College of Graduate Studies

Department of Construction Technology and Management

Analysis Of Causes And Effects of Cost Overrun on Public Building Construction in The Case Of Dukem Administration Projects

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A Thesis Submitted to Addis College, School of Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Master of Science in Construction Technology and Management

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CERTIFICATE OF APPROVAL

This is to certify that the thesis prepared by Henok Tsegaye Anullo, entitled: "**Analysis of Causes and Effects of Cost Overrun on Public Building Construction in The Case of Dukem Administration Projects"** and submitted in partial fulfillment of the requirements for the Degree of Masters of Construction Technology and Management complies with the regulations of the College and meets the accepted standards with respect to originality and quality.

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DECLARATION

I, Henok Tsegaye Anullo, the under signed, declare that this thesis entitled:" **Analysis of Causes and Effects of Cost Overrun on Public Building Construction in The Case of Dukem Administration Projects"** is my original work. I have undertaken the research work independently with the guidance and support of the research supervisor. This study has not been submitted for any degree or diploma program in this or any other institutions and that all sources of materials used for the thesis has been duly acknowledged.

_____	_____	_____
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STATEMENT OF CERTIFICATION

I hereby certify that the thesis entitled *" Analysis of Causes and Effects of Cost Overrun on Public Building Construction in The Case of Dukem city Administration Projects ",* submitted by Mr. Henok Tsegaye Anullo in partial fulfillment of the requirements for the degree of Master of Science in Construction and Technology Management, under the Postgraduate Studies program at Addis College, is a result of original research conducted under my supervision and guidance.

Having thoroughly reviewed the thesis, I confirm that it is ready for defense and meets the necessary academic standards

_____	_____	_____
Name of Advisor	Signature	Date

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Henok Tsegaye

ABSTRACT

Cost overruns in public building construction projects remain a critical challenge in Ethiopia, particularly in rapidly developing urban areas like Dukem City. This study investigates the causes, effects, and potential remedies for these overruns in selected construction projects under the Dukem City Administration. Using a mixed-methods approach with structured questionnaires and document analysis, the research found that the most significant causes of cost overruns are inadequate project preparation, planning deficiencies, and material cost fluctuations. Specifically, incomplete tender documents and poor design coordination contribute to budget escalations in the design phase, while material price volatility, errors in bills of quantities, and delays in variation approvals are key factors during the construction phase. The completion phase is most affected by disputes, design failures, and poor workmanship, which lead to project delays and supplementary agreements. The study identifies delayed payments, budget shortfalls, and stakeholder dissatisfaction as the primary effects of cost overruns, while noting that professional collaboration generally remains intact. To mitigate these issues, the research recommends enhanced preconstruction planning, the use of standardized design checklists, and the appointment of experienced consultants. It also suggests critical measures for the construction phase, such as timely material supply and efficient variation management, as well as prompt dispute resolution and robust quality assurance for the completion phase. The study proposes the creation of a dedicated cost control task force and localized material price indices, offering actionable recommendations for policymakers, contractors, and consultants to improve cost management in Ethiopia's public construction sector.

Keywords: Cost overrun, public construction projects, Dukem City, Material price fluctuation, Dispute resolution, Project planning.

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ABBREVIATIONS

GDP	Gross domestic product
MIS	Mean item score
Qs	Questionnaire survey
MoWUD	Minister of work and urban development

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The construction industry is a vital driver of economic growth in many countries, contributing significantly to national GDP and employment (Takim, 2005; Olawale, 2010; Gomez, 2012). Ethiopia, in particular, has experienced remarkable economic expansion in recent years – averaging around 10.9% annual GDP growth over a decade (UNDP, 2014) – accompanied by a rapid rise in construction activities. The construction sector in Ethiopia grew at roughly 12.4% per year in the past decade, reaching about 5.3% of the country's GDP (ECIDP, 2014, as cited by Zinabu & Getachew, 2015). Public construction projects form a large component of this sector and consume a substantial portion of the national budget (nearly 60% of the government's capital budget according to MoWUD, 2006 and Wubishet, 2004, as cited in Nega, 2008). This growth and investment in construction underscore the sector's importance, but they also bring to light persistent challenges such as project cost overruns.

Cost overrun — often termed "cost increase" or "budget overrun" — refers to the excess of actual project cost over the initial estimated cost or contract amount agreed at the tender stage (Endut et al., 2005; Koushki et al., 2005; Zhu & Lin, 2004). It is typically expressed as a percentage increase beyond the original contract sum (Jackson, 1999, as cited in Monyane, 2013). Cost overruns are a common phenomenon worldwide and have become a major concern in the construction industry. They reduce the economic competitiveness of projects and can squander scarce financial resources, especially in the public sector. In Ethiopia and other developing countries, the problem of construction cost overruns is particularly acute in public projects, which often suffer from budget escalations and funding shortfalls.

Construction projects face numerous challenges throughout their lifecycle, from planning and design through implementation. Identifying these challenges and implementing preventative measures are crucial for achieving project objectives (Ferew, 2015). A recurring challenge in developing countries is the chronic occurrence of construction cost overruns (Chimwaso, 2001). Even under fixed-price contracts, unforeseen factors such as provisional works, price fluctuations, and variation orders can lead to additional costs (Chimwaso, 2001). Common issues contributing to cost overruns include poor project planning, resource and materials shortages, delays in material delivery, waste and inefficiency, and lapses in project management and control (Santosh et al., 2016). These issues often result in project delays, budget overruns, and conflicts among stakeholders. Owing to such complexities and

uncertainties – ranging from technical factors and resource constraints to economic and environmental conditions – very few construction projects are completed within their initial budget in practice. This situation highlights the need for effective cost control techniques and rigorous project management to minimize cost overruns and ensure project success.

In rapidly growing urban areas like Dukem City (in Ethiopia's Oromia region), cost overrun problems have become a pressing concern for public construction projects. Dukem City Administration has initiated multiple public building projects as part of the city's development efforts, and these projects have not been immune to the cost escalation issues seen elsewhere. The foregoing background illustrates the importance of the construction sector and the prevalence of cost overruns, thereby setting the stage for this study. In 1 light of the sector's significance and challenges, the present research focuses on analyzing the causes and effects of cost overruns in public building construction projects under the Dukem City Administration.

1.2. Research Problem Statement

The basic goal in any industry is to achieve the completion of project within time and stipulated budget. It is the same with construction industry. The construction industry being one of the most complex, fragmented, schedule and resource driven industry, is always facing serious problems like low productivity, low quality, delay, cost overrun etc. (Memon *et al*, 2011).

The Construction Industry plays an important role in the development of a country through the delivery of projects and other related activities that generate income for individuals and firms. Projects will be successful if major factors for cost overrun are identified and examined beforehand. It will benefit the industry to identify those causes that are common in the public sector since literature has indicated that they are severe in public sectors in the developing countries. To better understand the occurrence of cost overrun professionals should indicate their awareness of the frequency of occurrence of the cost overrun in the public building projects. The literature is dense with examples of performance related problems that incur cost overruns in construction. In essence, the assumed problem statement for this study states that "*public building projects are experiencing cost overruns that create a myriad of problems in Dukem city Administration projects".* To resolve this problem, three questions were formulated to act as guideline for this research. The questions include:

1. What are the major causes of construction cost overruns and what are the effective remedial

measures to be applied in Dukem City Administration construction Projects?

2. Which causes of cost overruns are prevalent in the study area?
3. Does the cost overrun constitute a performance problem or other problem for the Projects in the Study areas?

George Jarfas (2010) notes that there is no single cause for cost and schedule overruns on construction and engineering projects. Although some of the factors may seem to be insignificant on one project, they may prove to be significant on another project, as the conditions of project are not always the same. It appears that there will always be a need for debate and further research because of the chronic problem of construction cost overruns (Kasimu, 2012) [as cited by Subramani *et al*, (2014)]. The identification of the cost related risks, underlying drivers and impediments for effective management must be assessed in the contexts of three key stakeholders, namely clients, contractors and consultants (Doloi, 2012).

1.3. Objectives of the Research

1.3.1. The General Objectives of the Study

The general objective of this research is to investigate the issues of construction cost overruns in public building projects under the Dukem City Administration, with the view to understanding their cause and effects. In line with this general aim, the study has several specific Objective.

1.3.2. The Specific Objectives of the Study

1. Identify and examine the main causes of cost overruns in public building construction projects in Dukem city administration construction projects.
2. Assess the major effects of cost overruns on the performance and delivery of public building construction projects in the study area.
3. Determine the most significant or dominant factors contributing to cost overruns in Dukem City's public construction projects (i.e., identify which causes are most frequent or severe).
4. Identify the critical stages of the project life cycle where cost overruns most commonly occur in these projects, in order to understand at what project phase(s) interventions are most needed.

By achieving the above objectives, the research will provide a comprehensive understanding of the cost overrun phenomenon in the context of the selected public construction projects in Dukem City and lay the groundwork for developing strategies to mitigate these overruns.

1.4. Significance of the Study

The research attempts to provide stakeholders in Dukem city with a broader understanding of the causes of cost overruns. It provides the Dukem City Administration (as the client for public projects), contractors, consultants, and other industry professionals with a deeper understanding of the root causes of cost overruns in public building projects. The study highlights ways construction professionals can implement cost control measures to prevent cost overruns. The study will focus on challenges faced by the client , which in this case is the Dukem City Administration (a government entity). The findings on the effects of cost overruns also emphasize the implications of poor cost performance, thereby underlining the importance of proactive cost management. It also focuses on industry professionals and contractors involved in the city Administration construction Projects. The effective cost control measures for government development projects are a prerequisite for the successful completion of such projects, which are vital for the country's socio-economic advancement.

For the Dukem City Administration and policymakers, insights from this study can inform better project planning and procurement practices, ensuring that limited public funds are used more efficiently. For contractors and consultants, understanding the major causes of overruns (such as planning short comings or resource management issues) can guide improvements in project management practices. Effective cost control in government-funded construction projects is crucial for the successful completion of these projects and for delivering infrastructure that supports socio-economic development.

Generally, the study's significance lies in its potential to improve cost performance in public construction projects, contributing to more successful project outcomes and better utilization of public resources in Ethiopia's construction sector.

1.5. Scope of the Study

The scope of the research is mainly to focus on the literature review and a questionnaire survey. The questionnaire survey was designed based on the causes and effect of cost overrun on Dukem city B+G+6 building and Conference Hall construction projects. Other infrastructure construction projects are not part of this study. Cost growth, cost changes, variations and cost overrun are considered to have the same meaning for the purpose of this research and may be defined as the difference between the final cost and the initial budget when the decision to build was taken. Let's define the different scopes of the study:

- ✓ **Thematic Scope:** This research is thematically focused on construction project cost management, specifically, the causes and effects of cost overruns. It addresses cost overrun issues in the area of public building construction projects. The study investigates which factors lead projects to exceed their budgets and what consequences arise as a result. In examining these issues, the emphasis is on identifying key cause-and-effect relationships that affect project cost performance.
- ✓ **Geographic Scope:** Geographically, the study is confined to construction projects under the Dukem City Administration in Ethiopia. Dukem City, a rapidly developing area in the Oromia region, is the area of the research. The projects examined are public building projects initiated or managed by the Dukem City Administration. Specifically, the study focuses on two notable projects in the city: a multi-storey building (with basement + ground floor + six stories, i.e., B+G+6) and a public conference hall. These projects were selected as representative cases of public building construction efforts in the area. Other locations are not covered, as the intent is to understand deeply the local context of Dukem City.
- ✓ **Temporal Scope:** In terms of timeframe, the study covers data and events within the period of June 2024 to May 2025. This roughly one-year period corresponds to when the research was conducted, including the administration of surveys and the collection of project data. The projects under study were active during this timeframe, allowing observation of cost performance and outcomes. It should be noted that the study's findings are contextual to this time period; any significant changes in the economic or policy environment after this period fall outside the scope of the research.

Furthermore, for the purposes of this research, terms like *cost growth*, *cost increase*, and *budget overrun* are used interchangeably with *cost overrun*. All these terms are defined as the difference between a project's final actual cost and its initially budgeted or contracted cost. The study adopts this definition consistently when analyzing project cost performance.

1.6. Limitation of the Study

Like any research, this study encountered certain limitations. The research was conducted over a one-year period (June 2024 to May 2025) and focused on two selected public building projects within the Dukem City Administration. As a result of this narrow project sample, the findings are context-specific and may not be directly generalizable to all other settings or project types.

Practical challenges were also faced during data collection. There was limited accessibility to some key stakeholders involved in the projects, which constrained the extent of qualitative data. In particular, some contractors and officials were reluctant to participate in the questionnaire survey or interviews, limiting the data on their perspectives. These conditions meant that the study had to rely on the available respondents and documentation, which might not capture every aspect of the cost management processes in the projects.

Despite these limitations, the data collected were sufficient to meet the study objectives, and careful measures were taken to validate and cross-check information (for example, by comparing survey responses with project financial records where available). The limitations are acknowledged so that the findings can be interpreted with appropriate caution, and they also point to areas for future research beyond this study's scope.

1.7. Overview of the research process and study

Chapter I: Introduction to the study. This provides a general to the study, statement of the problem, objectives, and significance of the study, limitations and scope of the study and the contents of the research. This chapter establishes the context and rationale for investigating cost overruns in Dukem City's public construction projects.

Chapter II: Literature Review. The chapter discusses theories relevant to the study and provides literature previously done by other researcher on cause and effect of cost overrun on public building construction projects. This chapter provides a theoretical foundation and situates the study within the existing body of knowledge, covering general concepts of construction cost management, classifications of costs, stakeholder roles, common causes of cost overruns, and their impacts on project performance.

Chapter III: Research Methodology. This chapter discusses the research design, population and sample size, data collection methods (such as questionary and interviews) and analyses that would have been used in the research. This chapter justifies the methodological choices and explains how the study was conducted

to achieve the stated objectives.

Chapter IV: This chapter presents the findings of the study and provides an analysis of those results in relation to the research questions and objectives. It includes the identified causes of cost overruns in the Dukem City projects, the observed effects of those overruns, and an examination of which factors were most significant. The results are discussed and interpreted, with comparisons to insights from the literature review to highlight consistencies or discrepancies with earlier studies.

Chapter V: Concludes the thesis by summarizing the key findings and drawing conclusions about the causes and effects of cost overruns in the studied 4projects. Based on these conclusions, the chapter offers practical recommendations for various stakeholders (such as the Dukem City Administration, contractors, and policymakers) on how to mitigate cost overruns in future projects. It also suggests areas for further research and reflects on how the findings contribute to the broader understanding of cost management in construction.

Generally: Through this organized structure, the thesis systematically addresses the research problem from introduction to conclusion, ensuring that the reader can follow the development of the study and understand how the conclusions were reached. The overall aim is to provide a coherent and comprehensive examination of construction cost overruns in the case of Dukem City's public building projects, thereby contributing valuable insights for both academia and construction industry.

CHAPTER TWO: LITERATURE REVIEW

This Chapter presents a literature review on construction cost overrun, covering key sections such as General Concepts**,** Definitions**,** Classification of Construction Cost**,** The Role of Construction Stakeholders**,** Cost Management**,** Causes of Cost Overrun**,** and Effects of Cost Overrun**.** It outlines how poor planning, inaccurate estimates, and design issues contribute to cost overruns, while stressing the importance of proper management and stakeholder coordination to minimize their negative impact on timelines, budgets, and project outcomes.

2.1 General

A "construction project" is a high value, time bound, special construction mission of creating a construction facility or service, with predetermined performance objectives defined in terms of quality specification, completion time, budgeted cost and other specified constraints (Chitkara, 2011). In simple terms, every construction project must balance scope, time, cost, as well as quality and resources, to be considered successful. These elements are often referred to as the project management "constraints," and they are closely interrelated – if one factor changes, it will likely affect the others. For example, if the project scope (the amount of work or its specifications) is fixed and cannot change, then any unexpected issues must be managed by adjusting the time or cost. Similarly, maintaining a high-quality standard might require more resources or time, which can increase the cost if not carefully controlled. As Chitkara (2011) emphasized, keeping these parameters in balance is challenging but essential for efficient and effective project delivery. When one aspect, like cost, is not managed in harmony with time and scope, the project can face overruns that threaten its success. This is why cost is considered one of the most critical parameters – because going over budget can undermine all other project goals. In construction, cost performance is often a primary measure of project success or failure, and stakeholders are very sensitive to any overruns because of their financial impact. If costs escalate beyond what was planned, the project owner's objectives are at risk, and the contractor's profit margin can disappear quickly. In fact, even a small additional cost beyond the budget can wipe out the expected profit of a construction job, especially in highly competitive markets with tight profit margins. As Akinci and Fischer (1998) pointed out, repeated or significant cost overruns can threaten the financial stability of construction firms, potentially even leading to bankruptcy if not addressed. This underlines how vital it is for project managers and stakeholders to monitor and control costs

throughout a project's life cycle.

Cost is one of the five main parameters that can sufficiently define a construction project. Other parameters are scope, quality, resources and completion time. The five parameters are interactive, that is, each parameter is a function of other. The evaluation and balancing of interrelationship among the five project parameters are a complicated process. However, in a given project, the scope and quality of work in terms of quantity and specifications are specified and these parameters are not subjected to change (unless scope changes substantially). Resources and costs are co-related. Therefore, for a given quality, in such situation, time, cost and scope are core parameters. These parameters are interlinked and must be kept in balance to achieve project objective efficiently and effectively within changing environments (Chitkara, 2011).Nowadays, even a marginal cost overburden can sweep away the profit of a job, and continuous cost overburdens in most of the projects of a firm can lead to bankruptcy (Akinci & Fischer, 1998). Organizations face a major challenge in controlling project budgets over the time span between project initiation and the completion of construction. The development of cost estimates that accurately reflect project scope, economic conditions, and are attuned to community interest and the macroeconomic conditions provide a baseline cost that management can use to impart discipline into the design process. Projects can be delivered on 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 relevant factors and causes that lead to cost overrun [as cited by Subramani *et al*, (2014)].

It is not uncommon to see construction projects failing to achieve their mission of creating facilities within the specified cost and time. Very few projects are completed on time and within budget since construction projects are exposed to uncertain environments because of such factors as construction complexity; presence of various interest groups such as the project owners, end users, consultants, contractors, financiers; materials, equipment, project funding; climatic environment; the economic and political environment and statutory regulations. (Nega, 2008)

Cost overruns – where the actual spending exceeds the budgeted cost – are unfortunately very common in construction projects worldwide. Studies have shown that the majority of projects end up costing more than initially planned. For instance, research on large projects by Flyvbjerg et al. found that on average nine out of ten projects globally experience cost overrunirbnet.de. This means that it is almost expected that a given project will face some degree of budget escalation. There are many famous

examples illustrating this problem. A classic case is the Sydney Opera House in Australia, which is often cited as having one of the most notorious cost overruns and schedule delays in history. It was originally estimated in 1957 to cost about A$7 million and to be completed by 1963. In reality, the Opera House was not finished until 1973 and ultimately cost around A$102 million – approximately 14 times the original budget. Such extreme cases show how a project's costs can spiral far beyond initial expectations, especially when there are design changes, technical difficulties, or other unforeseen challenges. While not all projects have overruns of that magnitude, even moderate overruns are cause for concern. They represent inefficient use of resources and can diminish the value and benefits of the investment. In many developing countries, cost overruns are particularly problematic because resources are limited. Money lost to an over-budget project could have been used for other critical needs. Thus, controlling costs isn't just about individual project success – it's also about broader economic and social impacts.

In the context of Ethiopia, cost overrun in construction is recognized as a serious and prevalent issue. The country has been experiencing a growing number of public building projects as urbanization and development accelerate. However, many of these projects struggle to stay within their allocated budgets and timelines. According to Nega (2008), who studied public building construction projects in Ethiopia, completing projects within the planned cost is a frequent challenge. Given the scarce financial resources of the country, any waste of funds due to cost overruns is very concerning, and cost overrun has become one of the major problems in the Ethiopian construction industry. In Nega's research on 70 public building projects across Ethiopia, an alarming 95.7% of them ended up exceeding their initial cost estimates. In other words, 67 out of 70 projects surveyed had a cost overrun to some extent. This indicates that cost overruns are almost the norm rather than the exception in the local context. The extent of these overruns was also significant – the additional costs ranged from very minimal in some cases (0%) to as high as 126% of the contract amount in the worst case. An overrun of 126% means that a project more than doubled its expected budget by completion, which can be devastating for project owners and financiers. Such statistics highlight the gravity of the issue: if left unchecked, cost overruns can lead to incomplete projects, wasted public funds, or the need for emergency financing to cover the extra costs. This is especially problematic for public projects in Ethiopia because the government's development budget is limited, and overruns can divert money away from other public services or infrastructure initiatives. When projects require more money than planned, it often results in either delays while additional funds are secured or a reduction in project

scope/quality to cut costs – both of which are undesirable outcomes.

There are multiple reasons why construction projects in Ethiopia (and elsewhere) run over budget. Many of these causes align with global findings, but some have particular relevance to the local context. One major factor is inflation and the rising cost of materials. Ethiopia, like many developing countries, can experience fluctuations in the price of construction materials (such as cement, steel, etc.), sometimes due to inflation or changes in foreign exchange rates for imported goods. These price increases can significantly drive-up project costs beyond what was estimated if they occur after the budget is set. In Nega's study, inflation or increases in material costs were identified as the most important cause of cost overrun in Ethiopian public building projects. Another critical factor is poor planning and coordination. If a project is not planned well from the start – for example, if cost estimates are not done accurately, or if the project schedule is unrealistic – it is much more likely to face overruns. Poor coordination among stakeholders (clients, consultants, and contractors) can lead to misunderstandings or delays that eventually increase costs. Nega's research also highlighted issues like change orders (modifications to the project scope or design during construction) as a significant contributor to cost overruns in Ethiopia. Often, clients may request enhancements or changes once construction is underway, or unforeseen conditions might force changes; these changes usually come with extra costs. Additionally, excess quantity or inaccuracies in quantity estimation can cause overruns – if the project ends up needing more materials or work than initially accounted for, costs will naturally rise. All these factors show that both technical issues (like inaccurate estimates or design changes) and external economic conditions (like inflation) play a role in driving project costs beyond the plan.

Because of these challenges, controlling construction costs from start to finish is a major challenge for project stakeholders. The longer the duration of a project, the more exposure it has to risks like price inflation, scope changes, or unforeseen events, meaning the budget set at the beginning can become outdated by the end. Organizations and project managers must be vigilant throughout the project life cycle – from the initial feasibility study and design stage, through procurement and into construction – to keep costs in line. A key step is developing reliable cost estimates at the very outset. If the initial budget is unrealistic or too optimistic, the project is almost guaranteed to overrun. Shane et al. (2009) stress that delivering projects on budget requires a good starting estimate and strong project management discipline to stick to that budget. This involves considering all known factors and macroeconomic conditions (like market prices, currency exchange, etc.) when estimating costs, and

also setting aside contingencies for unexpected issues. During execution, cost management means regularly tracking expenses, managing changes carefully, and making adjustments as needed to prevent small deviations from ballooning into large overruns. Effective coordination among stakeholders is also crucial; for example, consultants need to design within the client's budget and contractors need to manage resources efficiently. When everyone communicates well and monitors progress, potential cost issues can be identified early and corrective actions taken. Moreover, awareness of common cost escalation factors – such as those identified by studies (e.g. inflation, delays, changes) – can help practitioners mitigate these issues. As Subramani et al. (2014) noted, understanding the root causes of cost overruns is necessary in order to develop strategies to avoid them. By identifying the typical factors that lead to cost increases, project teams in Ethiopia and elsewhere can focus on risk management plans to address those specific areas (for instance, locking in material prices through contracts to combat inflation, or improving design planning to reduce change orders). In summary, cost overruns are a pervasive problem in construction projects, but with careful planning, continuous management, and by learning from past projects (both locally and globally), stakeholders can improve the chances of delivering projects within budget. The following sections will delve into formal definitions of cost overrun, how construction costs are classified, the roles of stakeholders in managing costs, and a closer look at the various causes and effects of cost overruns as identified in literature.

2.2 Definitions

Cost is the budgeted expenditure, which the client has agreed to commit for creating/acquiring the desired construction facility (Chitkara, 2011).Cost overrun is defined as the difference between the actual and estimated costs as a percentage of the estimated cost, with all costs calculated in constant prices. Actual costs are defined as the accounted costs actually spent, as determined at the time of project completion. Estimated costs are defined as the budgeted or forecasted costs at the time of project approval, which are typically similar to costs presented in the business case for a project (Lee, 2008) [as cited by Subramani *et al*, (2014)].

A cost overrun (also known as a budget overrun) happens when the actual spending on a project exceeds what was originally budgeted. Essentially, it means the project ended up costing more than planned. The amount of overrun can be measured in absolute terms (how many extra dollars or birr spent) or as a percentage of the original estimate. For example, if a building was budgeted at 1,000,000

Birr but actually cost 1,200,000 Birr, there is a cost overrun of 200,000 Birr, which is a 20% increase over the budget.

The definitions above highlight that cost overrun is the difference between planned and actual cost at completion. All definitions convey the same idea: a cost overrun occurs when the final cost of a project overshoots the initial agreed-upon cost. Different terms like cost growth or cost escalation are sometimes used in the literature to describe this phenomenon (Avots, 1983). No matter the term, the concept is the same – the project needed more money than anticipated. It is important to note that these comparisons are usually made in constant prices, meaning they account for inflation or changes in price levels, to ensure a fair comparison between the estimated and actual costs (Lee, 2008 [as cited by Subramani et al., 2014]). This prevents general price inflation from being mistaken as a project cost overrun.

Avoiding cost overruns is considered a major success factor by clients, contractors, and consultants alike. Completing a project within its initial budget is often seen as a mark of effective project management and success. Cost is one of the triple constraints (along with scope and time) in project management that needs to be balanced for project success (Chitkara, 2011). Even a small cost overrun can eat into a project's profit margin or a public project's funding reserves, while large overruns can jeopardize project viability. Nowadays, even a marginal cost overburden can sweep away the profit of a job, and continuous cost overburdens in most projects of a firm can lead to bankruptcy (Akinci & Fischer, 1998). For public projects, cost overruns mean the government or client must allocate additional funds, which can affect taxpayers or delay other projects.

Cost overruns are unfortunately common in construction projects around the world. Studies have shown that a majority of projects end up costing more than initially estimated. For instance, Flyvbjerg et al. found that roughly 9 out of 10 global megaprojects suffered cost overrun. In Ethiopia, cost overrun is a well-recognized issue in the construction industry. Fetene Nega (2008) observed that it is not uncommon to see projects in Ethiopia failing to stay within their budget and that very few projects are completed within the initially allocated cost. Similarly, a study of the Ethiopian construction sector noted that cost overrun is a reality of nearly all construction projects, with many projects exceeding their budgets to varying degrees (Zewdu & Aregaw, 2015). Research on 24 construction projects in Ethiopia revealed that about 80% of those projects experienced cost overruns, with an average cost overrun of approximately 27% beyond the contract amount. This shows that going over budget is more

of a norm than an exception in the local context. Such statistics underscore why accurately estimating costs and controlling expenditures are critical in construction projects. Cost overrun can stem from many causes (planning deficiencies, price fluctuations, design changes, etc.), but regardless of the cause, the result is the same: the client must pay more than planned, or the contractor's costs exceed what they bid, leading to financial losses.

Overall, managing cost and preventing cost overrun is of paramount importance. Cost overrun affects not only the financial performance of construction firms but also the ability of public agencies to deliver projects within allocated budgets. It can delay project completion and strain relationships among stakeholders. Therefore, throughout this thesis and in construction management literature, keeping project costs under control — and understanding what a "cost overrun" means — is a key focus. In this research, as stated, cost overrun will specifically refer to the difference between the final actual cost at completion and the original contract amount for the project, which aligns with common definitions. By clearly defining this term, we can consistently measure and discuss the factors that lead to cost overruns and how to mitigate them.

2.2.1 Classification of Construction Cost

The cost of a work unit is comprised of many cost elements. These cost elements include labor costs (Skilled/Unskilled), material costs, plant and machinery (Equipment) costs, administration costs and other expenses. In construction projects, it is helpful to break down the total cost into categories to better understand and manage them. The two broad categories mentioned are direct costs and indirect costs (often called overhead costs). This classification is widely used in project management (Chitkara, 2011; Subramani et al., 2014). Below is an explanation of each category with examples to clarify their meaning:

- ✓ Direct Costs: These are expenses directly tied to a specific work activity or component of the project. If a cost can be traced to a particular item of work or section of the project, it is a direct cost. Common examples of direct costs include:
    - i) Materials: The cost of all building materials that end up in the final construction. For instance, in a public building project, direct material costs would include cement, bricks, sand, steel reinforcement bars, timber, glass, paint, etc. used in the structure.
    - ii) Labor: Wages and salaries for the workforce that is physically constructing the project on site. This includes payments to skilled labor (like engineers, masons,

electricians) and unskilled or semi-skilled labor (like helpers, construction laborers). For example, the wages paid to carpenters for formwork or to electricians for wiring the building are direct labor costs associated with those specific tasks.

iii) Equipment (Plant and Machinery): Expenses for construction machinery and equipment usage dedicated to the project. This can include the rental or depreciation costs of excavators, concrete mixers, cranes, generators, etc. If a crane is used to lift steel beams for the building, the cost of renting and operating that crane is a direct cost of the structural work activity.

iv) Other direct expenses: Any other costs that can be clearly attributed to a specific work item. For example, if the project requires special testing or a subcontractor for a particular task (like a specialist for installing elevators), those costs can be considered direct to that part of the project. Transportation of materials to site can also be a direct cost if it is directly linked to specific materials for the project.

Direct costs generally make up the bulk of the project cost – they are often the most visible expenses in a project's budget. Because they are tied to specific activities, direct costs will increase or decrease in proportion to the scope of work. For instance, if the design of a building changes to include more floor area, the direct costs (more materials, additional labor) will rise accordingly.

- ✓ Indirect Costs (Overheads): These are expenses related to the project that cannot be pinpointed to a single work activity. Indirect costs support the project as a whole rather than a specific task. Examples of indirect costs include:

  i) Site Administration and Supervision: The cost of running the site office, salaries of the project management team, site engineers, supervisors, and security personnel who oversee the entire project. For instance, the project manager's salary is an indirect cost – their work benefits all aspects of the project rather than one specific activity.

  ii) Temporary Facilities and Utilities: Expenses for site facilities like site offices, storage sheds, workers' camps, toilets, water and electricity for the site, communication systems, etc. These are necessary for the project's execution but are not part of the final building.

  iii) Insurance and Permits: The cost of insurance (e.g., contractor's all-risk insurance) and permits or licenses required for the project. These protect the project or allow it to proceed but are not tied to a particular construction task.

iv) Interest on Financing: If the project is financed by a loan, the interest charges during construction are often considered an indirect cost of doing the project. This financing cost is time-related and not attributable to a specific activity on site.

v) Head Office Overheads: Sometimes a percentage of the construction company's general overhead (head office management, administration not on site) is allocated to the project. While not occurring at the job site, it is a cost of keeping the business running to support the project.

Indirect costs are often time-related costs – they accumulate as time passes, regardless of the amount of work done on a given day. For example, every day a project is ongoing, the site office has to be maintained and supervisors paid. Therefore, if a project is delayed, indirect costs typically increase because the project's overheads run longer. This is why delays can significantly impact the budget even if no additional physical work is added – the prolonged indirect costs will cause a cost overrun (Subramani et al., 2014).

Understanding the classification of costs into direct and indirect is important for cost management. It allows project managers and accountants to monitor where money is going and identify which costs are driving the project budget. For instance, direct costs might be managed by controlling resource usage (e.g., reducing waste of materials or improving labor productivity), whereas indirect costs might be controlled by improving the project schedule (finishing sooner to cut down on site overhead time) or by optimizing site operations. By categorizing costs, one can also better estimate the project budget: direct costs can be estimated from quantities of work (using bills of quantities or detailed take-offs), and a percentage can be added on top for indirect costs based on project duration and complexity (Chitkara, 2011).

In the Ethiopian construction context, project budgets similarly distinguish between direct expenses and overheads. For example, contractors bidding on public building projects in Ethiopia will itemize direct costs for materials like concrete and finishing items, and also include a percentage (often around 10–15% of direct costs) for site overhead and general overhead in their bid. If not properly accounted for, indirect costs can be underestimated, leading to budget shortfalls. A contractor might find that prolonged project duration due to delays (a common issue in Ethiopia) increases indirect expenses like equipment rental time and staff salaries, thus causing a cost overrun even if direct costs of materials and labor stay on track. Therefore, careful planning of both direct and indirect costs is needed to ensure the total project cost remains within the budget.

In summary, direct costs are linked to specific building tasks (e.g. laying foundations, constructing

walls, installing roofing), and indirect costs are the behind-the-scenes expenses that keep the overall project running (e.g. management, site facilities, insurance). Both types must be monitored. Effective cost control involves tracking direct costs against each work item and keeping indirect costs (overheads) in check by adhering to the schedule and efficient site management. By understanding the classification of construction costs, stakeholders can better pinpoint areas where savings can be made and where costs are increasing, thereby helping to prevent cost overruns.

2.2.2 The Role of Construction stakeholder in construction Cost

Effective construction cost management is a team effort. Every major stakeholder in a construction project – primarily the client, the consultant, and the contractor – has a crucial role to play in ensuring that the project stays on budget. If any one of these parties fails in their responsibilities, it can lead to cost overruns. Below is an expanded discussion of each stakeholder's role in controlling or causing project costs, with examples and context (including the Ethiopian construction environment):

- **The Client (Owner)**

The client is the project initiator and the one who provides the funding, so their decisions greatly influence the project cost. A client's primary role in cost management is to define the project clearly and provide adequate funding. Early in the project, the client should have a clear brief of what they want. When a client knows exactly what facility they need and communicates their requirements well (as Smith (1971) emphasizes), the design can be completed without excessive changes. Changes or unclear requirements by the client are a leading cause of cost overruns – for example, if a client keeps modifying the building design or scope during construction, new work will be added and the cost will increase. Such scope changes have been identified as a major factor for cost growth in projects. It is therefore important for the client to set a realistic budget and cost limit at the outset (during the briefing stage) and stick to it (Mweresa, 2013). The client should also ensure that financing is in place so that the project is not disrupted by cash flow problems. In Ethiopia, many public projects are client-funded by government budgets; if the funds are not released on time, contractors experience delays and costs rise due to idle resources. Timely payment by the client is crucial – delayed payments can lead to contractors slowing work or incurring financing costs, which ultimately increase the project cost (Memon et al., 2011). The client can help avoid cost overruns by making prompt decisions (for example, approving drawings or variations quickly) and by avoiding unnecessary changes once construction has started. A successful client also invests in the planning stage – conducting proper feasibility studies, soil investigations, etc. – to minimize surprises during construction.

In summary, the client's skill in project planning and decision-making sets the foundation for cost control. A well-prepared client who defines the project thoroughly and secures sufficient funds is far less likely to encounter cost overruns than one who starts with vague goals or uncertain financing (Smith, 1971; Nega, 2008.

- **The Consultant (Architects/Engineers/Quantity Surveyors)**

Cost considerations are among the most important and basic considerations that Consultants must deal with. It is essential to see that projects are contained within the client's budget and cost forecasts. Cost has the final control over virtually every project. Accurate cost analysis and control is one of the necessary services the client requires from the consultants (Smith (1971). The consultant team, which includes designers and cost estimators, carries the responsibility of planning and monitoring costs throughout the project on behalf of the client. Consultants must ensure that the design and specifications align with the client's budget. One of the consultant's first roles is to prepare accurate cost estimates and advise the client if the project scope is exceeding budget in the design phase. In other words, the consultant helps balance what the client wants with what they can afford. Cost planning techniques (such as cost per square meter benchmarking or elemental cost analysis) may be used during design to keep the project within budget. If the consultant does not perform this role well, the project could be designed in a way that is too expensive, leading to overruns when bids come in or during construction. Cost considerations are thus at the heart of the consultant's job from day one.

During construction, consultants (e.g., a supervising engineer or quantity surveyor) must also perform cost control: they monitor expenditures, certify payments for work actually done, and manage any changes to ensure they are necessary and priced fairly. Accurate cost analysis and control is one of the critical services the client expects from the consultant (Smith, 1971). For example, if the contractor proposes a change or claims additional costs, the consultant evaluates it to confirm if it's valid and to negotiate a reasonable cost, protecting the client's budget. Consultants are also responsible for complete and clear design documentation. Many cost overruns in construction are caused by design issues – incomplete drawings or errors can lead to change orders and extra work during construction. In Ethiopia, it is common to encounter cost increases due to design revisions or mistakes discovered on site (Nega, 2008). Such occurrences reflect a lapse on the part of the design consultants. By producing a well-thought-out design and thorough contract documents (drawings, bills of quantities, technical specifications), consultants can minimize unexpected costs later on. Additionally, consultants can employ value engineering, which is a systematic review of the project design to find more cost-effective ways to achieve the project's objectives (for instance, suggesting alternative materials or methods that are cheaper but still meet quality requirements). This helps reduce

unnecessary costs before construction begins.

Overall, the consultant's role is to be the technical expert who keeps an eye on cost: they advise the client, design within budget, and control costs during execution. If consultants fail in these duties – for example, by underestimating costs or not detecting wasteful practices – the project is at high risk of cost overruns. Therefore, the competency and diligence of the consulting team (project managers, architects, engineers, and quantity surveyors) are a major factor in whether a project's cost will be kept under control (Mweresa, 2013). A capable consultant will forecast potential cost problems and deal with them proactively, whereas an ineffective consultant may only react after budgets are already exceeded.

- **The Contractor**

The contractor is the party that actually executes the construction work, and thus they have a direct impact on cost through their efficiency and management of resources. According to Smith (1971), the contractor's major task is to assemble and allocate resources (labor, materials, equipment) efficiently to complete the project within the budget and time specified. In practice, this means the contractor should apply good project management and construction methods to avoid waste and cost overruns. For example, a contractor who plans the work properly will schedule activities to prevent downtime, order materials in bulk on time to avoid price increases, and ensure workers and machines are productively engaged.

A well-organized contractor can often find ways to save costs – such as minimizing material wastage (through accurate measurements and proper storage) and preventing rework by doing things right the first time. On the other hand, if a contractor is inefficient or disorganized, the project can incur additional costs. Contractor-related issues are a common cause of cost overruns, as noted in many studies (Memon et al., 2011; Mukuka et al., 2014b). For instance, poor site management or supervision by the contractor can lead to mistakes that have to be fixed later at extra cost. If the contractor fails to plan the work sequence well, there might be idle labor or machinery waiting around, which means paying for time that is not producing progress – effectively wasting money.

In Ethiopia, some contractors face challenges like shortage of experienced project managers or lack of modern equipment, which can reduce efficiency and drive-up costs. Additionally, contractors sometimes underbid to win contracts (offering a price lower than the realistic cost) and then find during construction that they cannot complete the work for that price. This situation often results in cost overruns through variation claims or degraded quality/speed. A responsible contractor should provide a reasonable bid and then manage the project diligently to meet that budget. They should also implement cost control internally – tracking their expenditures on materials, labor, and plant daily or weekly to ensure they are in line with the work done, and taking corrective actions if costs start exceeding what was allowed. In summary, the

contractor's role in cost management is about execution and control: they must execute the project efficiently and control their construction processes and resources.

A competent contractor contributes to cost savings (for example, by finishing earlier than scheduled, thus saving indirect costs, or by innovating methods to reduce material use), whereas an incompetent contractor can easily cause the project to go over budget through inefficiency or mismanagement. Smith (1971) underscores that it is through efficient resource allocation that contractors achieve completion at maximum efficiency in cost, time, and quality. Modern construction management techniques such as lean construction principles, proper scheduling, and quality management help contractors avoid costly delays and defects. Therefore, having a capable contracting firm with skilled managers and a good track record is a vital factor in keeping construction costs under control.

In addition to these three primary stakeholders, other parties can also influence construction costs. Subcontractors and suppliers need to deliver services and materials on time and at agreed costs; if they fail to do so, the project might face cost increases. Regulatory authorities or government agencies can impact cost if there are delays in permits or changes in regulations (for example, a sudden change in tax on materials or import duties could raise costs). In the Ethiopian context, issues like import delays for materials or fluctuating foreign exchange rates can also be considered external stakeholder influences on cost. Financiers or project funders (like banks or international donors for public projects) indirectly affect cost management since their terms and disbursement schedules determine the cash flow available to the project.

However, the client, consultant, and contractor remain the core trio responsible for proactive cost management:

- ✓ The client must establish a solid groundwork (clear scope, sufficient budget, timely decisions).
- ✓ The consultant must plan and oversee the project with cost-effectiveness and rigor (accurate estimates, cost monitoring, design management).
- ✓ The contractor must implement the work efficiently and avoid waste (effective execution, resource control).

When each stakeholder fulfills their role and collaborates transparently, the risk of cost overrun is minimized. Conversely, if any stakeholder neglects their duties – for instance, a client who constantly changes the scope, a consultant who produces a flawed design, or a contractor who manages the site poorly – the project is likely to suffer increased costs. Effective communication and coordination among stakeholders are also key; for example, if the contractor foresees a cost issue (such as a spike in material price or a design discrepancy), raising it early with the consultant and client can lead to joint solutions

before it escalates into a major budget problem. Thus, construction cost management is a shared responsibility, and each stakeholder has a distinct but interconnected part to play in ensuring the project is completed within the authorized budget (Mweresa, 2013; Olawale & Sun, 2010).

2.2.3 Construction Project Cost Management

The management of costs in a project is a common thread running through the entire life of a project. The feasibility of a project depends on its cost and financial viability and the project is not complete until the last payments and paperwork have been completed. Caruthers *et al*. (2008) state that the management of costs begins with the financial feasibility study, progresses through all the costs that are required to purchase all the resources needed by the project, through to using cost control to ensure that all work that is done is properly completed. Kimmons, (1990) cited in Caruthers *et al*., 2008:161) states that at any stage during the project, the total predicted cost consists of the defined elements, the contingency, the escalation, and the scope creep (or job growth).

At the feasibility and planning stage, cost management involves estimating how much the project will likely cost and determining if the project is affordable and worthwhile. This is where a financial feasibility study is done – the project's costs (and sometimes its economic benefits, if it's an income-generating project) are analyzed to see if the investment makes sense. If the estimated cost is too high, the project may need to be scaled down or canceled. Thus, from the very beginning, cost considerations can decide the fate or scope of a project (Caruthers et al., 2008). In Ethiopia, for example, a city administration like Dukem must evaluate the cost of a new public building against the available budget and expected benefits; if the cost is too high, they might seek additional funding or reduce the project size before proceeding.

Once a project is deemed feasible and moves into the design phase, cost management focuses on cost planning and budgeting. A cost estimate is prepared (often by a quantity surveyor or cost engineer) based on the design, which includes detailed calculations of quantities of materials, labor, and other resources required. This estimate results in a project budget (or cost plan) that will be approved and used as the baseline. Managing cost at this stage might involve evaluating different design alternatives for cost-effectiveness – for example, comparing the cost of using concrete blocks vs. burnt bricks for walls, and choosing the option that fits the budget while meeting quality standards. Techniques like value engineering are sometimes applied during design to achieve required functions at lower cost, ensuring the project is designed within the client's budget. According to the Project Management Institute's PMBOK guide, project cost management includes processes for estimating costs,

determining the budget, and controlling costs (PMI, 1996). Determining the budget involves aggregating all estimated costs and adding appropriate contingencies to cover risks or uncertainties.

During the procurement and construction phase, cost management is about monitoring and controlling expenditures. This is often referred to as cost control. The project team will track actual spending on the project and compare it to the budget on an ongoing basis. Regular reports are produced (monthly, for example) to show the current costs, any variances from the budget, and the forecast of total cost at completion. If the reports indicate that costs are running higher than planned for a certain part of the project, the team investigates the reasons and tries to take corrective actions. For instance, if the cost of concrete works is exceeding the budget due to waste or higher material prices, the project manager may look for ways to reduce waste (better site management) or find alternative suppliers, or perhaps use some contingency funds if available. Earned value management (EVM) is one useful technique often employed: it evaluates project performance by comparing the budgeted cost of work planned vs. budgeted cost of work actually completed vs. actual cost spent, which helps forecast if the project will finish over or under budget (Kerzner, 2009). While terms like EVM might be technical, the basic idea is to detect trends – if a certain job is costing more than expected per unit of work done, that signals a potential cost overrun that needs attention.

Throughout construction, managing cost also means controlling changes. As noted, any change in the project scope or design can affect the cost. Uncontrolled changes (often called scope creep when small additions accumulate without formal approval) are dangerous for the budget. Cost management requires that all changes go through a formal process: typically the consultant will estimate the cost impact of a proposed change and the client must approve the additional cost before it's implemented. This way, everyone is aware of how changes will alter the overall budget. Caruthers et al. (2008) emphasized that cost forecasts must include allowances for defined elements, contingencies for uncertainties, possible escalation (inflation) costs, and scope creep – but scope creep itself must be rigorously controlled by formal variation orders. This means that while the budget may have some contingency funds, one cannot keep adding work without adjusting the budget formally. By documenting variations (change orders) and updating the budget accordingly, the project maintains a realistic picture of final costs. If changes are made without such control, the project can quickly exceed its budget without the client realizing it until too late. In Ethiopian public projects, strict procedures (often outlined by public procurement regulations) exist for change orders specifically to keep financial control – for example, a change beyond a certain percentage of the contract price might need higher-level approval. These processes are part of cost management governance.

Another aspect of cost management during construction is managing time and resources, because cost is closely linked to schedule. Delays in construction often lead to cost overruns due to extended site overhead costs and inflation on materials. Therefore, keeping the project on schedule (or accelerating if behind) can save money. For instance, if an Ethiopian road project is delayed into a rainy season, not only do indirect costs rise, but productivity drops, potentially increasing labor costs per unit of work. Good cost management thus works hand in hand with schedule management: project managers might spend extra on overtime or additional crews (a cost increase in one area) to avoid a larger cost impact of a severe delay overall. This balancing act is done continuously to achieve the best cost-time outcome.

Finally, in the project closing stage, cost management ensures that all bills are settled, any remaining funds are returned or reallocated, and cost records are properly documented. The final cost of the project is compared to the budget, and any lessons learned (e.g., certain costs were underestimated) are noted for future reference. For example, if a public building in Dukem city ended up 10% over budget due to underestimated electrical costs, the city might record that information to improve future estimates for similar projects.

Considering the Ethiopian context, effective cost management faces some challenges: cost data may not be readily available for accurate estimating, inflation rates for construction materials can be high and volatile, and there may be limited capacity in cost management (shortage of experienced cost engineers or quantity surveyors). Nega (2008) pointed out that balancing scope, quality, and cost is necessary throughout project phases to achieve project objectives within a changing environment. This underscores that in a developing country environment, adapting to changes (like price fluctuations or scope adjustments) while keeping costs in check is a continuous effort. Merid (2016) studied construction projects in Ethiopia and found that improved cost management practices are needed to curb the prevalence of budget overruns.

Merid (2016) specifically recommended several measures (listed in the original text) to strengthen construction cost management. Let us expand on each of those recommended measures and explain how they help in managing or reducing cost overruns:

Merid (2016), in his study, reported the following measures for construction cost management:

- Proper Project Costing and Financing
    - ✓ Proper project costing and financing means planning the budget correctly from the start and making sure the money is available when needed. This includes getting accurate cost

estimates, adding all expenses (materials, labor, design, supervision, permits), and keeping a contingency fund for surprises. It also means securing the source of funds early, whether it's government budget, a loan, or a grant. In Ethiopia, many projects slow down or stop because funding runs out or payments are delayed, which then increases the cost. When a project is fully funded and realistically costed from the beginning, the chance of delays and cost overruns becomes much lower.

- Competent Personnel
  - ✓ Having skilled and experienced personnel is key to controlling project costs. Competent staff—such as project managers, quantity surveyors, site managers, and procurement officers—can prepare accurate estimates, plan the work well, and prevent costly mistakes. In Ethiopia, many cost overruns happen because staff lack proper training or experience. When the team is knowledgeable, they can predict problems early, negotiate better prices, manage schedules properly, and track expenses correctly. Simply put, hiring or training qualified people helps keep the project on budget and running smoothly.
- Appropriate Scope Definition
  - ✓ Appropriate scope definition means clearly deciding what the project will include from the very beginning. When the scope is clear and detailed, designers know what to design and contractors know exactly what to build. This helps prevent frequent changes, which usually increase cost. In Ethiopia, many projects face overruns because the scope was not well defined or kept changing. By preparing a detailed project brief, getting all stakeholders to agree on it, and finalizing it before work starts, the project can avoid scope creep and unexpected expenses. A clear scope creates a stable plan that helps keep both time and cost under control.
- Proper Cost Control
  - ✓ Proper cost control means regularly checking how much money the project is spending and comparing it to the budget. This includes tracking expenses, reviewing reports, and taking action early when costs start to rise. The project team should monitor costs frequently—such as through monthly budget meetings—and investigate any differences between planned and actual spending. In Ethiopia, this also means checking payment certificates carefully so the client only pays for work that is truly done. Good cost control helps avoid surprises,

prevents overspending in one phase, and allows the team to fix problems early. In short, proper cost control makes sure the project stays within budget from start to finish.

- Risk Management during Project Execution
  - ✓ Risk management during project execution means identifying possible problems early and preparing solutions before they happen. Construction projects face many risks—price increases, delays, bad weather, accidents, design changes, or supply shortages. By planning ahead, the project can reduce extra costs. For example, in Ethiopia, material prices like cement or steel may rise, so the project can sign fixed-price contracts or buy materials early. Delays from heavy rain can be managed by adding buffer time or using contingency funds. Keeping a risk register helps the team track new risks and respond quickly. When risks are managed proactively, the project avoids surprises and stays closer to its budget. It's essentially an investment in foresight: spending time and sometimes money to hedge against possible problems so that if they occur, the cost impact is minimized (Caruthers et al., 2008, as cited in Monyane, 2013).
- Appropriate Contractual Framework
  - ✓ Having the right type of contract is very important for controlling project cost. The contract must clearly state responsibilities, risks, and how payments and changes will be handled. If the contract is fair and clear, both the client and contractor can manage costs better.Different contract types affect cost control in different ways. For example, in a lump-sum (fixed-price) contract, the contractor must finish the work for a fixed amount, so they work hard to control costs. But if there is no adjustment for inflation, the contractor may suffer losses or add a high price at the start. In Ethiopia, many projects use unit-price contracts, which work well only if quantities are accurate—otherwise costs rise.

    A good contract also includes price-escalation clauses for materials like cement, steel, and fuel, because prices often change in Ethiopia. This prevents disputes and avoids contractors adding large risk premiums. Clear procedures for variations and claims also help prevent conflict and unexpected extra costs.In short, choosing the right contract type and including fair clauses helps keep costs under control, reduces disputes, and ensures both parties work smoothly toward completing the project within budget.
- Increase Supply of Materials

- ✓ Increasing the supply of materials means making sure important construction materials are available when the project needs them, at stable and reasonable prices. In Ethiopia, shortages of items like cement or steel often cause delays and sudden price increases, which lead to cost overruns. To avoid this, projects should secure reliable suppliers, buy materials early in bulk, or even store critical items if possible. They can also switch to alternative local materials when imported ones become too expensive or hard to find. Zewdu & Aregaw (2015) noted that material price fluctuations are a major cause of cost overruns, and these fluctuations usually happen when supply is low. By planning procurement well and ensuring a steady material supply, the project can avoid delays, prevent price spikes, and keep overall costs under control.

- Realistic Cost Estimation
  - ✓ Realistic cost estimation means preparing a budget that reflects the true cost of the project, not too low and not too high. Many projects in Ethiopia face cost overruns because the original estimates were incomplete or based on wrong assumptions. A realistic estimate uses current market prices, data from similar projects, and includes all expected costs such as design fees, permits, materials, labor, and inflation. Subramani et al. (2014) found that inaccurate estimates are one of the main causes of cost overruns, and Shane et al. (2009) also showed that projects with realistic initial budgets are far more likely to finish on budget. In Ethiopia, using local cost data and recent tender prices helps improve accuracy. By investing time in detailed quantity take-offs, getting supplier quotes, and adding reasonable contingencies, the project creates a budget that can actually be achieved. A realistic estimate prevents future surprises and sets a strong foundation for successful cost control.

- Efficient Management
  - ✓ Efficient management means using time, money, materials, and manpower wisely so the project is completed with minimum waste. It includes good scheduling, keeping workers and equipment productive, managing materials properly, and making quick, informed decisions. When management is efficient, delays are reduced, resources are not wasted, and costs stay under control. In Ethiopia, studies such as Mukuka et al. (2014b) show that slow client decisions, poor contractor management, and weak planning are major causes of cost overruns—problems that come from inefficient management. Improving efficiency means

better coordination, strong supervision, timely procurement, and a cost-conscious attitude across the whole team. When a project is managed efficiently day-to-day, it naturally avoids extra costs and is far more likely to stay within budget.

In conclusion, effective cost management in construction is a continuous process that begins with realistic planning and continues through careful monitoring during execution. The measures identified by Merid (2016)—such as proper budgeting, clear scope, skilled personnel, good contracts, steady material supply, risk management, and efficient project administration—work together to keep costs under control. For public projects in Ethiopia, applying these principles is especially important because resources are limited and accountability is high. While no system can eliminate all cost overruns, strong cost management greatly reduces their likelihood and impact, helping projects finish closer to budget and deliver better value for the community.

2.3 Causes of Construction Cost Overrun

Nega (2008) affirmed in his study that parties blamed each other for encountered cost project escalations in the Ethiopian construction industry. Nega (2008) then suggests that it was important to identify the stakeholders who are responsible for causing cost overruns in public building construction projects in order to evolve corrective measures. Nega (2008), reported that there were claims made by clients concerning issues related to design, specifications and contract documentation. (Monyane, 2013)

The study of 258 transport projects by Flybjerg (2004) in five continents deduced that nine out of ten projects assessed were having cost overrun. Furthermore, Flybjerg note that the longer the project took and if it was a mega project, the cost escalation will increase by 4.64% every passing year from decision to build until operations. At 14%, a study by Omoregie and Radford (2006) establishes the minimum percentage escalation cost of projects in Nigeria. The approximate minimum mean percentage escalation period of project in Nigeria from this study was 188%. In spite of these severe loses, the mean average percentage completion of work was 96% (Omoregie and Radford, 2006). The literature review indicated that the most significant contributing factors causing cost overruns on global projects were changes in material prices, changes to work or additional work and time delays. The findings from the FIFA World Cup stadia in South Africa also indicated material cost as the largest contributor to cost overruns with inaccurate material estimates and shortage of skills ranked second

and third in contribution (Baloyi and Bekker 2011). Similarly, another industry findings show that wrong perceptions of time exist within project teams, and this perceptions in turn impact on the cost and quality performance of a project (Bowen et al. 2002) [as cited by Gaetsewe *et al*, (2013)].

On the global stage, many infrastructure projects have run into diverse forms of overruns. For example, Dutch rail projects perform considerably better, with projects having significantly lower percentage cost overruns in real terms (11%) compared to projects in other North West (NW) European countries (27%) and in other geographical areas (44%). Bridge projects also have considerably smaller cost overruns 7% in the Netherlands compared with 45% in other NW European countries and 27% in other geographical areas (Cantarelli et al., 2012). The findings reveal a discrepancy between estimated and actual costs, with a mean cost overrun of 7.9% ranging from 259% to 183%. One particular finding that has not been shown before in previous studies is that cost overruns appear to be more predominant among smaller projects as compared to larger ones. This observation, for the Norwegian road sector in particular, leads to the proposition that cost savings lies in exerting pressure on smaller projects. Other factors found to influence the size of cost overruns include completion time of the projects and the regions where projects are situated (Odeck, 2004). The empirical analysis found the change in scope of work on site, incomplete design at the time of tender, contractual claims (extension of time with cost), lack of cost planning and monitoring of funds, and delays in costing variations and additional works as important overrun factors in South Africa (Ramabodu and Verster 2013). The study of Prinsloo, et al. (2011), has shown that time and cost overruns are a real problem in the Botswana local authorities. Leading causes being inefficient contractor's management, low productivity of contractor's workforce, low productivity of contractor's equipment, client's responsibility, and design errors by consultants as being the highest ranked causes [as cited by Gaetsewe et al, (2013)].

In the South African construction context, Baloyi and Bekker (2010), identify the causes of cost overrun related to the stadia built or refurbished for the 2010 FIFA World Cup. The top ten causes in order of importance included: [as cited by Monyane, (2013)].

- Increase in material cost;
- Inaccurate material estimates;
- Shortage of skilled labor;
- Client's late contract award;

- Project complexity;
- Increase in labor cost;
- Inaccurate quantity take-off;
- Difference between selected bid and the consultant's estimate;
- Change orders by client during construction, and
- Manpower shortage

Ismaaini (2014), in his study found that there were 9 high risk factors on cost overrun, namely: poor site management and supervision, incompetent subcontractors, schedule delay, inaccurate time and cost estimates, mistakes during construction, incomplete design at the time of tender, poor design and delays in design, contractual claims, such as, extension of time with cost claims, and poor financial control on site.

Nega (2008) in his study reported that there were factors which are chosen by respondents to be causes of cost overrun in the Ethiopian public building construction and he listed 39 causes of cost overrun in Ethiopian public building construction and responsible parties in a table (Table 4.3) based on the response of clients, consultants and contractors; the top 10 cause of cost overrun were listed as follows:

1. Inflation or increase in the cost of construction materials
2. Lack of planning and coordination or less emphasis to planning
3. Fluctuations in the cost of labor and material
4. Insufficient geotechnical investigation
5. Additional costs due to variations works
6. Change in foreign exchange rate (for imported materials)
7. Change orders and/or lack of control on excessive change orders
8. Costs due to special risks which very often occur unexpectedly
9. Delay of drawings and order requested by the contractor
10. Changes in Plans and drawings

Mweresa (2013) in his study he discussed factors which affect cost of construction projects. These were

- Inaccurate or Poor Estimation of Original Cost
- Inflation of Project Costs

- Improper Planning
- Fluctuation in Price of Raw Materials
- Poor Project Management
- Lack of Experience
- Mistake in Design
- Insufficient Fund
- Poor Contract Management
- Construction Cost Underestimation
- Risk Management during Project Execution

Savita and Pradeep (2014) classified the factors of cost overrun into 11 groups according to their source of the cost overrun. They presented the cost overrun factors in 11 groups (as shown in Table2.1). Each group of factors is listed as reported in their study

Table 2.1 Cost Overrun Factors by Savita and Pradeep (2014)

No.	Cause of cost overrun	Group
1	Slow decision making	**Client**
2	Slow payment of completed work by owner	
3	Poor planning and scheduling	**Contractor**
4	Financial difficulty faced by contractor	
5	Rework due to error in construction	
6	Disputes on site	
7	Poor site management	
8	Contract management	**Consultant**
9	Delay in performing inspection	
10	Inaccurate time and cost estimate	
11	Quality assurance	
12	Frequent design change	Design
13	Improper design and delay in producing design document	
14	Delay in approval of design	
15	Additional work	

16	Lowest bid procurement policy	Project
17	Change in the scope of the project	
18	Climatic condition	External
19	Fluctuation in price material	
20	Accidents during construction	

Source: Savita and Pradeep (2014)

In summary, construction cost overruns result from several interconnected factors. Poor planning and weak coordination often lead to delays and rework, a problem highlighted in Ethiopian public projects by The Reporter Ethiopia (thereporterethiopia.com). Inaccurate or deliberately low-cost estimates also cause overruns, as studies note issues like optimism bias and strategic underestimation (en.wikipedia.org). Frequent design changes and errors further inflate costs, and Ethiopian audits have identified late design information as a major contributor (thereporterethiopia.com).

Inflation and price fluctuations—especially after events like the 2017 Birr devaluation—dramatically increase material costs, confirming findings by Nega (2008) and reports from The Reporter Ethiopia. Payment delays and contractor cash-flow issues also prolong projects, increasing overhead. Contractor inefficiency and low productivity have been observed both in Ethiopia and internationally, with studies from Botswana and other regions showing similar trends.

Resource shortages—whether labor, materials, or equipment—lead to delays and higher costs, as noted in studies of Ethiopia and large global projects (etd.aau.edu.et). Contract management problems and lowest-bid procurement practices contribute as well, with Savita & Pradeep (2014) identifying lowest-bid selection as a major risk for cost escalation. Finally, inadequate risk management means projects are unprepared for unforeseen conditions, such as unexpected ground conditions identified by Nega (2008) or security issues cited in Ethiopian audits (thereporterethiopia.com).

Overall, the evidence shows that cost overruns commonly stem from weak planning, inaccurate estimates, design changes, inflation, financial delays, low productivity, poor contract practices, and unmanaged risks. Addressing these factors holistically can significantly reduce overruns in Ethiopian construction projects.

2.4 Effects of Construction Cost Overruns

Effects are the consequences that will be encountered when cost overruns occur on a construction project. Nega, (2008), states that cost overruns have obvious effects for the key stakeholders in particular, and on the construction industry in general. To the client, cost overrun implies added costs over and above those initially agreed upon at the onset, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental or lease costs or prices. To the professionals, cost overrun implies inability to deliver value for money and could well tarnish their reputations and result in loss of confidence reposed in them by clients. To the contractor, it implies loss of profit for non-completion, and defamation that could jeopardize his or her chances of winning further jobs, if at fault. To the industry as a whole, cost overruns could bring about project abandonment and a drop in building activities, bad reputation, and inability to secure project finance or securing it at higher costs due to added risks (Mukuka *et al*, 2014).

Cost overrun has obvious effects for the key stakeholders in particular, and on the construction industry in general. The degree of effects of cost overrun varies on the stakeholders in the construction industry; all the parties involved are affected by cost overrun. The first victim of cost overrun would be the project owner since he has envisaged his construction project to be realized within an allocated cost. Anything outside these stated frames is cost overrun to the client (Merid, 2016).

The study of Nega, (2008), further identified the following as the major effects of cost overruns: delays during construction, supplementary agreement, additional cost, budget short fall, adversarial relationship between participants of the project, loss of reputation to the consultant, the consultant will be viewed as incompetent by project owners, high cost of supervision and contract administration for consultants, delayed payments to contractors, the contractor will suffer from budget short fall of the client and poor quality workmanship. Also Nega in his study he listed Eshofonie findings on effects of cost overrun on construction on his research as Eshofonie identifies four effects of cost overruns as follows: company or firm liability to insolvency and liability of the companies or firms to bad debt, under-utilization of man-power resources, plants and equipment, increased project cost due to extension of time: Longer project duration means that more resources will need to be allocated to the project, which then increases the project costs and project abandonment. (Mukuka *et al*, 2014)

Cost overrun does not affect only those parties that are involved directly in the construction of a

project, but its effect passes to the construction industry as a whole and consequently to the national economy of the country. Cost overrun for public clients, whose financial resources are scarce, has many effects and it will be a source of friction between the public client and the consultant.

Merid (2016) in his study he listed out the main effect of cost overrun as follow:-

- Delay
  - ✓ Cost overruns create several serious project-level consequences. One of the most common is construction delay. When a project exceeds its budget, work may slow down or stop while the client and contractor negotiate additional funding, such as through a supplementary agreement (onlinelibrary.wiley.com). These delays often increase costs even further because the project remains active longer, raising expenses for supervision, equipment, and site management (researchgate.net).

    Studies in Ethiopia support this connection. Nega (2008) and Merid (2016) noted that cost overruns frequently lead directly to time overruns. A recent study of public building projects in Dire Dawa found that projects exceeded their budgets by about 20.7%, often alongside significant schedule delays (preprints.org). This creates a cycle where higher costs cause longer durations, and longer durations cause even higher costs—showing that cost overruns and time overruns are strongly linked (researchgate.net).

- Supplementary agreement
  - ✓ Cost overruns often force projects to prepare supplementary agreements and revise the original budget. In Ethiopia, this is a common consequence: when the initial funds are not enough, clients and contractors must formally amend the contract to add money or extend the schedule. Merid (2016) identified this as one of the main effects of overruns.

    These revisions create administrative and legal burdens because they require negotiations, official approvals, and sometimes changes to deadlines and payment terms. They can also strain relationships between clients, contractors, and consultants. A study in the Tigrai region confirmed that supplementary agreements are frequently needed when costs exceed the budget, making them a major effect of overruns (onlinelibrary.wiley.com).

    In short, cost overruns push projects back into renegotiation, causing delays, extra paperwork, and additional costs that could have been avoided with more accurate budgeting and stronger cost control.

- Additional cost
  - ✓ Cost overruns create immediate financial pressure for both clients and contractors. For clients, especially in Ethiopian public projects, an overrun means finding extra money beyond the approved budget. In recent years, government projects collectively requested nearly 300 billion Birr in additional funding to cover overruns, highlighting the scale of budget shortfalls (thereporterethiopia.com). When these extra funds are not available, projects slow down or stall.

    Contractors are also affected because funding gaps often lead to delayed payments. Since Ethiopian contractors depend heavily on timely cash flow, payment delays can prevent them from paying workers and suppliers. Sometimes contractors are forced to temporarily finance the project themselves, which strains their resources and may result in idle workers and equipment. In short, cost overruns directly cause financial stress, delayed payments, and potential project stoppages for all parties involved.

- Adversarial relationship between participants of the project
  - ✓ Cost overruns often create conflict and blame among project participants. Clients may accuse contractors of inefficiency or consultants of bad estimates, while contractors may blame clients for design changes or delayed payments. In Ethiopia, such disputes frequently escalate into arbitration or legal cases, adding even more cost and delay. Nega (2008) and Eshofonie both note that severe conflict can even lead to project suspension or abandonment.

    Audit reports in Ethiopia confirm this risk: several irrigation and university projects were halted mid-construction because escalating costs made completion impossible, leaving behind wasted resources and unfinished structures (thereporterethiopia.com). In short, cost overruns damage relationships, create disputes, and—at their worst—can cause projects to be abandoned entirely.

- Loss of reputation to the consultant/contractor
  - ✓ Cost overruns can also push companies toward insolvency and bad debt. Eshofonie (as cited by Nega) notes that when contractors or consultants face delayed or reduced payments because the client's budget is exhausted, they may borrow money to keep the project running. Over time, this financial strain can grow into serious debt. In Ethiopia, a firm working on multiple overrun projects may become unable to pay suppliers, workers, or creditors, leading to bankruptcy or major downsizing. This consequence goes beyond a single project—it can

affect the stability of construction companies and the wider industry.

- Poor quality workmanship
  - ✓ Cost overruns can also weaken the project's quality and reduce its scope. When funds run short, contractors may cut corners by using cheaper materials, rushing work, or reducing supervision. Merid (2016) notes that supervision costs for consultants increase when projects take longer, yet their effectiveness may decline if their budget for monitoring is stretched thin. This can lead to defects, poor workmanship, or early deterioration of completed structures.

    In Ethiopia, some buildings and roads have shown quality problems linked to cost-driven compromises. Overruns may also force the client to reduce the project scope—such as eliminating planned facilities or shortening a road—to fit the remaining budget. This results in a final product that delivers less value than originally intended, creating dissatisfaction among users and project owners.

- Dissatisfaction by project owners and consequently by end users (Creates frustration on stakeholders)
  - ✓ Cost overruns also create frustration among stakeholders and the public. Merid (2016) notes that when a project exceeds its budget, project owners and end users often become dissatisfied, especially because overruns usually bring delays or reduced project scope. For example, if a public hospital in Oromia costs 50% more than planned, the government may delay opening or equipping it, disappointing the community that depends on it. Such situations can erode public trust and trigger complaints, protests, or demands for accountability. In this way, cost overruns not only affect finances and schedules but also damage confidence in construction projects and in the authorities responsible for delivering them.

In summary, In summary, cost overruns in construction projects lead to several serious consequences: project delays, contract revisions through supplementary agreements, increased financial pressure and budget shortfalls, damaged working relationships, and reputational harm. They can also reduce construction quality and, in extreme cases, cause projects to remain incomplete or be abandoned. These effects have all been seen in Ethiopian projects, showing that cost control is essential not only for financial reasons but also for ensuring project success, maintaining trust among stakeholders, and protecting the credibility of the construction industry.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. From existing research findings, factors that cause cost overruns were identified and used as a framework. These factors were organized into different sections in the questionnaire, which was designed to enable respondents to add any other factor that they consider necessary for inclusion in the list of factors.

3.2 Study Area

Dukem is a rapidly growing city in the Oromia Region of Ethiopia, located about 37 kilometers southeast of the capital, Addis Ababa. It is part of the Oromia Special Zone Surrounding Finfinne, an area undergoing significant industrial expansion. Strategically positioned along the Adama–Dire Dawa highway and the Addis Ababa–Djibouti railway, Dukem serves as a key hub for transportation and logistics. The city hosts an industrial park spanning 40 hectares, developed by East African Group (Ethiopia) Ltd., attracting investment and boosting infrastructure development. This economic growth has contributed to an expanding urban landscape and a rising population. Dukem also serves as the administrative center of Akaki Woreda and sits at an elevation of 1,950 meters above sea level.

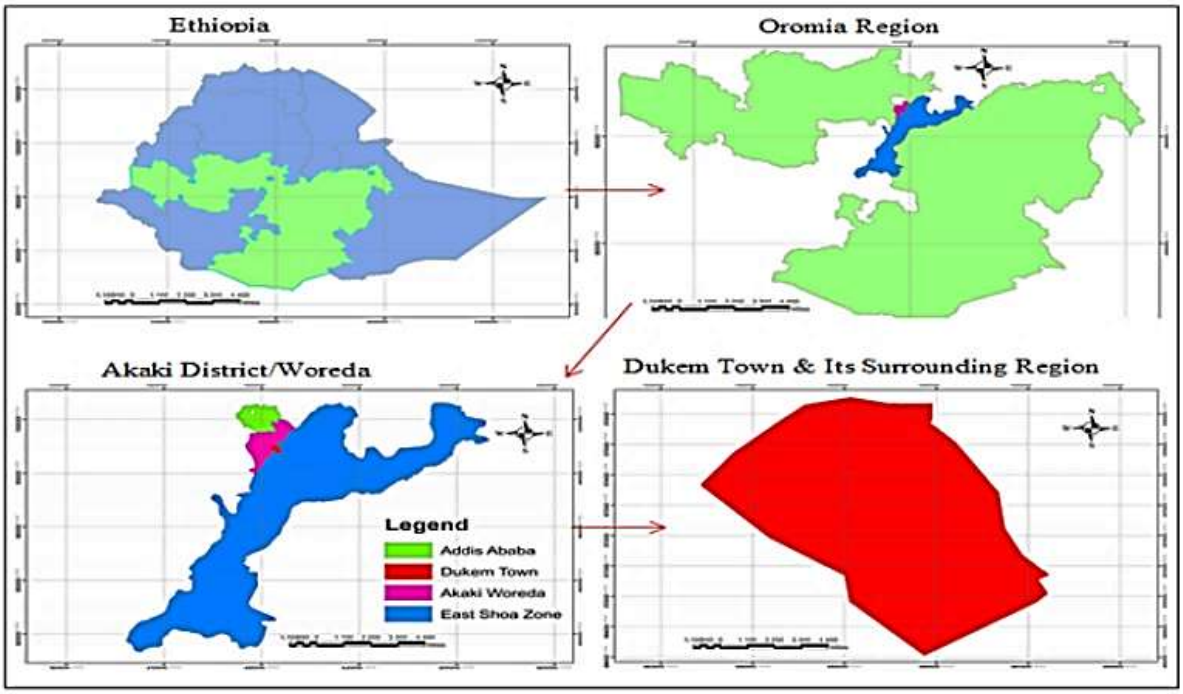

Figure 3.1. Study Area Map (Source: Girma et al,. (2023).

3.3 Research Design

The study uses descriptive survey method to analyze the data, providing a general summary of the results so that interpretations and discussions can be made. Moreover, the reviewed literature was used as one of the main guidelines for analyzing the findings. To summarize the collected data and determine the number of responses in each category, frequency tables and charts were used.

3.4 Research Population, Sample Size and Sampling Technique

The study employed a structured approach to determine the sample size and ensure representative participation from all key stakeholder groups. The minimum sample size was calculated using Yamane's formula for finite populations, considering a total population (N) of 46 stakeholders and a 5% margin of error (e = 0.05). Applying the formula, the calculated sample size was approximately 41.26, which was rounded up to 42 respondents to ensure adequate representation.

The sample size was calculated using Yamane's formula (Equation 1) for a finite population.

$$n = \frac{N}{1+N(e^2)N} \qquad \text{…….. Equation 1}$$

Where:

n = Sample size

N = Population size (46)

e = Margin of error (5% or 0.05)

$$\frac{46}{1 + 46(0.05^2)46} = 41.26 \approx 42$$

To guarantee that all stakeholder categories were proportionally included, stratified sampling was used. The population was divided into four strata: construction firms (20), consulting firms (15), clients (8), and regulatory bodies (3). The sample size for each stratum was determined by multiplying the proportion of each group in the total population by the overall sample size (42). This resulted in a final distribution of 18 construction firms, 14 consulting firms, 7 clients, and 3 regulatory bodies as shown in table 3.1. This method ensured that each subgroup was fairly represented, enhancing the validity and reliability of the findings. By using stratified sampling, the study minimized sampling bias and improved the generalizability of results across different stakeholder groups. The final sample distribution reflected the actual composition of the research population, ensuring that the findings

accurately represented the perspectives of contractors, consultants, clients, and regulatory authorities involved in public construction projects in Dukem.

Table 3.1 Population and Sample Size for each stratum

Stakeholder Group	Population (N_i)	Proportion	Sample Size (n_i)	Rounded Sample
Contractors	20	43.48%	18.26	18
Consultants	15	32.61%	13.70	14
Clients	8	17.39%	7.30	7
Regulatory Bodies	3	6.52%	2.74	3
Total	**46**	**100%**	**42**	**42**

(Source Population size from Dukem City Administration Construction Office, 2025)

Within each stratum, random sampling was applied to select participants, ensuring unbiased representation. However, where necessary, purposive sampling was also used to include individuals with specialized knowledge or direct involvement in the Dukem City Administration Building Projects. This combined approach balanced statistical rigor with practical considerations, allowing for meaningful insights while maintaining methodological soundness.

3.5 Data Source and Collection Methods

This study employed a comprehensive data collection strategy using both primary and secondary sources to ensure strong findings on cost overrun issues in public building construction projects in the city of Dukem. Primary data was collected through structured questionnaires administered to four key stakeholder groups: Project Owners, Contractors, Consultants, and Regulatory bodies. These respondents were carefully selected based on their direct involvement in public construction projects within the study area. To ensure high response rates and data quality, questionnaires were personally delivered and collected by the research team, allowing for immediate clarification of questions and verification of responses when needed.

3.5.1 Questionnaire Design and Administration

The research instrument was systematically designed with four distinct sections to thoroughly investigate cost overrun causes and effects. Section I gathered background information about respondents and their organizations, including professional experience and historical data on typical cost overrun percentages encountered in their projects. Section II focused on identifying and analyzing

the root causes of cost overruns, presenting respondents with a comprehensive list of potential factors and using Likert scales to measure their frequency and impact. Section III examined the multidimensional effects of cost overruns, assessing consequences on project timelines, quality outcomes, stakeholder relationships, and organizational reputation. The final section (Section IV) explored mitigation strategies, evaluating the effectiveness of various control measures and collecting professional recommendations for improvement.

3.5.2 Supporting Document Analysis

To complement and validate the questionnaire findings, the study incorporated detailed analysis of critical project documentation. This secondary data collection included thorough examination of contract documents, project progress reports, payment certificates, and completion reports. These documents provided tangible evidence of cost deviations and offered insights into documentation practices related to cost management. The document review process proved particularly valuable for identifying patterns of cost overruns, verifying reported instances, and understanding the practical challenges in cost control within public construction projects. This multi-method approach, combining questionnaire responses with documentary evidence, enabled comprehensive data triangulation and strengthened the reliability of the study's findings.

3.6 Data Analysis Method

The descriptive statistical method was used to compute the rank of mean scores of responses. Five ordinal measures of agreement towards each statement (1, 2, 3, 4 and 5) are used to calculate the mean score for each factor and effects that is used to determine the relative ranking.

Mean Item Score (MIS)

A five-point Likert scale was used to determine the causes and effects of construction project cost overruns in Dukem City Administration Building Projects with regards to the recognized factors from the reviewed previous literature and responses from respondent. These scales were used to identify the occurrence of cause and effects of cost overrun as follow:

1 = Never

2 = Sometimes

3 = Often

4 = Usually

5 = Always

The other scale was used to identify the effectiveness of remedies for cost overrun, as follows:

1 = Not effective

2 = Slightly effective

3 = Moderately effective

4 = Very effective

5 = Extremely effective

The five-point scale response were converted into Mean Item Score (MIS) for each factor, following the method used by Mukuka et al. (2014b) as shown in Equation 2. For each item as Mukuka, *et al*, (2014 b) cited on their study as follows:

$$MIS = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{\Sigma N}$$ Equation 2.....(Mukuka, *et al*, 2014 b)

Where:

n1 = Number of respondents for extremely unlikely or strongly disagree;

n2 = Number of respondents for unlikely or disagree;

n3 = Number of respondents for neutral;

n4 = Number of respondents for likely or agree;

n5 = Number of respondents for extremely likely or strongly agree

N = Total number of respondents

After mathematical computations, the factors and effects were then ranked in descending order of their Mean item score (from the highest to the lowest).

3.7 Validity and Reliability Test

According to Creswell (2014), verifying the validity and reliability of data collection instruments before using them in the actual study is critical to ensuring data quality.

3.7.1 Validity Test

Validity refers to the extent to which a measuring instrument accurately captures true differences among subjects. To ensure research quality, both content validity (relevance of measurement tools) and construct validity (alignment with theoretical concepts) were assessed through a thorough literature review and expert feedback from eight design consultants and professionals. The research instrument was initially developed by the researcher under the advisor's guidance to enhance accuracy and reliability.

3.7.2 Reliability Test

Table 3.2 Reliability Statistics Test

Items	Cronbach's Alpha	N of Items
Causes of cost overrun in design Phase	.933	9
Causes of cost overrun in Construction Phase	.752	18
Causes of cost overrun in Completion Phase	.804	8
Effect of cost overrun in design phase	.955	2
Effect of cost overrun in Construction Phase	.842	3
Effect of cost overrun in Completion phase	.896	6
Remedies of Cost overrun in design phase	.816	9
Remedies of Cost overrun in Construction phases	.955	16
Remedies of Cost overrun in Completion phase	.842	8

Survey Result, 2025

The results of the reliability analysis, measured using Cronbach's Alpha analysed by SPSS (Version 26), indicate strong internal consistency across most categories related to cost overrun in construction projects. The causes of cost overrun in the design phase show excellent reliability ($\alpha = 0.933$) with nine items, suggesting highly consistent responses. However, such a high value may also indicate potential redundancy among the items, which could be worth reviewing. The construction phase causes have

acceptable reliability (α = 0.752) but with 18 items, the large number might be diluting consistency, so refining or grouping related items could improve reliability. Meanwhile, the completion phase causes demonstrate good reliability (α = 0.804) with eight items, indicating a solid measurement scale.

For the effects of cost overrun, the design phase has an exceptionally high Cronbach's Alpha (α = 0.955), but since it only includes two items, this may reflect over similarity rather than true reliability. Expanding this section with additional distinct items could provide a more balanced assessment. The construction phase effects show good reliability (α = 0.842) with three items, while the completion phase effects exhibit high reliability (α = 0.896) with six items, both performing well in measuring their respective constructs.

The remedies for cost overrun also display strong reliability across all phases. The design phase remedies have good reliability (α = 0.816) with nine items, while the construction phase remedies show excellent reliability (α = 0.955) with 16 items. However, the high alpha with so many items suggest possible redundancy, and a shorter, more concise scale might be more efficient without losing reliability. The completion phase remedies also perform well (α = 0.842) with eight items, reinforcing their consistency.

Overall, the findings suggest that most of the measurement scales are reliable, though some categories—particularly those with very high alphas and few items or lower alphas with many items—could benefit from refinement. Adjustments such as removing redundant items, rewording ambiguous questions, or conducting factor analysis to identify sub-dimensions could further enhance the robustness of these scales. If needed, additional analysis could help optimize the number of items while maintaining reliability.

3.8 Ethical Considerations

This study was conducted with a strong commitment to ethical research principles. All participants were engaged on a voluntary basis and were fully informed about the purpose, methods, and scope of the research. To ensure transparency and informed consent, participants provided verbal agreement to participate. Throughout the process, the researcher took measures to uphold the dignity and freedom of all individuals. Strict confidentiality was maintained, and participants were assured that their responses would be handled with the utmost privacy and would not be disclosed to any third parties. Furthermore, the researcher pledges to truthfully report all data, results, methods, and procedures, ensuring the integrity and transparency of the study's findings.

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter is describing the analysis and interpretation of the data collected through the research instrument, presenting findings related to the initial research problems and questions. The analysis and interpretation will serve as the foundation for drawing tangible conclusions and suggesting valuable recommendations. The study was conducted by analyzing information gathered via questionnaires distributed to various stakeholders, including building contractors, consultants, owners, and Dukem City administration. This means that the chapter brings together all the raw data collected from the field and transforms it into meaningful insights that directly address the core objectives of the research. By interpreting the information gathered from different respondent groups, the chapter provides a clearer understanding of how and why cost overruns occur in public building projects within the Dukem City Administration. The inclusion of multiple stakeholders helps ensure that the findings reflect a balanced and comprehensive view of the construction process, as each group experiences the causes and effects of cost overruns from a unique perspective.

The chapter also explains how the data was organized, categorized, and analyzed using statistical tools such as mean scores, percentage distributions, and ranking methods. These analytical tools help identify which factors contribute most significantly to cost overruns and which ones have relatively lower impacts. In this way, the analysis not only highlights the most critical issues but also provides an opportunity to compare how different stakeholders perceive the severity of each factor. For example, consultants may prioritize design-related issues, while contractors may highlight material price fluctuations or delays in payment processing. Such differences strengthen the analysis by revealing how perceptions vary depending on professional roles and responsibilities.

Moreover, the chapter relies on a structured questionnaire that used a five-point Likert scale, allowing respondents to express how frequently certain causes occur and how effective certain remedies might be. The inclusion of an “Unsure” option also improved accuracy by preventing respondents from choosing a rating when they had no relevant knowledge or experience regarding a specific item. The analysis also incorporates tables and figures that summarize response rates, demographic information, and ranked lists of causes, effects, and remedies across the three major phases of a typical construction project—design, construction, and completion. Each of these phases presents different challenges, and the use of phase-based analysis helps highlight how certain issues are more dominant at one stage than another.

Overall, this introduction prepares the reader for a detailed discussion that follows, emphasizing the importance of the collected data in forming the conclusions and recommendations of the study. It also reinforces the idea that understanding cost overruns requires examining both technical and administrative aspects of a project, as well as comparing insights from various actors involved in the public construction process. By laying this foundation, the chapter ensures that the subsequent sections are easy to follow, logically connected, and aligned with the investigation's primary goals. The primary statistical measure used in the analysis is the mean, and the data presented in the form of pie charts and tables. Questionnaires employed a five-point Likert scale, supplemented with an "Unsure" option. For the causes of cost overrun, the scale ranged from "Never" to "Always," while for remedies, it ranged from "Not effective" to "Extremely effective." Table 4.1 represents rate of return of questionnaires and Tables 4.2 to 4.10 provide the respondents' perceptions on causes, effects, and remedies across the Design, Construction, and Completion phases, using a mean score (MS) and percentage responses for each scale point.

4.2 Response Rate and Respondent's demographics

Table 4.1 Rate of return of questionnaires

Respondents	**Number of questionnaires Distributed**	**Number of questionnaires Received**	**Number of valid questionnaires'**	**% of valid responses**
Client	7	7	7	100 %
Regulatory bodies	3	3	3	100 %
Consultant	14	13	10	80 %
Contractor	18	16	12	77.78 %
Total	**42**	**39**	**30**	**76.47 %**

(Source Survey result 2025)

Table 4.1 summarizes the questionnaire distribution and return rates, revealing a strong overall valid response rate of 76.47% from 42 distributed questionnaires. A detailed breakdown by stakeholder group shows excellent engagement across the board. Both Clients and Regulatory bodies provided a 100% valid response rate, with 7 and 3 valid responses, respectively, indicating their full participation. Consultants returned a high percentage of valid questionnaires at 80% (10 out of 14 distributed), while Contractors provided a solid 77.78% valid response rate (12 out of 18). The strong participation from all stakeholder groups makes the data robust and ensures that the study's findings supported by a representative sample of project participants. This high level of responsiveness suggests that the issue of cost overrun is widely recognized by stakeholders as an important and relevant topic within the Dukem City public construction

sector. When response rates reach levels as high as this, the reliability of the data improves significantly because the findings based on perspectives from a broad and diverse group of professionals. This level of engagement indicates a strong willingness among respondents to share their experiences, challenges, and observations, which enhances the overall credibility of the study.

The full participation of clients and regulatory bodies is particularly noteworthy because these two groups often play critical roles in determining project budgets, approving designs, and managing contractual obligations. Their 100% response rate implies that they are highly aware of the problems associated with cost overruns and may even be directly involved in many of the processes that lead to such issues. By contrast, consultants and contractors—who had slightly lower but still strong response rates—represent the technical and execution side of project delivery. Consultants contributed 80% valid responses, suggesting a high level of interest and awareness but also indicating that some individuals may have been unavailable or less directly involved in the surveyed projects. Meanwhile, contractors responded at a rate of 77.78%, which, while slightly lower, still demonstrates substantial engagement and provides a reliable reflection of the challenges encountered during project implementation.

When comparing these response rates across stakeholder categories, it becomes clear that the consistency of participation enhances the representativeness of the data. In many construction-related studies, contractors or consultants sometimes show lower response rates due to busy schedules or workload pressures, but even in this case, the returned questionnaires exceeded what is typical for similar research contexts. This strengthens the conclusion that the sample is sufficiently balanced and reduces the likelihood of bias caused by underrepresented groups. Additionally, the range of professional backgrounds among respondents brings a multidimensional perspective to the analysis, as each group experiences cost overruns differently—clients from a budgeting standpoint, consultants from a design and management perspective, and contractors from a resource and execution viewpoint.

Overall, the high participation rates across all respondent categories indicate that the findings presented in the subsequent sections are well grounded, trustworthy, and reflective of real conditions in public building construction projects in Dukem City. The diversity and volume of responses ensure that the analysis of causes, effects, and remedies for cost overruns is informed by practical experience across the entire project lifecycle, from initial planning to completion.

4.3 Causes and effects of cost overrun

Based on the research methodology outlined in Chapter 3, this section of the study is dedicated to identifying and ranking the causes, effects, and remedies of cost overruns on public building projects in Dukem City. Questionnaires were utilized to accomplish this objective, with the importance of each factor determined by analyzing its mean item score. The analysis presented here includes an overview of the questionnaire response rate and respondent demographics, as well as a ranking of the causes, effects, and remedies of cost overrun. This section serves as the core of the study because it transforms raw data collected from professionals into meaningful insights that explain why cost overruns occur, what impact they create, and how they can be minimized. Each factor identified in the questionnaires been quantified and compared, allowing for a structured evaluation of which issues are most influential during different phases of the construction process. By examining cost overrun drivers and their consequences across the design, construction, and completion phases, the study reflects the reality that challenges evolve as a project progresses. For example, problems that originate during the design phase often create ripple effects that intensify during construction or force costly adjustments during completion.

The use of mean score ranking makes it possible to determine not only which issues are frequently encountered but also how strongly stakeholders perceive their impact. A high mean score suggests a factor is consistently problematic, while lower scores point to issues that may occur but with less frequency or severity. This ranking approach also allows for meaningful comparisons between professional groups; for instance, a cause that contractors rank as a major problem might be viewed as less significant by consultants or regulatory bodies. Such differences reflect the varied roles and responsibilities of stakeholders and provide a more nuanced understanding of where interventions may be most needed.

Additionally, the structure of this section ensures that the discussion is not limited to identifying problems but also extends to examining how these problems can be addressed. By analyzing effects and remedies alongside causes, the study creates a comprehensive picture of cost overrun dynamics. This integrated format helps connect the root causes to their consequences and the potential solutions required at each phase of a project. As a result, the section allows readers to see both the immediate and long-term implications of issues such as poor planning, material price fluctuations, or delays in decision-making.

The following subsections therefore analyze the ranked causes, effects, and remedies in detail. They provide insight into how these factors interfere with project success, why some issues are more damaging

than others, and how targeted improvements could significantly enhance cost performance in future public building projects. Through this systematic examination, the study aims to deepen understanding and support informed decision-making for project managers, policymakers, consultants, and contractors.

4.3.1 Ranking of Causes of Cost Overrun

The study evaluated respondents' perceptions of cost overrun causes across three project phases by analyzing questionnaire data using the Mean Score (MS) method (Equation 2), supplemented by descriptive analysis of open-ended responses. Respondents rated the frequency of each cause on a five-point Likert scale (1 = "never" to 5 = "always"), enabling the calculation of a Mean Importance Score (MIS) for ranking purposes.

a. Causes of cost overrun on design phase

Table 4.2 Cause of cost overrun in design phase

Cause	Mean	Rank
Inadequate project preparation, planning	4.17	1
Inadequate planning	4.00	2
Procurement-related and non-procurement-related factors	3.50	3
Incomplete design at time of tender	3.17	4
Lack of co-ordination at design phase	2.83	5
Lack of experience of project type	2.67	6
Lack of experience of project location	2.33	7
Technical omissions at design stage	1.67	8
Increased costs to crash activity time arising out of political pressure	1.33	9

(Source Survey result 2025)

Table 4.2 identifies inadequate project preparation and planning as the most critical cause of cost overrun in Dukem City Administration projects. This suggests that professionals often rush to initiate projects without allocating sufficient time for proper planning. Given that thorough preparation is crucial for project success, this oversight leads to avoidable expenses once construction begins.

This ranking indicates that the early stages of public building projects in Dukem City frequently suffer from insufficient time and effort devoted to foundational planning activities such as feasibility studies, needs assessment, resource estimation, and risk evaluation. When these crucial tasks are rushed or

overlooked, a project begins on an unstable foundation, increasing the likelihood of design changes, material adjustments, or corrective actions once implementation starts. Proper planning should ideally predict possible challenges, outline detailed project requirements, and align stakeholder expectations; however, when this process is incomplete, the entire project becomes vulnerable to unnecessary cost escalations. This aligns with international construction research, which consistently emphasizes that inadequate early planning is one of the strongest predictors of budget overruns.

In comparison to other causes listed later in the table, inadequate preparation has a more far-reaching impact because it affects all subsequent phases of the project. For example, poor planning during design can lead to unrealistic cost estimates, which then cause budget strain during construction. It may also result in an incomplete understanding of the site, project scope, or technical requirements, which inevitably forces the team to issue revisions, rework drawings, or procure additional materials later on. Thus, although the issue arises in the design phase, its negative effects spread throughout the entire project life cycle, making it a high-priority concern for project managers and policymakers.

The table further highlights that procurement and non-procurement-related factors significantly contribute to cost overruns, indicating inefficiencies in contractor selection, material sourcing, or contract management. Another major issue is incomplete design at the time of tender, which stems from the haste to commence bidding. When designs are finalized under time pressure, they frequently require revisions, resulting in additional costs. Incomplete designs at tender stage further complicate the situation. When bidding documents lack clarity or contain missing information, contractors price the project based on assumptions rather than detailed specifications. These assumptions often differ from the client's expectations, leading to disputes, design adjustments, or expensive change orders once construction begins. Comparatively, this issue has a slightly lower ranking than inadequate planning, but remains one of the most influential contributors to cost overruns because it directly triggers rework, variation claims, and schedule delays. In practice, tender-stage incompleteness reflects deeper systemic issues such as tight deadlines, pressure to accelerate project approval, and inadequate coordination among professionals. Additionally, the lack of coordination among professionals during tender document preparation exacerbates these problems, as disjointed planning often leads to costly corrections rather than savings.

Respondents also identified lack of experience in both project type and location as a contributing factor. This is particularly relevant for new construction projects, where contractors may not have sufficient prior knowledge of site conditions or project requirements.

On the other hand, technical omissions at the design stage and political pressure leading to accelerated

schedules were rated as the least significant causes. However, this does not imply they have no impact; rather, their perceived influence varies depending on respondents' roles and project involvement. Technical omissions may be less frequent, but when they occur, their consequences can be severe, especially if they relate to structural safety or compliance requirements. For example, overlooking a critical detail in a structural drawing can necessitate major redesigns during construction, which often cost significantly more than, if the issue had been addressed earlier. Similarly, political pressure for accelerated project delivery may not be common in Dukem City, but when present, it can force design teams to compress timelines, skip important reviews, or approve incomplete documents. These rushed decisions increase the likelihood of errors, miscalculations, and ambiguities — all of which translate into cost overruns later.

The relatively low ranking of these factors suggests that they are not widespread issues among the surveyed projects, but they should still be monitored closely. Their impact is project-specific: political pressure may heavily influence government-prioritized projects but be absent in smaller, routine developments. Technical omissions may occur more frequently among inexperienced design teams but be rare among well-established firms. Therefore, while statistically less prominent, these factors serve as reminders that even less frequent causes can create substantial financial consequences if not proactively managed.

b. Causes of cost overrun on construction phase

Table 4.3 Cause of cost overrun in construction phase

Cause	Mean	Rank
Materials cost increased	4.22	1
Fluctuations in the cost of building materials	4.00	2
Omissions and errors in the bills of quantities	3.89	3
Delays in costing variations and additional works	3.78	4
Labor cost increased due to environment restrictions	3.22	5
Contractor’s unstable financial background	3.00	6
Contractual claims, such as, extension of time with cost claims	2.68	7
Adjustment of prime cost and provisional sums	2.67	8
Improvements to standard drawings during construction stage	2.45	9
Delays in decision making by government, failure of specific coordinating	2.44	10
Monthly payments difficulties from agencies	2.34	11

Delay in construction, supply of raw materials and equipment by contractors	2.33	12
Poor contractor management	2.22	13
Unpredictable weather conditions	2.11	14
Changes made by the contractor	2.11	15
Inadequate project implementation	1.56	16
Labor unrest	1.33	17
Changes in owner's brief	1.11	18

(Source Survey result 2025)

Table 4.3 identifies materials cost increases as the most critical cause of cost overrun during the construction phase of Dukem City Administration projects. This suggests that volatile market conditions and supply chain disruptions significantly impact project budgets. Given that material costs typically account for a substantial portion of construction expenses, this finding highlights the need for better price fluctuation management in contracts.

Material cost increases are a major challenge because construction projects rely heavily on cement, reinforcement bars, aggregates, finishing materials, and other key inputs whose prices can change rapidly due to market instability. These price shifts may be influenced by global economic conditions, currency fluctuations, transportation bottlenecks, or local shortages caused by high demand. When material prices increase suddenly, contractors often struggle to procure the required quantities within the allocated budget. This leads to either delays in material supply or the need for renegotiation of contract terms — both of which add unexpected costs to the project. Additionally, because public procurement processes often require pre-determined contract sums, contractors frequently bear the initial financial shock before any price adjustment can be approved, deepening cost pressure and affecting cash flow.

Compared to other factors, material price fluctuation is particularly damaging because it is largely uncontrollable by the project team. While planning errors or coordination issues can be resolved internally, material price spikes arise from external market forces. This makes them more unpredictable and difficult to manage, especially in developing countries where imported materials are common and currency depreciation is a frequent issue. As such, the study emphasizes the need for more adaptive contract mechanisms—such as price escalation clauses or indexed material adjustment formulas—to help stabilize cost performance during construction

The fact that the second-ranked cause is also related to material pricing reinforces how sensitive

Dukem City projects are to financial volatility in the construction supply chain. Even small errors in estimating material quantities—whether overestimation or underestimation—can create significant budget overruns. For example, underestimating the amount of reinforcement steel for a structural frame may force the contractor to purchase additional steel at a higher market price later in the project. Overestimation, on the other hand, ties up unnecessary funds in material procurement, limiting cash flow for other essential activities.

Errors in the Bills of Quantities (BOQ) often originate from incomplete design information, lack of coordination among design professionals, or limited availability of accurate site data. BOQs serve as the financial backbone of a construction project, and inaccuracies directly distort cost estimates. A BOQ with missing items or incorrect measurements can mislead contractors during bidding, causing them either to price a project too low (leading to losses) or too high (reducing competitiveness). Once construction starts, correcting such errors requires contract variations, re-measurement, and additional approvals — all of which extend both time and cost. Compared to causes linked to planning weaknesses, BOQ errors represent a technical failure that could have been prevented through more thorough design reviews and crosschecking procedures.

Another major issue revealed is the delay in costing variations and additional works, indicating administrative bottlenecks in processing change orders. This is compounded by increased labor costs due to environmental restrictions, suggesting that regulatory compliance is adding unexpected expenses to projects. The presence of contractors' unstable financial background as a notable factor point to potential weaknesses in the prequalification process. Delays in pricing variations and approving additional works reflect inefficiencies within the project's administrative and contractual frameworks. When contractors identify changes that require extra cost — such as design errors, site condition differences, or client-requested modifications — they must submit variation claims. If the reviewing bodies delay approval, contractors often proceed with the work to avoid halting progress, thereby exposing themselves to financial risk. These delays lead to disputes, claims accumulation, and cash flow shortages that inevitably push the project into cost overrun territory. Such administrative bottlenecks may stem from understaffed government offices, lengthy bureaucratic procedures, or insufficient clarity in contractual guidelines for variation approval.

Environmental restrictions affecting labor costs are another contributor. Requirements such as safety compliance, environmental mitigation measures, or work-hour limitations can increase the total amount of labor needed to complete a job. For instance, if workers are restricted from performing certain activities during peak heat hours or dust-intensive tasks require additional protective

equipment, productivity drops and labor expenses rise. Although regulatory compliance is necessary for safety and environmental protection, its cost implications must be carefully planned and integrated into the initial budget, which appears not always to be the case in Dukem City public projects.

Contractual claims — such as extension-of-time claims accompanied by cost requests — are common in construction, but respondents suggest they are not among the most damaging causes. This likely means that existing contract management systems are relatively effective at handling such claims before they escalate. Adjustments to prime cost and provisional sums also appear manageable, possibly because these allowances are built into the contract precisely to address uncertainties in material pricing or scope definitions.

Unpredictable weather conditions ranked low, suggesting that Dukem City may not face extreme weather events like floods, hurricanes, or prolonged storms that severely disrupt construction. Mild weather variability, although inconvenient, can be mitigated through flexible scheduling and contingency allowances. Similarly, labor unrest appears to be rare or controlled, which helps maintain productivity stability compared to regions where strikes or industrial disputes frequently disrupt construction activities.

However, despite their low ranking, these factors should not be ignored. Weather unpredictability can worsen under climate change trends, and labor grievances can intensify if economic conditions shift. Their current low severity may simply reflect favorable conditions at the time of the study rather than guaranteed long-term stability.

On the other hand, factors like unpredictable weather conditions and labor unrest were rated among the least significant causes. However, this doesn't mean they should be ignored - rather, it suggests that in the context of these specific projects, other factors were more dominant in causing cost overruns. The lowest-ranked factor, changes in owner's brief, indicates that scope changes were either well-managed or infrequent in these projects.

The findings collectively reveal that while external market factors are challenging to control, many significant cost drivers stem from manageable aspects of project administration and contract management. Factors like weather, labor unrest, or changes in owner instructions, while important to consider, currently exert less influence in Dukem City's public building projects. This knowledge provides a useful foundation for policymakers and project managers to focus on strengthening procurement strategies, improving BOQ accuracy, and enhancing contract administration processes.

c. Cause of cost overrun on completion phase

Table 4.4 Cause of cost overrun in completion phase

Cause	Mean	Rank
Errors in the bills of quantities	3.31	1
Delay in resolving disputes	3.08	2
Design failures	2.77	3
Poor quality workmanship	2.62	4
Delay in final account agreements	2.15	5
Works suspended due to safety reasons	1.77	6
Artificial disasters	1.69	7
Late contract instruction after practical completion	1.54	8

(Source Survey result 2025)

The survey results identify errors in bills of quantities as the primary cause of cost overruns during project completion, followed by delays in dispute resolution and design failures. These findings highlight critical weaknesses in quantity surveying accuracy, conflict management processes, and quality control measures that emerge during final project stages. While some factors like safety-related suspensions and late contract instructions show minimal impact, the results emphasize that most completion-phase cost escalations stem from preventable administrative and procedural shortcomings.

This ranking shows that even when most of the physical construction work is finished, financial risks remain high due to administrative tasks that were not properly handled earlier. Errors in the Bills of Quantities (BOQ) may have originated during the design or tender stage, but their impact becomes fully visible during completion when final measurements, payments, and financial reconciliations take place. If the quantities were miscalculated or items were omitted, the contractor may submit claims for additional payment that the client had not budgeted for. This forces the project into a stressful financial review process during a time when both sides expect smooth closure.

These BOQ errors not only affect direct costs but also damage trust between clients and contractors. When discrepancies appear late in the project, discussions become more sensitive, and resolving them often requires revisiting earlier documents, conducting joint measurements, or even involving third-party

evaluators. Compared to earlier phases, completion-stage overruns create more visible tension because they occur when the project is nearing handover and budget flexibility is limited. The fact that this cause ranked highest during completion reflects that inadequate attention to detail earlier in the project eventually resurfaces and disrupts the final stage — the phase when all activities should ideally be wrapping up smoothly.

The data suggests three key improvement areas: enhanced quantity surveying practices, more efficient dispute resolution frameworks, and strengthened quality assurance processes. These measures could significantly mitigate completion-phase cost overruns, as the findings demonstrate that while some risks are inherent, many significant contributors can be addressed through improved project management approaches and more rigorous administrative controls. Enhanced quantity surveying practices include more accurate early-stage measurement, periodic review of BOQs during construction, and stronger collaboration between design teams and cost estimators. These improvements would help ensure that the quantities presented in tender documents match the actual work performed on site, reducing disputes about final payments. Additionally, adopting technologies such as digital measurement tools, Building Information Modeling (BIM), or quantity takeoff software could drastically minimize human errors that frequently occur when BOQs are prepared manually.

Efficient dispute resolution frameworks are equally essential. During completion, disagreements over variations, claims, or workmanship assessments often become urgent because they directly affect the release of final payments and the issuance of certificates of completion. If these disputes are managed through slow or unclear procedures, the project experiences delays and potential cost increases, especially when legal counsel becomes involved. By establishing clearer dispute escalation pathways—such as mediation, adjudication, or faster administrative review processes—projects can resolve conflicts more quickly and avoid prolonged financial uncertainty.

Strengthened quality assurance processes address the risks associated with design failures or poor workmanship identified during late inspections. During completion, quality checks often reveal defects or elements that do not meet specifications. If quality assurance was weak earlier, these issues multiply and require costly corrections at the final stage. Proper quality control throughout construction ensures that fewer surprises emerge during handover, thereby reducing additional costs tied to remedial work and extension of services.

4.3.2 Ranking of Effects of Cost Overrun

As mentioned before, The respondents' agreement on the effects of cost overrun in the three phases was also examined.

a. Effects of cost overrun on design phase

Table 4.5 Effects of cost overrun in design phase

Effects	Mean	Rank
High cost of supervision and contract administration	2.50	1
Loss of reputation	0.83	2

(Source Survey result 2025)

Table 4.5 indicates that the effects of cost overrun in the design phase are high cost of supervision and contract administration. When there is cost overrun, the project requires highly experienced supervision and administration, which increases expenses. Meanwhile, the least likely effect of a cost overrun in the design phase is a loss of professional reputation. This result suggests that when mistakes, omissions, or rushed decisions occur during the design stage, the consequences become visible later, requiring more oversight to manage complications that arise during implementation. Projects with poorly developed designs tend to experience more variations, clarifications, and technical challenges once construction begins. As a result, supervisory teams must spend additional time and resources ensuring that contractors interpret and implement the design correctly. This increased supervision is not just about monitoring progress but also involves frequent site visits, design revisions, and technical assessments — all of which require more staff hours and higher-level expertise, thus raising administrative costs well beyond the initial budget.

The ranking shows that design-phase cost overruns do not immediately damage professional reputation to the same degree as they increase administrative work. This may be because design errors or omissions are often corrected internally and do not always become visible to external stakeholders. For example, the client may observe delays or cost increases but may not directly attribute them to the architect, engineer, or consultant responsible for the design. Compared to construction-phase effects, where poor workmanship or delays are more visible, design-phase issues tend to be more technical and less publicized. This explains why respondents considered reputation loss to be relatively minimal in this stage.

However, even though reputation loss ranked lower, it should not be dismissed entirely. In consulting professions, reputation builds through consistent performance and accuracy; repeated design-phase cost overruns can gradually weaken trust, especially if clients observe recurring patterns. Additionally, if overruns are severe enough to draw attention from senior officials, auditors, or community stakeholders, the responsible design professionals may face reputational consequences. The lower ranking does not mean the effect is negligible; rather, it shows that in the context of Dukem City projects, the financial and administrative burdens take precedence over intangible impacts such as reputation.

The results also reinforce the critical link between the quality of design-phase work and the efficiency of later project stages. A flaw at the design stage has a domino effect: it increases supervision, slows down decision-making, complicates contract administration, and raises the likelihood of disputes. Compared to later phases, design-stage overruns are more preventable because they occur before physical work begins. Therefore, investing in quality design work early on is one of the most cost-effective strategies for reducing project-wide overruns.

b. Effects of cost overrun on construction phase

Table 4.6 Effects of cost overrun in construction phase

Effects	Mean	Rank
Delayed on payment	3.34	1
Budget short fall	3.33	2
Poor quality workmanship	2.11	3

(Source Survey result 2025)

Table 4.6 reveals that payment delays and budget shortfalls constitute the most critical effects of cost overruns during the construction phase. These financial constraints directly impact project schedules, often disrupting critical path activities and causing significant timeline extensions.

Conversely, the data indicates that poor workmanship quality ranks as the least prevalent consequence of construction-phase cost overruns. This finding suggests that while budget pressures may affect various project aspects, they do not consistently compromise work quality standards in these projects. This suggests that cost overruns during construction do not simply remain as abstract budget problems; they

immediately translate into practical difficulties that slow down progress on site. When payment delays occur, contractors struggle to pay laborers, purchase materials, hire equipment, or settle invoices with suppliers. These cash flow shortages create a chain reaction: workers may reduce productivity due to delayed wages, suppliers may withhold materials until outstanding payments are cleared, and subcontractors may refuse to continue work. All these disruptions affect the critical path — the sequence of activities that determines the entire project duration — causing the schedule to fall behind and requiring costly acceleration measures later.

Budget shortfalls have similar impacts. When project funds are depleted earlier than expected, the remaining activities may lack sufficient financing to continue smoothly. This forces project managers to rearrange priorities, slow down progress, or seek emergency budget approvals, which introduce bureaucratic delays. Compared to other phases, construction-phase financial impacts are more severe because the phase involves the largest workforce, the most equipment, and the greatest volume of material consumption. Any financial instability during this phase therefore ripples quickly across the entire project.

Interestingly, poor workmanship ranks as the least common effect of cost overruns, which indicates that even under financial pressure, contractors in Dukem City generally maintain a reasonable level of quality. This could mean that regulatory inspections, client supervision, or contractor professionalism are effectively preventing a decline in workmanship despite financial challenges. However, this does not mean craftsmanship is unaffected by all cost pressures; it simply means that respondents perceive other effects — such as delays and shortfalls — to be far more significant and immediate. In many construction environments, financial stress can compromise quality, but in this context, quality seems to be somewhat protected, possibly due to strict government standards or the fear of penalties for noncompliance.

The contrast between high-ranked and low-ranked effects highlights an important pattern: cost overruns during construction primarily harm project finances and schedules rather than technical quality. This finding suggests that construction teams prioritize completing work even when cash is constrained, but such completion may come at the cost of extended project timelines. For policymakers and project managers, this indicates the need for more stable, reliable funding mechanisms and improved payment processing systems. Ensuring timely payments may prevent many of the delays and disruptions that currently plague public building projects in Dukem City.

c. Effects of cost overrun on completion phase

Table 4.7 Effects of cost overrun in completion phase

Effects	Unsure	Rank
Delay of project	3.92	1
Supplementary agreement	3.54	2
Additional cost of project	3.31	3
Dissatisfaction of project owners	2.23	4
Creates frustration on stakeholders	1.69	5
Adversarial relationship between participants of the project	1.46	6

(Source Survey result 2025)

The analysis of table 4.7 reveals that project schedule delays constitute the most severe consequence of cost overruns during the completion phase, consistently pushing final delivery dates beyond contractual timelines. A secondary yet substantial impact involves the necessity for supplementary contractual agreements among project stakeholders to reconcile budgetary discrepancies and accommodate revised project scopes. These findings show that even when most construction work has already been finished, cost overruns continue to exert a strong influence on the final outcome of the project. Delays at the completion stage are especially problematic because this is the phase when stakeholders expect the project to be handed over and operational. When cost overruns force the project beyond its planned timeline, both the client and end-users experience inconvenience, and the extended duration often incurs additional administrative and operational costs. For example, extended supervision, ongoing site security, prolonged rental of equipment, or temporary utilities all contribute to additional spending that was not originally budgeted.

The need for supplementary contractual agreements indicates that existing contracts were unable to absorb the magnitude of changes triggered by cost overruns. These agreements typically involve renegotiation of payment amounts, deadlines, or responsibilities, which not only delays the closing process but also increases legal and administrative workloads. While such agreements are sometimes necessary to resolve legitimate variations, their frequency during the completion stage suggests deeper issues in early planning

and contract management. Unlike early-phase adjustments, late-stage contractual changes have little room for recovery because most project components are already finalized. This explains why supplementary agreements are viewed as a substantial consequence in this phase.

Furthermore, survey respondents consistently reported that cost overruns generate considerable client dissatisfaction and erode stakeholder confidence. Notably, interpersonal relationships among project team members appear least affected by these financial pressures, indicating that professional working relationships demonstrate resilience despite fiscal and scheduling adversities. This dichotomy suggests that while cost overruns create tangible operational and financial challenges, they do not necessarily undermine fundamental collaborative dynamics within the project team. Interestingly, even though dissatisfaction and confidence erosion are significant effects, interpersonal relationships within the project team are less affected according to the rankings. This may be because by the time the project reaches completion, team members have already adapted to working with each other, and their professional relationships remain intact despite financial challenges. This suggests that the emotional or relational impact of cost overruns is less severe than the financial or operational impact at this phase. However, while relationships may remain stable, the institutional reputation of the involved parties—especially contractors and consultants—can still suffer if delays and overruns become recurrent patterns.

The ranking also shows that adversarial relationships, often expected in troubled projects, were relatively minimal compared to other effects. This indicates that even though the completion stage is stressful, conflict escalation is generally avoided, perhaps due to established conflict-resolution procedures or long-standing professional norms within the Dukem City construction environment. Compared to other countries where cost overruns often cause intense disputes, the relatively low ranking here suggests a more cooperative completion-phase environment. Yet, even with cooperation, the financial and operational consequences remain substantial and require careful attention.

4.3.3 Ranking of remedies of Cost Overrun

The respondents' agreement on the remedies of cost overrun in three phases of the project cycle were tested.

a. Remedies of Cost overrun on design Phase

Table 4.8 Remedies of cost overrun in design phase

Remedy	Mean	Rank
Adequate project preparation, planning	4.33	1
Appointment of highly experienced technical consultants	4.00	2
Proper experience of project location	3.33	3
Adequate co-ordination at design phase	3.17	4
Completed designs at time of tender	3.17	5
Minimum changes at design stage	3.01	6
Proper experience of project type	3.00	7
Comprehensive project planning	2.33	8
Attending to procurement-related and non-procurement-related factors	2.00	9

(Source Survey result 2025)

The analysis identifies comprehensive project preparation and planning as the most critical remedy for design-phase cost overruns. The appointment of highly experienced technical consultants emerges as equally vital, highlighting the value of expertise in preliminary project stages. Effective mitigation also depends on professionals' familiarity with project locations and robust coordination during design development. The identification of highly experienced technical consultants as a vital remedy emphasizes the importance of professional expertise during design development. Experienced consultants bring deeper knowledge of design standards, local regulations, construction methodologies, and risk factors. They are better equipped to foresee potential challenges, provide accurate technical guidance, and produce

clear and complete design documents. In contrast, inexperienced consultants may overlook critical elements or misinterpret project requirements, leading to costly adjustments later. Therefore, investing in experienced professionals is not merely a financial decision but a preventive strategy that protects the project from future overruns.

Familiarity with the project location further strengthens the likelihood of accurate and efficient project delivery. Consultants and planners who understand local environmental conditions, site constraints, material availability, and regulatory frameworks are able to design structures that align with both practical and contextual realities. For instance, designing a building without understanding soil conditions may result in foundation problems later, requiring expensive redesign or reinforcement. When project teams have prior knowledge of the area, they can incorporate appropriate solutions that reduce uncertainty and cost risk during implementation.

Robust coordination among professionals during design development also plays a significant role. When architects, engineers, quantity surveyors, environmental experts, and regulatory bodies collaborate effectively, design inconsistencies are reduced. Poor coordination often results in conflicting drawings, unclear specifications, or duplicated work — all of which eventually lead to disputes or expensive revisions during construction. By establishing structured coordination mechanisms such as design review meetings, digital collaboration platforms, and cross-checking procedures, stakeholders can ensure alignment and reduce errors before the project proceeds to tender.

Completing designs before tender submission and minimizing design changes prove significantly beneficial, while addressing procurement-related factors appears least impactful at this stage. These findings collectively emphasize that early-stage interventions focusing on preparation and technical competence yield the greatest cost control benefits. The lower ranking of procurement-related remedies during the design phase suggests that cost overruns at this stage are more strongly linked to technical and planning issues rather than procurement inefficiencies. While procurement is essential during construction, its impact is limited during design. Poor procurement strategies cannot be fully addressed until the bidding or construction phase since design-phase overruns stem mostly from incomplete information, coordination issues, or lack of expertise.

Overall, these findings highlight that early interventions — particularly those involving careful planning, experience-based decision-making, and technical accuracy — offer the most substantial benefits in preventing cost overruns. Once a project moves beyond the design stage, the opportunity to make cost-saving changes becomes narrower and more expensive, making early-phase remedies the most cost-effective approach.

b. Remedies of cost overrun on construction phase

Table 4.9 Remedies of cost overrun in construction phase

Remedy	Mean	Rank
Proper project implementation	3.44	1
Timely supply of raw materials and equipment by contractors	3.43	2
Timely Improvements to standard drawings during construction stage	3.33	3
Timely costing of variations and additional works	3.23	4
Adequate provision for contractual claims, such as, extension of time with cost claims	3.22	5
Provision for monthly payments	3.21	6
Timely decision making by government, failure of specific coordinating	3.11	7
Proper contractor management	3.11	8
Provisions for materials price escalations	2.67	9
Minimum errors in the bills of quantities	2.55	10
Adequate provision for unpredictable weather conditions	2.44	11
Adequate provision for labor cost increased due to environment restrictions	2.11	12
Adequate provision for prime cost and provisional sums adjustments	2.10	13
Minimum changes in owner's brief	2.02	14
Provisions for changes made by the contractor	2.00	15
Provision labor unrest	0.78	16

(Source Survey result 2025)

For construction-phase cost overruns, proper project implementation and timely material supply stand out as the most effective solutions. The study reveals that maintaining schedule integrity through prompt drawing updates and efficient variation processing substantially reduces cost escalations. Establishing clear contractual terms for claims and ensuring regular payments also demonstrate strong mitigation potential. Interestingly, provisions for external factors like weather conditions or labor disputes show limited effectiveness compared to operational improvements. This suggests that construction cost control depends more on project management efficiency than on anticipating external disruptions.

c. Remedies of cost overrun on completion phase

Table 4.10 Remedies of cost overrun in completion phase

Remedy	Mean	Rank
Timely resolving disputes	3.77	1
Good quality workmanship	3.54	2
Minimum errors in the bills of quantities	3.46	3
Timely final account agreements	2.69	4
Timely contract instruction after practical completion	2.54	5
Comprehensive safety plan	2.46	6
Adequate designs	2.31	7
Provisions for artificial disasters	1.92	8

(Source Survey result 2025)

During project completion, timely dispute resolution and consistent quality workmanship emerge as paramount for cost control. The research indicates that accurate quantity surveying and efficient final account settlement significantly contribute to preventing budget overruns. While comprehensive safety planning and design adequacy remain important, their relative impact diminishes in the completion phase. When implementation is structured, disciplined, and well-monitored, delays decrease and the likelihood of unexpected cost increases is minimized. Timely material supply is equally essential because construction work depends heavily on the uninterrupted availability of materials. If materials arrive late or in inconsistent quantities, workers become idle, schedules slip, and contractors may incur additional overhead costs, all contributing to cost overruns.

One of the most significant challenges in the construction phase is the management of design updates and variations. Because unexpected site conditions, technical clarifications, or regulatory requirements often result in design adjustments, the ability to communicate these changes quickly becomes crucial. When design modifications are relayed promptly, contractors can adjust their work without interruption, preventing costly rework or delays. This explains why efficient variation processing ranks highly as a remedy: it reduces uncertainty, improves workflow continuity, and ensures that both the client and contractor remain aligned on updated scope requirements.

Clear contractual terms regarding claims are also essential for maintaining financial stability during construction. Many disputes and overruns arise from unclear or incomplete contract clauses that fail to define how delays, variations, or price adjustments will be compensated. When contractors and clients

fully understand the claim procedures — including documentation requirements, approval timelines, and entitlement criteria — the contract becomes more predictable and easier to manage. Regular payments further support financial stability, allowing contractors to pay workers on time, procure materials without delay, and maintain site productivity. In contrast, payment delays create negative ripple effects, reducing efficiency and increasing the risk of disputes.

Notably, provisions for extreme events like artificial disasters rank lowest, reflecting their rare occurrence despite potential severity. These findings underscore that contractual clarity and quality assurance outweigh exceptional circumstance planning in the final project stages. The relatively lower ranking of provisions for artificial disasters reflects their rarity within Dukem City's construction context. Events such as major fires, explosions, or severe structural failures are uncommon, and therefore planning for them has limited influence on cost control at the end of a project. While these events could have catastrophic financial implications if they occurred, their likelihood is too small to rank them as effective remedies in a typical project setting.

Overall, the remedies for completion-phase cost overruns emphasize administrative efficiency, accuracy, and collaborative closing procedures. They show that technical and procedural discipline earlier in the project simplifies the final stage, preventing unexpected extensions and financial disputes. Compared to remedies in the design and construction phases, completion-phase remedies focus more on closure, documentation, reconciliation, and final quality assurance — all of which ensure that the project concludes within its expected budget and timeframe.

Comparative Effectiveness

The remedy analysis reveals a clear effectiveness progression across project phases. Design-stage preparations offer the highest potential for cost control, with their impact diminishing if deferred to later phases. Construction solutions show the widest variation in effectiveness, highlighting the importance of selecting appropriate mitigation strategies for specific challenges. Completion-phase remedies generally demonstrate moderate effectiveness, primarily addressing consequences of earlier shortcomings rather than preventing overruns. By contrast, when issues remain unaddressed until the construction or completion phases, their impacts accumulate, leaving less room for adjustment and increasing the financial implications. The data clearly demonstrates that the earliest decisions shape the cost trajectory of the entire project, making early-stage remedies not only more effective but also more economical.

During construction, remedies are diverse because this phase contains the greatest number of variables — labor productivity, weather conditions, material availability, contractor management, regulatory

compliance, and more. These variables require a mixture of managerial skill, technical accuracy, and administrative efficiency. The broad range of construction-phase remedies suggests that no single solution can fully prevent cost overruns; instead, success requires a combination of timely decision-making, clear communication, and structured monitoring to stabilize the inherently dynamic nature of construction activities. Compared to the design phase, remedies here are more reactive, addressing issues as they arise rather than preventing them from occurring in the first place.

By the time a project reaches the completion phase, remedy effectiveness becomes increasingly limited. Completion-stage remedies tend to focus on resolving problems that should have been addressed earlier, such as disputed quantities, unfinished documentation, or poor coordination. While these remedies play a critical role in closing the project properly, their ability to prevent cost overruns is inherently constrained. They must operate within the confines of decisions made months or even years prior. As a result, completion-phase remedies are more corrective than preventive, aiming to finalize accounts, ensure quality, and resolve disputes rather than significantly altering the financial direction of the project.

Comparing all three phases reveals a consistent pattern: the earlier the intervention, the greater its cost-control value. Proper design preparation, accurate BOQs, thorough site investigations, and experienced consultants have the strongest long-term impact because they establish a clear and stable foundation. Construction-phase remedies, though important, cannot fully compensate for design-stage weaknesses. Similarly, completion-phase remedies help close financial and contractual gaps but rarely reverse major cost impacts.

This layered progression emphasizes the necessity of adopting a proactive project management culture. Stakeholders must recognize that cost control is not something achieved only on-site; it begins on the designer's table, continues through careful procurement, and is sustained by disciplined execution. When early decisions are sound, fewer corrective actions are needed later. Conversely, when early stages are rushed or poorly managed, later stages become overwhelmed with reactive measures that increase cost and reduce efficiency.

In summary, the comparative analysis shows that early-phase remedies offer the most powerful means of preventing cost overruns, construction-phase remedies depend heavily on strong management practices, and completion-phase remedies are essential but limited in their influence. Therefore, project managers and policymakers should prioritize investment in design-phase quality while ensuring solid implementation practices during construction and efficient administrative closure at completion. This holistic and phase-sensitive approach offers the best opportunity to minimize cost overruns in public building projects within Dukem City Administration and similar contexts.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This comprehensive study has systematically investigated the persistent and detrimental challenge of cost overruns in Dukem City's public building projects. Through a combination of theoretical review and empirical analysis of data from a diverse group of project stakeholders, the research confirms several findings from international literature while uncovering unique contextual factors specific to the local construction ecosystem. The analysis culminates in three fundamental insights regarding the causes, effects, and effective remedies for cost overruns. A central theme that emerged is the interconnected nature of cost overrun drivers. Issues that arise in the early stages, particularly in design and planning, create a chain of consequences that intensify during construction and become most visible during project completion. In this sense, the findings confirm a well-known concept in project management: early-stage weaknesses amplify downstream risks. Yet, the data from Dukem City demonstrates that these effects are even more pronounced in public building projects where institutional capacity may be limited and procedural bottlenecks more frequent. This validates the significance of emphasizing early-phase rigor and proactive planning as a strategy for improving overall project outcomes.

Root Causes Analysis: The research identified inadequate project preparation and incomplete design at the time of tender as the most critical vulnerabilities. This manifests as a systemic issue where projects are rushed into the bidding phase, leading to fundamental flaws in planning and documentation. During the construction phase, material cost volatility and fluctuations emerged as the dominant external factors, while internal issues like omissions and errors in the bills of quantities further exacerbated the problem. The study's findings reveal a clear progression of risk, where initial planning deficiencies set the stage for financial instability during construction and administrative failures, such as delays in dispute resolution, during the completion phase.

Significant Effects: The consequences of these cost overruns are severe and directly impact project success. The data indicates that project delays and payment delays are the most significant effects during the construction phase, often creating a domino effect that disrupts the project timeline. This leads directly to budget shortfalls and a reliance on supplementary agreements. Ultimately, these financial and scheduling pressures result in considerable dissatisfaction from project owners,

undermining trust and collaboration. The study notes that while these issues create tangible operational and financial challenges, professional relationships among project participants demonstrate a surprising resilience, suggesting that the problem is rooted in systemic flaws rather than interpersonal conflicts.

Effective Remedies: The study's analysis of remedies provides a clear roadmap for mitigation. The most effective solutions are found in early-phase interventions, as highlighted by the top-ranked remedies for the design phase: adequate project preparation and the appointment of highly experienced technical consultants this emphasizes that proactive, preventive measures have an exponential impact on cost control throughout the project lifecycle. During the construction phase, operational efficiency is key, with proper project implementation and timely material supply being the most effective remedies. In the completion phase, timely dispute resolution and good quality workmanship are paramount for preventing final budget escalations. A notable insight is that the chain reaction created by delayed payments and schedule overruns does not only impact costs—it also affects stakeholder relationships and perceptions of project success. While respondents suggested that interpersonal relationships remain surprisingly resilient, the dissatisfaction of project owners highlights a deeper issue: systemic misalignment between expectations and practical project realities. This erosion of trust can have long-term consequences, influencing willingness to collaborate on future projects and undermining public confidence in local construction administration.

In conclusion, this study establishes that while external market factors pose challenges, the majority of cost overruns stem from controllable, internal factors primarily through enhanced early-phase rigor, improved contractual frameworks, and stakeholder capacity building. The high overall response rate of 76.47% validates these findings as representative of the experiences of stakeholders in Dukem City. The overall conclusion is clear: while external market conditions cannot be fully controlled, most major drivers of cost overrun are internal, procedural, and preventable. This shifts the responsibility toward improving project governance, enhancing stakeholder capacity, strengthening contract administration, and enforcing more disciplined planning processes

5.2 Recommendations

Based on the empirical findings, the following actionable recommendations are proposed for each key stakeholder group to mitigate cost overruns and improve project performance in Dukem City. These recommendations are designed not only to address the immediate causes of cost overruns but also to strengthen systemic weaknesses that have persisted across multiple projects. By linking each recommendation directly to the findings of this study, the proposed interventions reinforce evidence-based decision-making rather than relying on general assumptions or external models that may not align with the local construction environment. Furthermore, these recommendations reflect a combination of international best practices and context-specific strategies that acknowledge the administrative, economic, and technical realities of Dukem City's public sector.

A central theme that emerges is the necessity for different stakeholders—clients, consultants, contractors, and regulators—to play active roles at each stage of the project rather than focusing only on their traditional tasks. This integrated approach recognizes that cost overruns do not arise from one source alone; instead, they evolve from a chain of interconnected decisions and omissions. Strengthening collaboration, communication, and accountability across all levels of the project cycle is therefore essential. The following recommendations outline targeted actions that stakeholders can take to reduce risks and improve the predictability of project costs.

I. **For Government Entities and Dukem City Administration**:

Implement Mandatory Preconstruction Planning Periods: Formalize a mandatory 90-day preconstruction planning period for all public projects. This period should be used for detailed feasibility studies, comprehensive risk assessments, and finalizing all design and tender documents, thereby minimizing incomplete designs at the bidding stage.

Establish Dedicated Project Financing Accounts: To address the issue of payment delays and budget shortfalls, establish dedicated and ring-fenced project financing accounts to ensure that funds are readily available to pay contractors in a timely manner according to contractual obligations.

Develop Standardized Design Checklists: Create and enforce standardized checklists for design completeness that must be approved by a multi-disciplinary team of consultants and ERA representatives before any project can proceed to tender.

II. **For Consultants:**

Adopt Value Engineering and Value Management: Integrate value engineering and value management techniques into the design process to optimize project costs without compromising functionality or quality. This should be an iterative process conducted during the early design phases.

Simplify Complex Designs: Where feasible, consultants should avoid overly complex designs that increase construction difficulty and potential for errors. This measure is a direct response to the finding that errors in bills of quantities are a major cause of cost overruns.

Introduce Digital Monitoring Systems: Implement digital project management platforms for real-time cost tracking and communication. This will facilitate timely decision-making and reduce the administrative delays associated with costing variations and additional works.

III. For Contractors:

Enhance Resource Planning: Utilize modern project management tools, such as Building Information Modeling (BIM), to improve resource planning, duration estimation, and schedule development. This will help to minimize delays and their associated costs.

Maintain Contingency Reserves: Contractors should be encouraged to maintain a minimum contingency reserve (e.g., 10-15%) within their bids to cover for material price fluctuations and other unforeseen minor risks, reducing the need for continuous variation orders.

Conduct Proactive Stakeholder Meetings: Initiate and maintain a schedule of biweekly coordination meetings with all stakeholders to ensure open communication, address potential issues before they escalate, and prevent adversarial relationships.

Cross-Cutting Measures:

Establish a Dukem Construction Cost Control Task Force: Form a multi-stakeholder task force comprising representatives from the Dukem City Administration, ERA, consultants, and contractors to collaboratively identify, monitor, and address cost overrun risks.

Develop Localized Material Price Indices: To combat the effects of material price volatility, the Dukem City Administration should work with the local Chamber of Commerce to create and publish quarterly updated material price indices, which can be referenced in contracts to manage price escalation clauses more effectively.

Mandate Clear Dispute Resolution Timelines: The Administration should formulate a policy mandating specific timelines less than a month for dispute resolution during the completion phase, thereby reducing delays and associated costs.

5.3 Future Research Directions

To build upon the findings of this study, the following areas are recommended for future research:

1. Planning Duration Impact Study

A longitudinal analysis examining correlations between preconstruction planning duration and project variance outcomes would validate the optimal planning period recommendation.

2. AI-Driven Cost Forecasting

Machine learning applications could be developed to predict material price volatility specific to Ethiopia's construction market, enhancing budget accuracy.

3. Digitalization and Data Management in Public Projects

Assessing the impact of digital tools (BIM, cost management software, procurement platforms) on reducing errors, improving coordination, and increasing budget certainty.

4. Dispute Resolution Framework Optimization

Comparative studies of alternative dispute resolution mechanisms would identify the most cost-effective approaches for contract administration.

5. Capacity Building Evaluation

Systematic assessment of training program effectiveness could measure knowledge transfer and implementation gaps in cost management practices.

6. Contract Delivery Method Comparison

Analyzing how different procurement systems (design-bid-build, design-build, EPC, etc.) influence cost performance in Ethiopian public projects

7. Impact of Political and Economic Factors

Evaluating how inflation, exchange rates, government policy shifts, and administrative restructuring influence cost overruns.

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APPENDIX
QUESTIONNAIRE

Dear respondents,

The main purpose of this questionnaire survey is to collect information on "Cause and Effects of Cost Overrun on Project in Dukem City Administration Building Projects". I asked to answer the questions in the questionnaire based on your personal knowledge and experience regarding the research title.

The questionnaire has four sections. The first section (Part I) consists of questions aimed at collecting General information of the respondents. The second section (Part II) is aimed at finding out the factors affecting cost overruns. The third section (Part III) is focused on the effects of cost overrun. The last section (Part IV) is also focused on the remedies of cost overrun.

I kindly to fill up this questionnaire which will be of immense help in our study. We assure you that, this study is for only academic purposes and confidentiality of your response is guaranteed.

Please take a look at the required information and try to answer correctly and accurately, as many project information as possible. Please provide information as soon as you can, as timely reply is very crucial for the analysis.

Please record your details below to facilitate contacting you, in the event that a query should arise. **Please note that your information will be treated in the strictest confidence.**

For Additional Information
Henok Tsegaye Anullo
Phone number +251916863138

Thank you for your contribution to this research.

Section A: General Information

Please indicate your response by making an X in the block of your choice

e.g. [X]

1. Please indicate the sector that your organization belongs to among the under listed?

Private ☐
Public ☐
Both ☐

2. Please indicate how long your organization has been in existence?

0 – 5 years ☐
5 – 10 years ☐
>10 years ☐

3. Please indicate the approximate number of employees in your organization?

1 – 20 ☐
21 – 50 ☐
50 – 100 ☐
101 – 200 ☐
> 200 ☐

4. Please indicate your current position in the organization?

Director ☐
Managing director ☐
Construction / Project manager ☐
Architect ☐
Site agent ☐
Supervisor ☐

5. Please indicate the length of your experience in the construction industry?

1 – 5 years ☐
5 – 10 years ☐
>10 years ☐

6. Please indicate the highest formal qualification you have obtained?

Diploma ☐
BSc Degree ☐
MSc Degree ☐
PhD Degree ☐

Section B: Causes of cost overrun

On a scale of 1 (never), 2 (sometimes), 3 (often), 4 (usually) or 5 (always), please indicate the extent to which each of the mentioned causes leads to cost overruns on Dukem City Administration Building Projects (**please note the 'unsure' option**)?

1. Design Phase

Cause	**Unsure**	**Never ..... Always**				
		1	**2**	**3**	**4**	**5**
Inadequate planning						
Lack of co-ordination at design phase						
Incomplete design at time of tender						
Technical omissions at design stage						
Lack of experience of project location						
Lack of experience of project type						
Inadequate project preparation, planning						
Procurement and non-related procurement related factors						
Increased costs to crash activity time arising out of political pressure						

On a scale of 1 (never), 2 (sometimes), 3 (often), 4 (usually) or 5 (always), please indicate the extent to which each of the mentioned causes leads to cost overruns on Dukem City Administration Building Projects (**please note the 'unsure' option**)?

2. Construction Phase

Cause	Unsure	Never ..... Always				
		1	2	3	4	5
Unpredictable weather conditions						
Fluctuations in the cost of building materials						
Changes in owner's brief						
Adjustment of prime cost and provisional sums						
Contractual claims, such as, extension of time with cost claims						
Improvements to standard drawings during construction stage						
Omissions and errors in the bills of quantities						
Delays in costing variations and additional works						
Materials cost increased						
Labor cost increased due to environment restrictions						
Inadequate project implementation						
Delay in construction, supply of raw materials and equipment by contractors						
Delays in decision making by government, failure of specific coordinating						
Labor unrest						
Monthly payments difficulties from agencies						

Poor contractor management						
Changes made by the contractor						
Contractor's unstable financial background						

On a scale of 1 (never), 2 (sometimes), 3 (often), 4 (usually) or 5 (always), please indicate the extent to which each of the mentioned causes leads to cost overruns on Dukem City Administration Building Projects (**please note the 'unsure' option**)?

3. Completion Phase

Cause	**Unsure**	**Never .....Always**				
		1	**2**	**3**	**4**	**5**
Artificial disasters						
Design failures						
Errors in the bills of quantities						
Late contract instruction after practical completion						
Poor quality workmanship						
Delay in resolving disputes						
Delay in final account agreements						
Works suspended due to safety reasons						

On a scale of Never, Sometimes, Often, Usually or Always; in your experience how frequently do projects in Dukem City Administration Building Projects experience cost overruns?

……

With a Yes, No or Unsure, please indicate if the frequency of cost overruns constitutes a performance problem for the construction industry in Dukem City Administration Building Projects?

Yes, ☐ No ☐ Unsure ☐

Section C: Effects of cost overrun

On a scale of 1 (never), 2 (sometimes), 3 (often), 4 (usually) or 5 (always), please indicate the extent to which each of the mentioned effects of cost overruns on Dukem City Administration Building Projects (**please note the 'unsure' option**)?

4. Design Phase

Effects	**Unsure**	**Never ..... Always**				
		1	**2**	**3**	**4**	**5**
High cost of supervision and contract administration						
Loss of reputation						

On a scale of 1 (never), 2 (sometimes), 3 (often), 4 (usually) or 5 (always), please indicate the extent to which each of the mentioned effects of cost overruns Dukem City Administration Building Projects (**please note the 'unsure' option**)?

5. Construction Phase

Effects	**Unsure**	**Never ..... Always**				
		1	**2**	**3**	**4**	**5**
Delayed on payment						
Budget short fall						
Poor quality workmanship						

On a scale of 1 (never), 2 (sometimes), 3 (often), 4 (usually) or 5 (always), please indicate the extent to which each of the mentioned effects of cost overruns on Dukem City Administration Building Projects (**please note the 'unsure' option**)?

6. Completion Phase

Effects	**Unsure**	**Never ..... Always**				
		1	**2**	**3**	**4**	**5**
Delay of project						
Supplementary agreement						
Additional cost of project						
Dissatisfaction of project owners						
Creates frustration on stakeholders						
Adversarial relationship between participants of the project						

Section D: Remedies of Cost Overrun

On a scale of 1 (not effective), 2 (slightly effective), 3 (moderately effective), 4 (very effective) or 5 (extremely effective), please indicate the extent to which each of the mentioned remedies for cost overruns in Dukem City Administration Building Projects (**please note the 'unsure' option**)?

7. Design Phase

Remedy	**Unsure**	**Not ..... Extremely**				
		1	**2**	**3**	**4**	**5**
Comprehensive project planning						
Adequate co-ordination at design phase						
Completed designs at time of tender						
Minimum changes at design stage						
Proper experience of project location						
Proper experience of project type						

Adequate project preparation, planning						
Appointment of highly experienced technical consultants						
Attending to procurement and non- related procurement related factors						

On a scale of 1 (not effective), 2 (slightly effective), 3 (moderately effective), 4 (very effective) or 5 (extremely effective), please indicate the extent to which each of the mentioned remedies for cost overruns in Dukem City Administration Building Projects (**please note the 'unsure' option**)?

8. Construction Phase

Remedy	**Unsure**	**Not .....Extremely**				
		1	**2**	**3**	**4**	**5**
Adequate provision for unpredictable weather conditions						
Provisions for materials price escalations						
Minimum changes in owner's brief						
Adequate provision for prime cost and provisional sums adjustments						
Adequate provision for contractual claims, such as, extension of time with cost claims						
Timely Improvements to standard drawings during construction stage						
Minimum errors in the bills of quantities						
Timely costing of variations and additional works						
Adequate provision for labor cost increased due to environment restrictions						

Proper project implementation						
Timely supply of raw materials and equipment by contractors						
Timely decision making by government, failure of specific coordinating						
Provision labor unrest						
Provision for monthly payments						
Proper contractor management						
Provisions for changes made by the contractor						

On a scale of 1 (not effective), 2 (slightly effective), 3 (moderately effective), 4 (very effective) or 5 (extremely effective), please indicate the extent to which each of the mentioned remedies for cost overruns in Dukem City Administration Building Projects (**please note the 'unsure' option**)?

9. Completion Phase

Remedy	**Unsure**	**Not ..... Extremely**				
		1	**2**	**3**	**4**	**5**
Provisions for artificial disasters						
Adequate designs						
Minimum errors in the bills of quantities						
Timely contract instruction after practical completion						
Good quality workmanship						
Timely resolving disputes						
Timely final account agreements						
Comprehensive safety plan						