In the recommendation part of the research, it is recommended to the company that to employ experienced technical consultants in order to minimize the cost incurred to rework of unsatisfactory work which is a result of poor quality management, to hire a person who had better knowledge in the area of cost estimationand provide adequatetraining program to improve the capacity and productivity of the labor force, to focus on factors which can be minimized in order to minimize the effects of cost overrun factors that are beyond the company's control, to plan properly before the beginning of any activity and for the project manager to be wise in his/her leadership style in order to create good coordination and communication with sub-contractors and the employeesenvolved.Finally the government is recommended to solve the problem of water and electricity fluctuations to minimize the problem of cost overrun.

Keywords: Cost Overrun, Construction Projects, Project cost

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

A cost overrun is a situation where the cost in hand at project completion exceeds the cost that is at the time of project initiation.

Construction industry in Ethiopia is among the biggest sector which contributes for the country's economy by creating employment opportunities.The three project parameters cost, time, and quality are the measure of project success. Although the objective of any project stakeholder that is, the project manager, the client or the contractor is to accomplish the given project within the three project constraints, there is always a problem of cost overrun.Zhu and Lin (2004) states that cost overrun is the excess of actual cost over the planned amount. Azhar and Farouqui (2008) states that cost overrun problem is inevitable and it is more chronic in developing nations.

There are a variety of factors which cause a project cost overrun. However, Memon***et, al.*** (2010) states that in order to minimize cost overrun problems, the primary task should to be is identifying the reasons behind it.

Changes in owner's needs, unexpected site conditions, evolution in the design philosophy and design or budget errors are the most important cost overrun factors (Harold K.2009). Unexpected weather conditions or forces beyond human control are also among the factors responsible for cost overrun. The project cost overrun is a result of incorrect analysis or poor planning before the beginning of a project work. (Plan Grid Construction Productivity, Nov. 1, 2017). Studies showed that, the cost of a project at the time of completion exceeds the planned amount by 30% while change order results in 83% cost overrun (Al Momani, 1996). According to Roberts & Wallace (2004), the three constraints time, cost, and quality are interrelated and the presence of time overrun results in cost overrun.

The construction sector in Ethiopia is among the biggest sectors which contribute for the growth of the economy by creating employment opportunity. However, the sector faces a problem of time, cost and quality constraints and due to this, it is not working in its fullest potential. There are several factors responsible for the construction project cost overrun. The basic objective of this research is to identify the major factors which cause project cost overrun in case of Mekasha Ambaw building contractor.

1.2 Statement of the problem

The basic goal of any project stakeholder is to achieve the completion of project within the three project parameters time, cost and quality. Like other projects, construction projects encounter time, cost and quality problems due to their fragment and complex nature (Memon et al., 2011). The problem of cost overrun is a worldwide phenomenon and it affects the relationship between owners, project managers, and contractors (Creedy et al., 2010). Azhar and Farouqui (2008) observed that the effect of the problem is more severe in developing countries. The biggest the construction project is in its size, the complexity in planning, budgeting and managing will be great (Apolot et al., 2012). The severity of a project cost overrun makes the problem of cost overrun to be a great significance which needs a proper investigation(Kasimu, 2012). Cost overrun is the most important challenge in the construction industry. The failure to manage a project cost wisely, results in cost overrun and a difficulty in investment decision-making. Therefore, identifying the factors contribute to cost overrun should given priority in order to solve the problems (Ali & Kamaruzzaman, 2010). Identifying the root causes is usually the first step when addressing a problem (Chang, 2002).

Cost is one of the major factors for project success. The construction industry plays a major role for a nation's development by creating job opportunity for individuals and firms. A project incurring extra cost will bring associated problems if the reasons behind for the overrun are not identified and provided the necessary project management decision, otherwise this led the project to fail and create dissatisfaction for the owner of the project or client and affect other stakeholders involved. Cost, time and qualities are the triple project constraints which are inter-dependent on each other. When large projects diverge from their objectives (either in cost, completion time, performance, safety or environmental effects), the problem caused obviously go beyond the contracting parties and affects the project stakeholders and also the public at large.

For the client the major key success factors are completing the project with the planned cost, with the stated time and with the quality defined, failing to meet the first two factors is what becoming a headache for almost every construction projects in our country. Studies on construction projects undertaken in recent years shows that cost overrun is one of the major problems in Ethiopia (Ashebir ,Wubishet, and Murad, 2017: Abubekir 2015: Zinabu and Getachew 2015:Fetene 2008). The problem of cost overrun results difficulties in financing of new investments by the public and affects the relationship of stakeholders (Client, Contractor, and Consultant) involved in the construction process. According to Weyessa E, 2014, Addis Ababa light rail transit construction project had experienced cost overrun.

George Jarfas (2010) note that there is no single cause for project budget and time overruns. Projects has their own unique character and factors significant for one project may be insignificant for the other.This character of projects implies the need for debate and further investigationto minimize the severity of cost overruns (Kasimu, 2012).

Cost overruns can be dangerous to project success since it imply that, for maintaining project activities, a firm has to spend funds intended for entirely other purposes to the project work. From the context of financial problems, unexpected expenses may also provoke the growth of the organizational dept. Hence, it is essential to understand the reasons why cost overruns occur and address them accordingly. There are many studies conducted on the factors that cause the project cost overrun in the construction sector at large, but the problem of cost overrun is still a chronic problem which affects project success, the stakeholders involved and the public at large. In this study the researcher select one contractor company which is Mekasha Ambaw building contractor to assess the factors that cause project cost overrun. Mekasha Ambaw building cotractor is grade one contractor which undertake contracting of building construction projects. Prior to selecting the company, the researcher gathered information about projects undertaken by the company to assess whether or not the projects are succesful in terms of cost quality and time. As the general manager describes, among projects completed recently about four building projects in Addis Ababa, three from Bahirdar and one project from Gonder site encounter cost overhead problems. The researcher believed that in order to minimize the problem of cost overrun, it is necessary to know the factors that cause project cost overrun and prioritize the most important factors based on their frequency of occurrence and degree of severity in order to

enable managers and stake holders better deal with the most severe factors to minimize the problem hence dealing with all factors is impossible and difficult.

1.3 Basic research questions

This study attempts to address the following basic research questions.

- What are the factors causing project cost overrun in construction sector in the case of Mekasha Ambaw building contractor?
- What are the most frequently occurred factors in the company?
- Which cost overrun factors are more sever for the company?
- Which cost overrun factors are more significant?

1.4 Objectives of the study

General objective

- The general objective of this study is to assess the factors causing project cost overrun in construction sector in the case of Mekasha Ambaw building contractor.

Specific objective

- To identify factors which are frequently faced by the company.
- To identify factors which have high impact to the company.
- To identify the most significant factors to the company by computing their relative importance index.

1.5 Significance of the study

Construction projects are increasing time to time and the problem of cost overrun becomes a critical issue which needs an investigation. Undertaking this research will identify the major causes for the project cost overrun in construction projects undertaken by Mekasha Ambaw building contractor. The study try to investigate on factors which are most frequently occurred in the company and the most sever factors which have a great impact on the company's cost. So, the findings of the study enable the contractor company to prioritize on which factors to focus in order to minimize the effect of cost overrun. It also motivates other researchers to further study on how to minimize cost overrun problems based on the identified significant factors.

1.6 Scope of the study

This study is limited for projects undertaken by Mekasha Ambaw building contractor to identify factors that cause project cost overrun and to analyze them based on their level of frequency, degree of impact and importance. Even though there are key stakeholders who are responsible for the project cost overrun like Client and Consultant, this study only focus on the project contractor.The contractor company is located its head office at Addis Ababa around Gurd sholla and employed in different sites at Addis Ababa and out side Addis Ababa. For this study, in order to collect the needed data the researcher focused on all ongoing and recently completed projects in different sites from the persons who are believed to have a direct impact to the project that the company undertaken.

1.7 Limitation of the study

The problem that the researcher face in order to conduct this study is the problem of data gathering due to COVID-19 pandemic disease. Due to the pandemic, the researcher is unable to got all respondents on the proper time as needed and this results in shortage of time inorder toconduct the research intensively.

1.8 Organization of the study

The study is organized in five chapters

- **Chapter one:** introduces the background of the study, statement of the problem, research questions, objectives of the study, significance of the study, scope and limitation of the study and organization of the study.
- **Chapter two:** contains the literature review part of the thesis and thus, the theoretical and empirical literatures are reviewed.
- **Chapter three:** covers the research approach and methodology, the research design, Source of data and collection method, the population and sample size, sampling technique, method of data analysis, ethical consideration, measurement of reliability and validity and definition of variables.
- **Chapter four:**contains the discussion and analysis part. It contains the findings on causes of cost overrun.
- **Chapter five:** in this part, the research conclusion and recommendation are presented.

CHAPTER TWO

LITERATURE REVIEW

2.1 General

A "construction project" is a high value, time specific, special construction mission of creating a construction facility or service, with predetermined performance objectives defined in terms of quality specification, time, cost and other specified constraints (Chitkara, 2011).Cost is one of the five main parameters that sufficiently defines a construction project. Other constraints are scope, quality, resource and time. The five project parameters are interrelated, that is, the increase or decrease in one parameter has an impact on the other. Managing the interrelationship of the five project parameters is a complicated process. However, in most projects, scope and quality are specified first and are not subject to change (unless scope changes are made). Projects to be successful, the parameters must kept in balance within the changing environments (Chitkara, 2011).Nowadays, even a small amount of cost overhead affect the success of a project, and continuous cost overheads results in bankruptcy (Akinci& Fischer, 1998). Organizations face a challenge of controlling project cost during a project life span. The development of a better cost estimation techniques that accurately reflect project scope and economic conditions are essential to management in the design process. Projects can be completed within a specified budget but that requires a good starting estimate, project management discipline and an awareness of factors that can cause cost escalation (Shane et al., 2009). This necessitates finding the significant factors and causes that lead to cost overrun.

2.2 Definitions

Completion of a construction project with initial budget is frequently seen as a major success factor by clients, contractors, consultants and related stakeholders. It is noted that project management becomes essential tool for the delivery of successful projects than the traditional functional management. The Project Management Institute Project Management Body of Knowledge (PMBoK) Guide defines a project as ‘‘a temporary endeavor undertaken to create a unique product or service" (PMI, 1996).

Cost is the budgeted expenditure, which the client has planned to use foracquiring the desired construction facility (Chitkara, 2011).Cost overrun is defined as the difference between the cost at project initiation and the cost in hand at project completion. Final costs are defined as the recorded costs actually spent, as determined at the time of project completion. Estimated costs are defined as the planned or forecasted costs at the time of project initiation, which are typically similar to costs presented in the business case for a project (Lee, 2008).

2.2.1 Classification of Construction Costs

There are different types of costs. These include labor cost, material cost, plant and machinery costs, administration costs and other expenses. In order to identify costs associated with an activity, construction costs are classified into „Direct costs" and „Indirect costs" or „Overhead costs". Direct Costs: Direct costs are costs incurred to a specific activity or a work item, which is being done or produced. Direct cost of permanent work item = Direct material cost + Direct labor cost.

Direct material costs cover all costs related to materials, which are incorporated into regular works of the project. Direct labor costs include, net expenses for procurement, maintenance, and wages of all categories of workers employed at the work site for the execution of a project. Indirect Costs: Indirect costs include all costs, which are attributable to a given project but cannot be identified in a specific activity or a work package. (Fetene, 2008)

2.3 Causes of Cost Overrun

Angelo and Reina, (2002), stated that cost overrun is a major problem in both developed and developing countries. Several studies on major projects show that cost overruns are common. The causes of project cost overrun in construction projects are varied, some are not only hard to predict but also difficult to manage [Morris and Hough, 1991]. According to a study conducted in Turkey by Arditi, et al, (1985), the important sources for cost overruns were found to be inflationary pressures, increases in material prices and workmen's wages, difficulties in obtaining construction materials, construction delays, deficiencies in cost estimates prepared by public agencies and unexpected sub soil conditions were the most important sources for cost overruns. Kaming, et al, (1997), investigated on the factors influencing construction time and cost overruns for high-rise projects in Indonesia, and pointed out that the major factors influencing cost

overrun were material price increase due to inflation, inaccurate material cost estimating and the degree of project complexity. Mansfield, Ugwu, and Doran, (1994), investigated that costoverrun is attributed to problems in finance and payment arrangements, poor contract management, material shortages, changes in site conditions, design changes, mistakes and discrepancies in contract documents, mistakes during constructions, price fluctuations, inaccurate estimating, delays, additional work, shortening of contract periods, and fraudulent practices and kickbacks.

Stewart, (1982), attributes of cost overruns to several factors that are either not controllable or that to a varying degree are unmanageable. They include the accuracy of original cost estimate, degree of government regulation and control, construction completion delays, number of design changes, and labor related matters such as their availability, skills, and increases in fringe benefits. According to Robert F. Cox, (2007), project owners identified five reasons for project cost overruns: these were, incomplete drawings, poor pre-planning process, escalating cost of materials, lack of timely decisions and excessive change orders.

According to User's Guide, (2005), the following are the factors that influence the cost of theConstruction projects through time: poor project management, design changes, unexpectedGround conditions, inflation, shortages of materials, change in exchange rates, inappropriate contractors, funding problems and force majeure.

In developing countries, lack of proper phasing of construction projects can contribute to the economy to become 'overheated'. This leads to shortage of construction materials as the demand will exceed the supply, this in turn leads to increase in the cost of construction materials; this inevitably gives rise to project cost overruns, with consequential effects on Inflation and a decline in the efficiency of the construction industry [Mansfield, Ugwu and Doran, 1994].

According to Jahren, et al, (1990), on their research, they found the following factors to influence the cost overrun rates; the size of the project, the difference between lowest bid and engineer's cost estimate, the type of delivery method, the level of competition, quality of contract documents, and the nature of interpersonal relations on the project.

Studies have shown that the size of a construction project influences the level of cost overrun. Large projects are generally more complex, and in complex projects some items are may be forgotten during planning and design stages hence the complexity may increase the rate of cost

overrun. However, since the stakes are higher on larger projects, more care may be exercisedfrom conception of the project to the completion. Review of literatures indicates support for both of these conflicting views. Randolph, et al, (1987), found that cost overrun rates decreased as the contract amount increased, while Rowland, (1981), found that cost overrun rates increased with increase in the contract amount of construction projects.

Factors that could affect construction costs are numerous. Chan and Park, (2005), stated that the cost of a construction project is affected by various factors because of the fact that construction is a multidisciplinary industry and its work incorporate many parties such as the project owner and various professionals, contractors and suppliers. Thus, a construction project cost not only affected by a single factor but a cluster of variables that are related to the characteristics of the project and to the construction team as well as the market conditions.

According to Chitkara (2011), the major controllable causes of the projects‟ cost overruns include but are not limited to the following:

[1] Improper project formulation: Poor field investigation, lack of project information, incorrect cost estimates, lack of experience, poor project formulation and feasibility analysis, poor project appraisal leading to false investment decisions.

[2] Poor planning for implementation: Insufficient time plan, inadequate resource plan, inadequate equipment supply plan, inter-linking not anticipated, poor organization poor cost estimation.

[3] Lack of good contract planning and management: poor post-award contract management.

[4] Lack of good project management during execution: Insufficient and ineffective work, work delays, changes in scope of work and location, law and regulatins.

2.4 Construction project management

Construction project management can be defined as the direction, regulation and supervision of a project from initiation to completion. The ultimate goal of construction project is the full satisfaction of client’s demands for a viable project both in terms of functionality and budget. The main concept of construction project management is closely related to technical parameters

like budget and execution but it also requires solid communication between all the agents(stakeholders, contractors, community). It is a service that uses specialized, project management techniques to control the planning, design, and construction of a project, from its beginning to its end (Jose, 2017).

Project planning phase

Involves creating of a set of plans to help guide the project team in execution and closure phase. The plan created at this stage will help to manage time, cost, quality, change, risk and issues. It also help to manage the staff and external suppliers, to ensure that the project deliver the project on time and within the budget. This is a critical stage in the cost management process; improper planning can doom a project to continual stress and compromise, neither the client, end-user nor design team being completely satisfied at the end. A common mistake at this stage is to apply those historical data without making improvements for the myriad factors which affect construction costs such as size of the project, location, price increases, delivery system, overall quality of the project envisioned, etc (Bill, et al, 2006)

Project design phases

The design phase begins since the approval of the project budget which includes design and associated documents, professional time for the project manager, designer and potential contractors, and design contingency. At the end of design phase the construction budget is ready for approval and the project is ready to be constructed. The deliverables of this phase are design document, construction document and preliminary contract document package. Once an initial budget has been established, the scope set and quality expectations documented, it is important to monitor the estimated cost of the project by employing a series of increasingly precise cost estimating techniques that coincide with further development of design and construction details. Estimates are used at various stages of project design development as part of ongoing cost management, and as a means of evaluating competing alternatives. The drawings and specifications should also go through a constructability review, wherein the construction documents are analyzed for completeness, coordination between activities, cost effective designs, and general code compliance. The specifications should also be reviewed to ensure

thatthe general requirements included are not overly restrictive (e.g. working hours, noise restrictions and so forth), (Fetene, 2008).

Construction phase

After the construction document is completed during the design phase the project is ready to put out for bid. At the bid stage, drawings should be nearly 100% complete; however, in many situations this does not happen, leading to addenda being issued to clarify details, resolve conflicts or to complete the design. The preparation of the bidding document is also crucial in an overall cost management strategy. Attention should be given to contract clauses that govern changes in the work and how they will be valued; allowable mark ups on changes by the various levels of contractors and sub-contractors; notice requirements for delays; the use of unit prices for changes and any other clauses that may affect the final cost of the project. During construction, usually, the focus changed from predictive cost estimating to reactive cost control of any changes in the work. Changes arise from a number of different sources; unforeseen conditions, owner generated changes, drawing errors and omissions, code issues or contractual claims, etc. In addition, changes can arise from ongoing proactive cost management, generated either by the consultant, the client or by the contractor, where one of the parties proposes a better value substitution. (Fetene, 2008)

2.5 Review of Empirical Study

According to Changiz Ahbab, (2012),the existence of time and cost overrun problem in large construction projects in different countries was proved through an investigation on the selected 28 construction projects with the finance of some international banks. According to the investigation, existence of the causes for cost and time overruns in studied projects are as follows:

a) Increase in quantities of work - additional work;

b) Long period between time of bidding and contract award;

c) Design and work permit changes during construction;

d) Severe weather problems (hot, cold, snow, rain).

According to the results “Rework and wastage of materials” and “Inflation” are two most important critical factors from 46 factors that leading to cost overrun. Poor quality or mistakes in implementation means rework. Rework needs to employ extra materials and money and leads to cost overrun.

“Inflation” represents the second major cause for cost overrun according to the index analysis of the cost factor among the 46 factors. It is highly affecting different phases of the project especially increasing actual total cost in the countries with positive rate of inflation.

According to Zinabu Tebeje Zewdu, Getachew Teka (2015), the contractors outlined the top five factors that cause cost overrun on construction projects are poor planning, fluctuation of price of materials, poor productivity, inflationary pressure and project financing in descending order.

2.5.1 Studies of cost overrun in construction projects

There have been many studies conducted regarding factors causing cost overrun around the world and this section try to see their findings.

Muralidaran (2018) conducted a study on various factors influencing cost overrun in UAE construction industry and it was through questionnaire and interview that the data were collected. 194 responses were collected out of 295 and the findings showed that the most important causes of cost overrun were poor productivity, insufficient early planning, delayed completion, and lack of skilled resource and motivation.

Akinsiku, Akintola, Ameh and Ige, (2014) from Nigeria, conducted a research on the factors causing cost overrun from the contractor perspective. Their study was conducted using questionnaire survey in which 100 questionnaires were distributed to contractors using judgmental sampling and used descriptive statistic method to analyze the data by calculating the mean score and the result show that lack of adequate pre-contract planning and project team coordination are the most significant factor among construction professionals leading to cost overrun.

Table 2.1 factors responsible for cost overrun in building project

Factors Causing cost overrun	Mean	Ranking Index
Lack of planning and coordination	4.09	1
Additional costs due to variation works/Change order	3.96	2
Changes in plans and drawings or Design changes	3.93	3
Increase in the cost of construction materials	3.74	4
Poor cost control method	3.70	5
Inconsistent client brief	3.70	5
Changes to specification	3.69	7
Fluctuations in the cost of labor and/or material	3.61	8
Inexperienced contractor	3.60	9
Lack of control on excessive change orders	3.58	10
Inaccurate quantity estimate or excess quantity during construction	3.54	11
Inadequate site investigation	3.36	12
Delayed payments to contractors	3.30	13
Wrong method of cost estimation	3.29	14
Lack of coordination between design team and general contractor	3.26	15
Complexity of construction projects	3.25	16

Source: Akinsiku, Akintola, Ameh and Ige, (2014)

There are few studies conducted in our country on the project cost overrun factors, but the following review shows some of them and their findings.

Zinabu and Getachew (2015), conducted a research on the causes of contractor cost overrun in construction projects and it was administered through 140 questionnaire in order to rank the factors based on their occurrence and they were able to identify the top five factors as per the response of the contractors poor planning, fluctuation of price of materials, poor productivity,

inflationary pressure and poor project financing in descending order and the following table shows all the findings.

Table 2.2 Contractor's response of cost overrun factors

No	Contractors response of cost overrun factors		
1	Poor planning	21	Transportation cost
2	Fluctuation of price of materials	22	Previous experience of contract
3	Poor productivity	23	Manipulation of suppliers
4	Inflationary pressure	24	Cost of labor
5	Project financing	25	Lack of coordination between construction parties
6	Duration of contract period	26	Economic instability
7	Poor financial control on site	27	Contractual procedure
8	Monopoly by suppliers	28	Fraudulent practices and kickbacks
9	Contract management	29	Waste on site
10	Cost of machinery	30	Project location
11	Inadequate local production of raw Materials	31	Frequent changes in design
12	Bureaucracy in tendering method	32	Long period between design and time of Tendering
13	Currency exchange	33	Additional work
14	High machinery maintenance cost	34	Government policies
15	Lack of adequate manpower or technical Staff	35	Relationship between managers and Labors
16	Number of projects going at the same Time	36	Effects of weather
17	Wrong estimation method	37	Level of competitors
18	Number of competitors	38	Social and cultural impacts
19	High interest rates by bankers	39	Disputes on site
20	Absence of construction-cost data	40	Cost of insurance
		41	Political situation

Source: (ZinabuTebje and ZewduGetachewTeka, 2015)

Frimpongs et al. (2003) studied 26 factors that affect the cost of a project in construction of ground water projects in Ghana. It was a questionnaire survey and distributed for 125 respondents and 40 respondents were contractors and the findings show that the major factors

that results excessive cost overrun were poor management of the contractor, monthly payment difficulties from agencies, material procurement problems, poor technical performance, the rise of material prices according to their degree of impact.

Ramabodu and verster (2010) in South Africa conducted a study in order to identify the major cost overrun factors in construction sector and it included 25 questionnaires and an interview with selected groups and there were about 21 factors identified and these factors were divided into three categories very critical factors, moderate and less critical factors.

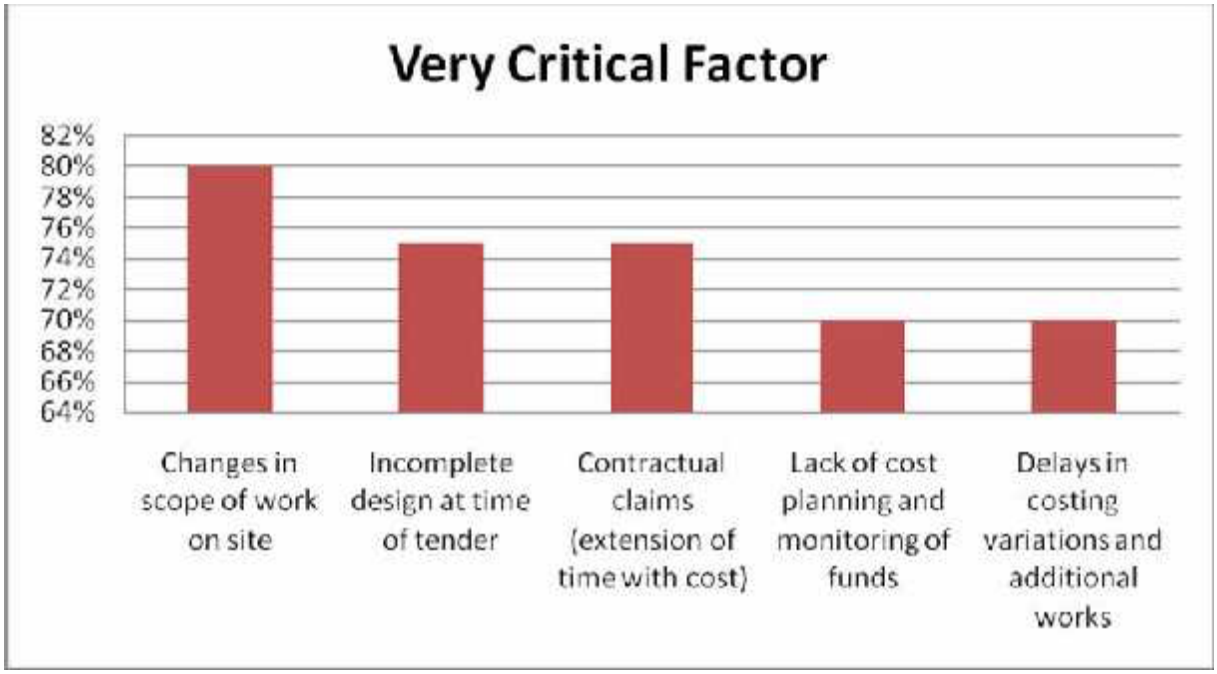

Figure 1: five very critical factors of cost overrun

Source: Ramabodu and verster (2010)

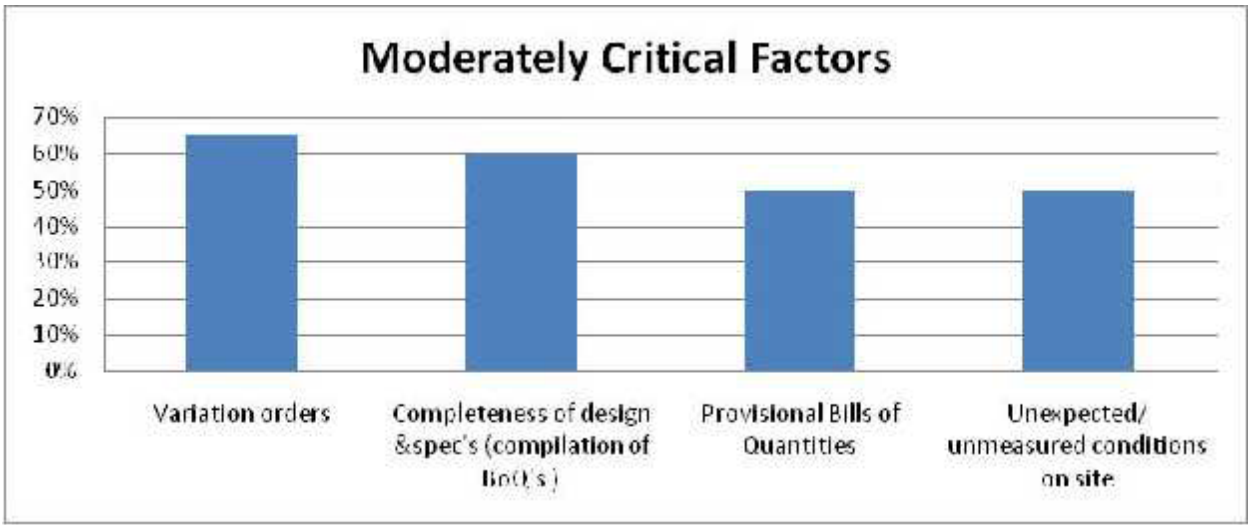

Figure 2: four moderate critical factors

Source: Ramabodu and verster (2010)

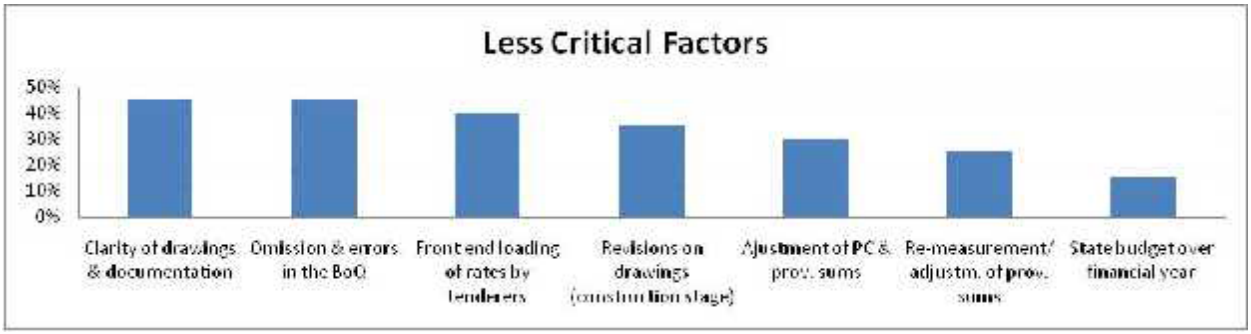

Figure 3: less critical factors of cost overrun

Source: Ramabodu and verster (2010)

Adnan et al. (2010) studied aiming to identify factors influencing cost overrun and time in Gaza Strip. Their researches were also conducted through detailed questionnaire of 80 containing 42 factors that cause cost overrun from contractors. Their responses were analyzed to rank the causes of time and cost overrun on an important index. The most significant causes were increase in material prices due to continuous border closures, delay in construction work, supply of raw materials and equipment by contractors, fluctuation in the price of building materials, project materials monopoly by suppliers, instability of local currency in relation to dollar value, low

commitment of donors to compensate any negative outcomes attributable to the poor economic and political situation, and donor policy in awarding tenders to the lowest bidder.

Fetene (2008) survey showed that 67 out of 70 public building construction projects in Ethiopia suffered cost overrun. It was through questionnaire and desk study that the research was conducted and about 42 questionnaires were collected from the client, consultant and contractor. And about 39 cost overrun factors were identified; the most important causes of cost overrun were inflation or increase in the cost of construction materials, poor planning and coordination, change order due to enhancement required by client, excess quantity during construction. The rate of cost overrun ranges from 0% to 126% of the contract amount for individual projects. Abubeker (2015) research showed that the cost overrun rate ranges from 4.11% to 135.06% of the contract amount. From 94 questionnaires 47 cost overrun factors were identified and the most important cause were delay in construction, inadequate supply of raw materials and equipment by contractors, design changes and incomplete design at the time of tender.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section presents the research methodology used in the study. Research Methodologyrefers to the overall approach to the research process, from the theoretical underpinning to the collection and analysis of the data.

3.2 Research Design

Research design is a master plan specifying the methods and procedures for collecting and analyzing the needed information. It is a framework or the blueprint that plans the action for research project. The selection of an appropriate research design involves several steps, beginning with identifying the problem, purpose of the study and in depth literature review. According to McDaniel and Gate (1999), a research design is a plan for a study that provides specification of procedures to be followed by the researcher in order to achieve the research objectives.

This study used a descriptive research type; the objective of this study is to describe factors to the project cost overrun and to give interpretation to the findings. Descriptive research is to portray an accurate profile of persons, events or situations (Malhotra, 2004).

3.3 Research Approach and Method

The data collection technique used in this research is quantitative approach which is a systematic empirical investigation of observable facts via statistical, mathematical or computational techniques.

3.4 Source of data and collection method

This study used both primary and secondary data. Primary data were obtained from the employees of Mekasha Ambaw building contractor through the questionnaire. The secondary data were obtained from reports of previous studies and literatures.

The research instrument used to identify and rank causes of cost overrun in this research was a structured questionnaire survey, which is designed from the literature reviews of various causes of cost overrun in construction projects. The questionnaire used is an open ended and closed ended Likert type scale of measurement in order to determine the level of agreement. It was employed to get professional opinion and other relevant data through questionnaire. Besides this a literature review to develop conceptual basis for the study was also conducted. Through the literature review, potential causes leading to cost overrun were identified. The review provided the basis to design the questionnaire which was distributed to professionals involved in Mekasha Ambaw building contractor.

3.5 Population of the study

The total populations for this study were workers who have a direct contribution to Mekasha Ambaw building contractor construction projects those are project Managers, engineers, subcontractors, forman and Project teams. Currently the contractor company employed in fifteen different cites which are under the control of engineers and project managers. The current total numbers of employees in the company are around 450, the total employees who are working permanently in projects are about 100 and about 350 are nonpermanent workers; the study focused on those who are permanent and so the population of the study was 100 and sample was taken from these populaton. Although the study population is small in number, it is difficult to conduct census study that most of the employees are working on sites out side Addis Ababa and also due to the pandemic the researcher is unable to got all respondents on their work place. These difficulty obliged the researcher to conduct a sample study.

3.6 Sampling Technique

Sampling occurs when researchers examine a portion or sample of a larger group of potential participants and use the results to make statements that apply to this broader group or population.

The research adopted a purposive sampling technique, i.e. the participants were selected using judgment sampling technique. Judgmental sampling is a form of sampling in which the investigator uses his discretion in selecting sample observations from the universe.

The researcher, by exercising judgment of expertise, chooses the elements to be included in the sample because he or she believes that they are representative of the population of interest or otherwise appropriate (Naresh, 2007, p. 390). A purposive sampling is a form of non probability sampling in which decisions concerning the individuals to be included in the sample are taken by

the researcher, based upon a variety of criteria which may include the respondent's knowledge of the research issue, or capacity and willingness to participate in the research.

According to Carvalho (1984), the sample size was determined as the following table shows and this study has applied it to determine the sample size of the study and 32 employees were taken to distribute the questionnaire since the study population which is 100 is within the interval of 91-150 population size, it is possible to take the sample size of 8 up to 32.

Table 3.1 Sample size determination

Population **1**	**Sample Size** **2**		
	Low	Medium	High
51-90	5	13	20
91-150	8	20	32
151-280	13	32	50
281-500	20	50	80
501-1,200	32	80	125
1,201-3,200	50	125	200
3,201-10,000	80	200	315
10,001-35,000	125	315	500
35,001-150,000	200	500	800

Source: Carvalho, 1984

3.7 Validity and Reliability

Reliability and validity in quantitative research show two strands: Firstly with regards to reliability, whether the result is replicable and with regards to validity, whether the means of measurement are accurate and whether they are actually measuring what they are intended to measure (Nahid, 2003).Kirk and Miller (cited in Nahid, 2003) identify three types of reliability referred in quantitative research, which relate to: 1) the degree to which a measurement, givenrepeatedly, remains the same, 2) the stability of a measurement over time, 3) the similarity of measurements within a given time period. The questionnaire was reliable in that it used the same questions to all respondents and was answered in a similar way. The questions were used from previously done studies which were subject to critics and the content validity was addressed in that all questions clearly represented all the variables intended to measure for the desired objective of showing the impacts of the independent variables on the dependent variable.

A general accepted rule is that a reliability coefficient (alpha) of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level. However, values higher than 0.95 are not necessarily good, since they might be an indication of redundancy. (Hulin, Netemeyer, and Cudeck, 2001). Based on the reliability test result, the variables in the questionnaire are reliable in that they can measure what is intended to be measure with regard of the research objective.

Table 3.2 Reliability test result of the questionnaire

	Cronbach's Alpha	Number of items
Frequency of occurrence	0.691	43
Degree of severity	0.625	43

Source: own survey 2020

3.8 Methods of data analysis

This study analyzed the data gathered from the selected respondents for the closed ended questionnaire by using the frequency of occurrence of factors, degree of severity, and relative important index. These three analyzing techniques were applied by many researchers who are included in the literature reviews, those were to measure the importance of the factors based on their frequency of occurrence and their impact on the project cost overrun in the company. And

the SPSS version 20 is used to compute the measurements. According to Le-Hoai et al (2008), the formula to calculate the frequency of occurrence and severity index are shown below:

A. **Frequency Index**: indicates occurrence-frequency of a factor that is responsible for cost overrun.

$$\mathbf{F.I}=\frac{\sum^{4}\mathbf{a}*\mathbf{n}}{\mathbf{4N}}$$

Where, a= constant expressing the weight assigned to each response which ranges from 1 for rarely to happen to 4 for Always.

n= frequency of the responses

N= total number of responses

B. **Severity Index**: indicates the severity of the factor that causes cost overrun.

$$\mathbf{S.I}=\frac{\sum^{4}\mathbf{a}*\mathbf{n}}{\mathbf{4N}}$$

Where, a= constant expressing the weight assigned to each response which ranges from 1 for little to 4 for extreme.

n= frequency of the responses

N= total number of responses

C. **Important Index**: the important index of each cause is calculated as a function of both frequency and severity indexes, as follows:

II== F.I*S.I

3.9 Ethical Consideration

The researcher takes into account the ethical obligations to all parties involved in the study. The researcher first gained the willingness of all respondents prior to administering the questionnaire and maintains their anonymity. In addition, the researcher ensured that the findings of the study were only used for academic purpose and also findings of the research were presented without any deviation from the outcome of the research. In addition, the researcher gave full acknowledgement to all the reference materials used in the study.

3.10 Variables used in the questionnaire

The goal of quantitative study is to examine the relationship between variables. A variable is a characteristic of interest in the research study that can take on different values. There are two types of variables dependent and independent. An independent variable is the variable

manipulated by the researcher. It affects the dependent variable. In this research the dependent variable is cost overrun. As described in the literature review, the studies in our country have identified many variables but the researcher has chosen those variables significant for the study. These variables are classified in three phases of the project which are Planning, Design, and Construction phases.

Planning phase

Poor planning, poor project risk management, wrong cost estimation technique

Inappropriate choice of site, lack of training program, poor cost control

Inaccurate estimation of a project time schedule, poor contract management, lowest bidding procurement policy

Design phase

Incomplete design at the time of tendering, poor design, frequent design change

Construction phase

Improvements to standard drawings, additional work at owner's request, poor financial control on site, currency exchange, high machinery maintenance cost, lack of adequate manpower or technical staff, number of projects going at the same time, High interest rates by bankers.

Transportation cost, cost of labor, economic instability, relationship between managers and employees, lack of experience of technical consultants, poor site management, change in scope/ scope creep, poor quality management, lack of coordination with sub-contractors, delay in progress payment, contractual claim such as, extension of time with cost claims, omissions and errors in the bills of quantities.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the results of data analysis through SPSS from the distributed 32 questioners.All questioners returned complete and the response rate of the questioner is 100%. The statistical data were entered into SPSS and analyzed by using descriptive statistical technique. The chapter begins by presenting the general background information of the respondents and then goes through the findings from questionnaire for the factors identified for the cause of project cost overrun. The response of the respondents for the frequency of occurrence and the level of severity for the cost overrun factors identified was analyzed by computing frequency and severity index and finally the major cost overrun factors for the company under study were identified by computing their importance index.

4.2 General background of the respondents

The study has distributed 32 questioners for the employees who are directly involved on projects under Mekasha Ambaw building contractor and all questioners returned complete. The respondents' age group, educational background, year of experience and their current position in the company is presented accordingly.

Table 4.1 General background of the respondents

Age	**Frequency**	**Percent**	**Valid percent**	**Cummulative percent**
<25	8	25.0	25.0	25.0
26-46	14	43.8	43.8	68.8
47-50	7	21.9	21.9	90.6
>51	3	9.4	9.4	100.0
Total	32	100.0	100.0	
Educational background				
Diploma	3	9.4	9.4	9.4
BA Degree	17	53.1	53.1	62.5
MA Degree	5	15.6	15.6	78.1
Others	7	21.9	21.9	100.0
Total	32	100.0	100.0	
Experiance				
<5	14	43.8	43.8	43.8
6-10	8	25.0	25.0	68.8
11-20	7	21.9	21.9	90.6
>21	3	9.4	9.4	100.0
Total	32	100.0	100.0	
Position				
Progect manager	9	28.1	28.1	28.1
Engineer	8	25.0	25.0	53.1
Team member	7	21.9	21.9	75.0
Other	8	25.0	25.0	100.0
Total	32	100.0	100.0	

Source: own survey 2020

Age: The majority of the respondents are in the age group of 26-46 which is fourteen, eight respondents are below 25, seven respondents under the age group 47-50 and three of them are above 51.The percentage calculation shows 43.8%, 25%, 21.9% and 9.4% respectively.

Educational background: From 32 respondents three of them are diploma holders, 17 are BA Degree, 5 of them are MA Degree holders and the remaining 7 have other background. The percentage calculation shows, 9.4%, 53.1%, 15.6% and 21.9% respectively.

Experiance: The majority of the respondents have less than five year work experience in the company which are 43.8% out of the total respondents, 25% of the respondents have 6-10 yearsof experience, 21.9% of the respondents have 11-20 years of experience and 9.4% of the respondents have above 21years of experience.

Position: Out of 32 respondents there are 9 project managers, 8 engineers, 7 project team members and 8 of them are in other positions.

Thus, demographic variables discussed above had an impact on the research topic directly or indirectly. The majority of the employees are under young age group and this shows how the company had strong work force which can affect the success of a project by affecting the level of labor productivity. Lobor productivity is among the variables which affect project cost overrun. Educational background and work experiance of employees can affect the reliability of theresearch data on the determination of factors which cause project cost overrun in that workers who had long year of work experiance and better educational background may had a better knowledge on the topic under study. Employees position in the company shows how they are close to the project and their impact to the project. In this study most of the respondents are project managers which are belived to have more knowledge in the topic under study.

4.3 Analysis interpretation and major findings

The data collected from the closed ended questionnaire were analyzed by using the formulasindicated on the previous chapter. The items which are used to measure the cost overrun factors are frequency index, severity index and important index. The frequency of occurrence were measured by using four indicators and those are 4 (Always), 3 (Often), 2(Sometimes) and 1(Rarely) and also for the degree of severity four indicators were used and those are 4(Extreme), 3(Great), 2(Moderate) and 1(Little). After calculating frequency and severity indexes, the importance of the identified factors were calculated and ranked accordingly. The research questionnaire regarding the factors for cost overrun was categorized into three phases of the project which are cost overrun factors at the planning phase, at the design phase and at the construction Phase. Their frequency and severity were calculated separately first and combined to drive their importance index and to rank them. The findings are presented briefly in the following tables.

Table 4.2 Factors identified at each phase of the project and the abbreviations used.

The researcher identified the following variablesfrom previous studies of assessment of factors causing project cost overrun in construction projectsand from different authors investigation of major cost overrun factors in the construction projects which the sources are referred in the reference part of the research. The researcher used the variables to assess how the variables are frequently occured and their level of impact on the cost of the company under study.

No	Code	Cost overrun factors at the planning phase
1	PP01	Poor planning
2	PP02	Poor project risk management
3	PP03	Wrong cost estimation tool/technique
4	PP04	Inadequate training program
5	PP05	Poor project cost management
6	PP06	Poor contract management
7	PP07	Lowest bidding procurement policy
8	PP08	Underestimating time requirement

No	Code	Cost overrun factors at the designing phase
1	DP01	Poor project design
2	DP02	Frequent design change
3	DP03	Incomplete design at the time of tendering
4	DP04	Lack of coordination
5	DP05	Delay in designing work
6	DP06	Lack of designer experience
7	DP07	Unclear specification
8	DP08	Accepting customer requests without management approval

No	Code	Cost overrun factors at the construction phase
1	CP01	Improvements to standard drawings during construction stage
2	CP02	Additional work at owner's request
3	CP03	Poor financial control on site
4	CP04	Currency exchange
5	CP05	High machinery maintenance cost
6	CP06	Lack of adequate manpower or technical staff
7	CP07	Number of projects going at the same time
8	CP08	High interest rates by bankers
9	CP09	Transportation cost
10	CP10	Cost of labor
11	CP11	Economic instability
12	CP12	Lack of experience of technical consultants
13	CP13	Poor site management
14	CP14	Change in scope/scope creep
15	CP15	Poor quality management
16	CP16	Lack of coordination with sub-contractors
17	CP17	Delay in progress payment
18	CP18	Contractual claim such as, extension of time with cost claims
19	CP19	Unpredictable weather condition
20	CP20	The rise of the price of materials
21	CP21	Complexity of the construction project
22	CP22	Poor communication with sub-contractor
23	CP23	Inappropriate choice of site
24	CP24	Theft/Corruption
25	CP25	Rework for correcting Unsatisfactory work
26	CP26	Damage of materials
27	CP27	Lack of motivated workers

Source: own survey 2020

4.3.1 Frequency index for factors causing cost overrun in the company

The frequency of occurrence for the cost overrun factors identified were calculated and ranked based on their degree of occurrence. The following table shows the computation of the frequency index for factors at each phases and their level of frequency.

Table 4.3 Frequency indexes of the identified cost overrun factors at planning, design and construction phases of the project

Variable	Frequency measurements				Total response	∑a*n	F.I	%	Rank
	4 Always	3 Often	2 Sometimes	1 Rarely					
PP01	11	9	10	2	32	93	0.726563	72.65625	2
PP02	7	9	8	8	32	79	0.6171875	61.71875	6
PP03	12	5	12	3	32	90	0.703125	70.3125	3
PP04	18	3	3	8	32	95	0.7421875	74.21875	1
PP05	3	8	5	16	32	62	0.484375	48.4375	8
PP06	8	4	4	16	32	68	0.53125	53.125	7
PP07	5	16	4	7	32	83	0.6484375	64.84375	5
PP08	4	16	8	4	32	84	0.65625	65.625	4
DP01	9	7	12	4	32	85	0.6640625	66.40625	2
DP02	4	8	12	8	32	72	0.5625	56.25	3
DP03	8	4	8	12	32	72	0.5625	56.25	3
DP04	12	4	14	2	32	90	0.703125	70.3125	1
DP05	3	5	20	4	32	71	0.5546875	55.46875	4
DP06	5	4	3	20	32	58	0.453125	45.3125	5
DP07	2	10	13	7	32	71	0.5546875	55.46875	4
DP08	4	4	4	20	32	56	0.4375	43.75	6
CP01	8	16	4	4	32	92	0.71875	71.875	11
CP02	3	4	12	13	32	61	0.4765625	47.65625	21
CP03	9	17	4	2	32	97	0.7578125	75.78125	8
CP04	5	8	15	4	32	78	0.609375	60.9375	16
CP05	12	12	4	4	32	96	0.75	75	9
CP06	5	3	16	8	32	69	0.5390625	53.90625	18
CP07	8	16	5	3	32	93	0.7265625	72.65625	10

CP08	2	4	18	8	32	64	0.5	50	20
CP09	12	12	7	1	32	99	0.7734375	77.34375	6
CP10	4	23	3	2	32	93	0.7265625	72.65625	10
CP11	9	11	10	2	32	91	0.7109375	71.09375	12
CP12	15	12	3	2	32	104	0.8125	81.25	5
CP13	9	5	14	4	32	83	0.6484375	64.84375	14
CP14	1	2	7	22	32	46	0.359375	35.9375	24
CP15	13	12	9	8	32	114	0.890625	89.0625	1
CP16	20	5	3	4	32	105	0.8203125	82.03125	4
CP17	4	23	3	2	32	93	0.7265625	72.65625	10
CP18	4	8	16	4	32	76	0.59375	59.375	17
CP19	16	11	4	1	32	106	0.828125	82.8125	3
CP20	17	11	3	1	32	108	0.84375	84.375	2
CP21	7	21	3	1	32	98	0.765625	76.5625	7
CP22	14	8	6	4	32	96	0.75	75	9
CP23	1	3	13	15	32	54	0.421875	42.1875	23
CP24	4	16	4	8	32	80	0.625	62.5	15
CP25	4	6	12	10	32	68	0.53125	53.125	19
CP26	4	16	8	4	32	84	0.65625	65.625	13
CP27	2	7	7	16	32	59	0.4609375	46.09375	22

Source: own survey 2020

In the above table, the analysis of frequency of occurrence for the factors identified are presented and ranked accordingly at each phase. At the planning phase the first factor with the highest frequency index is lack of training program 74.21%, second factor is poor planning 72.65%, the third factor is wrong cost estimation technique 70.31%, and the fourth factor is underestimating time requirement 65.62% and it continues up to factor eightas shown above. At the designing phase of the project the factor with the highest frequency index is lack of coordination 70.31%, the second factor is poor project design 66.40%, the third factors are frequent design change and incomplete design at the time of tendering 56.25% and the fourth factors are delay in designing work and unclear specification 55.46%. At the construction phase of the project 27 factors are identified and the five factors with highest frequency index are poor quality management 89.06%, the rise of the price of materials 84.37%, unpredictable weather condition 82.81%, lack

of coordination with sub-contractors 82.03% and lack of experience of technical consultants 81.25%.

4.3.2 Severity Index for factors causing cost overrun in the company

The degree of severity of the cost overrun factors were computed by applying the formula identified in chapter three and ranked based on the level of the percentage yelled. It shows the impact of the factors on the cost overrun. The following table shows the results of the analysis in detail.

Table 4.4 Severity indexes of the identified cost overrun factors at planning, design and construction phases of the project

Variable	Severity measurements				Total response	∑a*n	S.I	%	Rank
	4 Extreme	3 Great	2 Moderate	1 Little					
PP01	8	12	8	4	32	88	0.6875	68.75	2
PP02	4	12	12	4	32	80	0.625	62.5	3
PP03	8	16	4	4	32	92	0.71875	71.875	1
PP04	12	8	8	4	32	92	0.71875	71.875	1
PP05	2	6	20	4	32	70	0.546875	54.6875	5
PP06	8	8	4	12	32	76	0.59375	59.375	4
PP07	8	4	12	8	32	76	0.59375	59.375	4
PP08	12	4	12	4	32	88	0.6875	68.75	2
DP01	12	8	4	8	32	88	0.6875	68.75	2
DP02	4	16	8	4	32	84	0.65625	65.625	3
DP03	8	4	18	2	32	82	0.640625	64.0625	4
DP04	8	16	4	4	32	92	0.71875	71.875	1
DP05	4	16	4	8	32	80	0.625	62.5	5
DP06	8	12	4	8	32	84	0.65625	65.625	3
DP07	4	8	16	4	32	76	0.59375	59.375	6
DP08	4	12	4	12	32	72	0.5625	56.25	7
CP01	4	8	16	4	32	76	0.59375	59.375	8
CP02	3	8	12	9	32	69	0.5390625	53.90625	11

CP03	12	5	12	3	32	90	0.703125	70.3125	2
CP04	4	4	12	12	32	64	0.5	50	12
CP05	4	20	4	4	32	88	0.6875	68.75	3
CP06	8	12	8	4	32	88	0.6875	68.75	3
CP07	8	4	12	8	32	76	0.59375	59.375	8
CP08	4	14	6	8	32	78	0.609375	60.9375	7
CP09	4	8	16	4	32	76	0.59375	59.375	8
CP10	4	12	12	4	32	80	0.625	62.5	6
CP11	4	8	18	2	32	78	0.609375	60.9375	7
CP12	12	8	8	4	32	92	0.71875	71.875	1
CP13	8	12	8	4	32	88	0.6875	68.75	3
CP14	4	6	6	16	32	62	0.484375	48.4375	13
CP15	2	10	16	4	32	74	0.578125	57.8125	9
CP16	8	16	4	4	32	92	0.71875	71.875	1
CP17	4	12	13	3	32	81	0.6328125	63.28125	5
CP18	4	6	8	14	32	64	0.5	50	12
CP19	4	22	4	2	32	92	0.71875	71.875	1
CP20	8	10	12	2	32	88	0.6875	68.75	3
CP21	12	8	8	4	32	92	0.71875	71.875	1
CP22	12	8	8	4	32	92	0.71875	71.875	1
CP23	4	8	12	8	32	72	0.5625	56.25	10
CP24	8	12	4	8	32	84	0.65625	65.625	4
CP25	4	16	4	8	32	80	0.625	62.5	6
CP26	12	8	8	4	32	92	0.71875	71.875	1
CP27	4	16	8	4	32	84	0.65625	65.625	4

Source: own survey 2020

The severity index analysis shows, at the planning phase of the construction project the factors with highest severity are wrong cost estimation technique and lack of training program 71.87%, the second factors are poor planning and underestimating time requirement 68.75%, the third factor is poor project risk management 62.5%, the fourth factors are poor contract management

and lowest bidding procurement policy 59.37% and the fifth factor is lack of project cost management 54.68%. At the designing phase the factor with highest severity index is lack of coordination 71.87%, the second factor is poor project design 68.75%, the third factors are frequent design change and lack of designer experience 65.62%, the fourth factor is incomplete design at the time of tendering 64.06% and the fifth factor is delay in designing work 62.5%. At the construction phase the factors with the highest severity index are lack of experience of technical consultants, lack of coordination with sub-contractors, unpredictable weather condition, complexity of the construction project, poor communication with sub-contractors and damage of materials 71.87%, the second factor is poor financial control on site 70.31%, the third factors are high machinery maintenance cost, lack of adequate man power, poor site management and the rise of the price of materials 68.75%, the fourth factors are theft/corruption and lack of motivated workers 65.62% and the fifth factor is delay in progress payment 63.28%.

4.3.3 Importance Index for factors causing cost overrun in the company

The importance index identifies the major cost overrun factors by identifying the most frequent and the most sever factor since, it is the product of the two indexes. The table below presents the percentage calculations of the importance indexes of the factors at each phase and the rank given to them.

Table 4.5 Importance indexes of the identified cost overrun factors at planning, design and construction phases of the project

Variable	F.I	S.I	II%	Rank
PP01	0.726563	0.6875	49.951206	3
PP02	0.6171875	0.625	38.574219	5
PP03	0.703125	0.71875	50.537109	2
PP04	0.7421875	0.71875	53.344727	1
PP05	0.484375	0.546875	26.489258	8
PP06	0.53125	0.59375	31.542969	7
PP07	0.6484375	0.59375	38.500977	6
PP08	0.65625	0.6875	45.117188	4
DP01	0.6640625	0.6875	45.654297	2
DP02	0.5625	0.65625	36.914062	3
DP03	0.5625	0.640625	36.035156	4
DP04	0.703125	0.71875	50.537109	1
DP05	0.5546875	0.625	34.667969	5
DP06	0.453125	0.65625	29.736328	7
DP07	0.5546875	0.59375	32.93457	6
DP08	0.4375	0.5625	24.609375	8
CP01	0.71875	0.59375	42.675781	17
CP02	0.4765625	0.5390625	25.689697	24
CP03	0.7578125	0.703125	53.283691	7
CP04	0.609375	0.5	30.46875	21
CP05	0.75	0.6875	51.5625	8
CP06	0.5390625	0.6875	37.060547	19
CP07	0.7265625	0.59375	43.139648	16
CP08	0.5	0.609375	30.46875	21
CP09	0.7734375	0.59375	45.922852	12
CP10	0.7265625	0.625	45.410156	13
CP11	0.7109375	0.609375	43.322754	15
CP12	0.8125	0.71875	58.398438	3
CP13	0.6484375	0.6875	44.580078	14
CP14	0.359375	0.484375	17.407227	26
CP15	0.890625	0.578125	51.489258	9
CP16	0.8203125	0.71875	58.959961	2
CP17	0.7265625	0.6328125	45.977783	11
CP18	0.59375	0.5	29.6875	23
CP19	0.828125	0.71875	59.521484	1
CP20	0.84375	0.6875	58.007812	4
CP21	0.765625	0.71875	55.029297	5
CP22	0.75	0.71875	53.90625	6
CP23	0.421875	0.5625	23.730469	25
CP24	0.625	0.65625	41.015625	18
CP25	0.53125	0.625	33.203125	20
CP26	0.65625	0.71875	47.167969	10
CP27	0.4609375	0.65625	30.249023	22

Source: own survey 2020

At the planning phase the factor with the highest level of importance index is lack of training program 53.34%, the second is wrong cost estimation technique 50.53%, the third factor is poor planning 49.95%, the fourth factor is underestimating time requirement 45.12% and the fifth factor is poor project risk management 38.57%. At the designing phase of the project the factor with highest importance index is lack of coordination 50.53%, the second factor is poor project design 45.65%, the third factor is frequent design change 36.91%, the fourth factor is incomplete design at the time of tendering 36.03% and the fifth factor is delay in designing work 34.66%. Atthe construction phase of the project the factor which has the highest level of importance index is unpredictable weather condition 59.52%, the second factor is lack of coordination with sub-contractors 58.95%, the third factor is lack of experience of technical consultants 58.39%, the fourth factor is the rise of price of materials 58.01% and the fifth factor is complexity of the construction project 55.03%.

Table 4.6 Top 20 significant factors causing project cost overrun in the company

No	Code	Factors causing project cost overrun	II%
1	CP19	Unpredictable weather condition	59.521484
2	CP16	Lack of coordination with sub-contractors	58.959961
3	CP12	Lack of experience of technical consultants	58.398438
4	CP20	The rise of the price of materials	58.007812
5	CP21	Complexity of the construction project	55.029297
6	CP22	Poor communication with sub-contractor	53.90625
7	PP04	Inadequate training program	53.344727
8	CP03	Poor financial control on site	53.283691
9	CP05	High machinery maintenance cost	51.5625
10	CP15	Poor quality management	51.489258
11	DP04	Lack of coordination	50.537109
12	PP03	Wrong cost estimation tool/technique	50.537109
13	PP01	Poor planning	49.951206
14	CP26	Damage of materials	47.167969
15	CP17	Delay in progress payment	45.977783
16	CP09	Transportation cost	45.922852
17	DP01	Poor project design	45.654297
18	CP10	Cost of labor	45.410156
19	PP08	Underestimating time requirement	45.117188
20	CP13	Poor site management	44.580078

Source: own survey 2020

The above table shows the top 20 most important factors that are ranked based on their level importance index (II %) and the first six most important factors causing project cost overrun for the contractor company are from the construction phase of the project which are, unpredictable weather condition 59.52%, lack of coordination with sub-contractors 58.95%, lack of experience of technical consultants 58.39%, the rise of the price of materials 58.01%, complexity of the construction project 55.03%, and poor communication with sub-contractor 53.91%. the seventh important factor is from the planning phase of the project which is inadequate training program 53.34%. From the top 20 factors identified, about 14 project cost overrun factors emerge during the construction phase of the project. This implies most of the project cost overrun factors arise during construction phase for the company under study.

Major findings

Unpredictable weather condition , lack of coordination with sub-contractors, lack of experience of technical consultants, the rise of price of materials, complexity of the construction project, poor communication with sub-contractors and inadequate training program are factors with high importance index. The frequency index analysis showed that among the cost overrun factors under each phase of the construction project the most frequent factors are poor quality management, the rise of price of materials, unpredictable weather condition, lack of coordination with sub-contractors, lack of experience of technical consultants, lack of training program and poor planning. The severity index analysis showed that among the cost overrun factors under each phase of the construction project the most sever factors are wrong cost estimation technique, lack of training program, lack of coordination, lack of experience of technical consultants, lack of coordination with sub-contractors, unpredictable weather condition, complexity of the construction project, poor communication with sub-contractors and damage of materials.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The main objective of this study was to identify factors causing project cost overrun in the construction sector in case of Mekasha Ambaw building contractor. The study approach was descriptive and it used quantitative method of data collection through questionnaire. Those data from the questionnaire were analyzed through descriptive analysis by applying SPSS. The frequency of occurrence, degree of severity and finally the importance of the cost overrun factors were analyzed and ranked based on their level of frequency, severity and importance indexes.

The cost overrun factors identified in the questionnaire are 43 totally and further divided in to three sub-categories i.e. factors which exist at the planning phase, design phase and construction phase of a project. The finding showed that most of the cost overrun factors are arising from the construction phase of the project. This chapter will try to give conclusion and recommendation based on the findings.

5.2 Conclusions

Based on the findings and analysis of the study the following conclusions were drawn on the factors causing project cost overrun. As indicated in the previous chapter, the company's most significant factors causing the project cost overrun comes from the construction phase of the project.

The findings showed that the three measurements, frequency, severity and importance are related in that factors which have high frequency and severity indexes have high importance index, since importance index is the product of the two.

There are other parties who are responsible for the cause of project cost overrun but the contractor is the most responsible person that the major activities of the construction project including purchasing of construction materials is undertaken by the contractor.

In the open ended part of the questionnaire respondents mention other cost overrun factors like poor supply of water and electricity, poor labor productivity, machinery damage and leader ship behavior of managers. As they describe, all these factors are interrelated and leads to project time

overrun that the contractor cannot accomplish the project work within a specified time and the contractor is obliged to incur additional cost beyond the initial contract amount due to the rise of price of materials. Thus, most of the time the contract made between the client and the contractor is fixed in nature and the burden of cost overrun falls on the contractor.

5.3 Recommendations

Based on the findings the researcher suggests the following recommendations to the parties concerned:

- The company is recommended to employ experienced technical consultants in order to minimize the cost incurred to rework of unsatisfactory work which is a result of poor quality management.
- The project manager is recommended to be wise in his/her leadership style in order to create good coordination and communication with sub-contractors and the employees of the company. Coordination and good communication between the parties involved in the project creates a good working environment that motivates to a better work and can minimize the complexity of the construction project.
- The use of wrong cost estimation technique is a result of inadequate training program and thus a company is recommended to hire a person who had better knowledge in the area and provide a training program as necessarily. Wrong cost estimation may result in cost underestimation during a project initiation and this results the difference in planned and actual costs incurred. This implies cost overrun to the company. Providing adequate training program is also essential to improve the capacity and productivity of the labor force.
- A construction project cannot be constructed and facilitated without adequate supply of water and electricity. Inadequate supply of water and electricity creates a difficulty of completion of the project in a specified time. Since construction sector is a country's biggest sector, the government is recommended to solve the problem of water and electricity fluctuations.
- Unpredictable weather conditions, the rise of the price of materials and damage of materials are factors beyond the control of the company but can be minimized in some extent. The rise of price of materials are more sever if the project is not completed within

a specified time and by dealing with the problems specified above which are, lack of coordination and communication with sub-contractors, inadequate training program, wrong cost estimation technique, lack of experienced technical consultants and other factors mentioned in the findings, the company can better complete the project within a specified time. By doing so the effects of material damage, unpredictable weather conditions and the rise of the price of materials can be minimized.

- The company is recommended to plan properly before the beginning of any activity. Good planning enables the company to predict the future well, and to know how and where to go.
- Finally it is recommended to other researchers to investigate on how to solve cost overrun problems by dealing with the major cost overrun factors identified in this study.

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Appendix

Addis Ababa University

College of Business and Economics

School of Commerce

MA in Project Management

Factors causing project cost overrun in construction sector: in case of Mekasha Ambaw building contractor (Questionnaire)

Dear Sir/Madam,

My name is Hanna Amser, a graduate student of Addis Ababa University. I am conducting a research about *"Factors causing project cost overrun in construction sector in case of Mekasha Ambaw building contractor",* which I had chosen as a topic to conduct research on it for my master's thesis.

The main objective of this research is to identify factors which are causing the project cost overrun in the company and to provide recommendation based on the findings. The questionnaire has two parts. Part one is about the general background of the respondent and part two is about the factors contributing to the project cost overrun by their frequency of occurrence and degree of severity. At the end there is space provided to write additional factors if you have any.

I kindly invite you to be a part of this research and request you to assist me in completing the brief questionnaire. I would kindly request your participation, and cooperation of your construction personnel and project managers in providing the required information in the questionnaire.

The information provided will only be used for research on an academic purpose. Your kind assistance in this regard is highly appreciated. Thank You for your time and attention. I look forward to hearing from you,

Yours Sincerely,

Hanna Amser

Post graduate student, Project Management

Addis Ababa University Tel: 0926970300

Advisor: Teklegiorgis Assefa (Asst.prof)

Questionnaire Section 1: General Background Information

Please thick on only one box from the given alternatives.

1. Age of the respondent

Below 25 ☐ 47-50 ☐

26-46 ☐ Above 50 ☐

2. Educational background

Diploma ☐ Master Degree ☐

BA Degree ☐ Ot ☐

3. Year of experience in the company

Below 5 years ☐ 11-20 ☐

6-10 years ☐ e 21 ☐

4. Your position in the company

Project manager ☐ Engineer ☐

Project team member ☐ other ☐

Questionnaire Section2: Factors contributing to the project cost overrun in the company, their frequency of occurrence and degree of severity.

A. Assessment of frequency of occurrence

The given numbers indicate the following

4- Always 3- Often 2- Sometimes 1- Rarely

B. For the degree of severity

The given number indicates the following

4- Extreme 3- Great 2- Moderate 1- Little

No	Factors causing cost overrun	Frequency of occurrence				Degree of Severity			
		4	3	2	1	4	3	2	1
	Planning Phase								
1	Poor planning								
2	Poor project risk management								
3	Wrong cost estimation tool/techniques								
4	Lack of training program								
5	Lack of project cost management								
6	Poor contract management								
7	Lowest bidding procurement policy								
8	Underestimating time requirement								
	Design Phase								
1	Poor project design								
2	Frequent design change								
3	Incomplete design at the time of tendering								
4	Lack of coordination								
5	Delay in designing work								
6	Lack of designer experience								
7	Unclear specification								

8	Accepting customer requests without management approval								
	Construction Phase								
1	Improvements to standard drawings during construction stage								
2	Additional work at owner's request								
3	Poor financial control on site								
4	Currency exchange								
		Frequency of Occurrence				Degree of Impact			
No	**Construction Phase**	4	3	2	1	4	3	2	1
5	High machinery maintenance cost								
6	Lack of adequate manpower or technical staff								
7	Number of projects going at the same time								
8	High interest rates by bankers								
9	Transportation cost								
10	Cost of labor								
11	Economic instability								
12	Lack of experience of technical consultants								
13	Poor site management								
14	Change in scope/ scope creep								
15	Poor quality management								
16	Lack of coordination with sub-contractor								
17	Delay in progress payment								
18	Contractual claim such as, extension of time with cost claims								
19	Unpredictable weather condition								
20	The rise of price of materials								
21	Complexity of the construction project								
22	Poor communication with sub-contractors								

23	Inappropriate choice of site								
24	Theft/ Corruption								
25	Rework for correcting unsatisfactory work								
26	Damage of materials								
27	Lack of motivated workers								

1. Is there any other factor which cause cost overrun? If so, please mention them in the space provided below.